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APPENDICES

Appendix A Location and Description of Each Stream for Reformer Area.

Table A1 Location of Streams at Unit 100

HEX	STREAM
100-E2/2A	H1 : C1
100-E6	H2 : C2
100-E4	H3 : C4
100-EA3	H1 : AIR
100-E9	H2 : CW
100-EA5	H3 : AIR
100-E12AB	H3 : CW
100-E11	C3 : LP

Table A2 Location of Streams at Unit 110

HEX	STREAM
110-E1A-D	H4 : C6
110-EA1	H4 : AIR
110-E2/2A	C5 : HP

Table A3 Location of Streams at Unit 150

HEX	STREAM
150-H1	C7 : HEATER
150-E2AB	H7 : C8
150-EA3	H7 : AIR
150-EA1	H6 : AIR

Table A4 Location of Streams at Unit 200

HEX	STREAM
200-E2	H8 : C9
200-E6A-B	H15 : C10
200-EA1	H9 : AIR
200-E12	H11 : CW
200-E13	H11 : RE
200-EA2	H17 : AIR
200-E3	H12 : CW
200-EA3	H10 : AIR
200-E4AB	H13 : CW
200-E5	H14 : CW
200-E15	H16 : RE

Table A5 Description of Hot Streams

stream	Unit	Description
H1	100	Bottom from naphtha splitter column, Condensate residue to storage
H2	100	Bottom from DeC2 (100-V7), To LPG storage or LPG treating
H3	100	Bottoms from DeC4, Light Naphtha to storage
H4	110	Product from hydrolysis reactor, Feed to degasing drum (110-V2)
H5	150	Bottom from Reactor, Feed to 150-EA1 R1
H6	150	150-EA1
H7	150	Bottom from stripper, Stripper Bottoms to platforming unit
H8	200	200-E2
H9	200	200-EA1
H10	200	200-EA3
H11	200	Product from recycle comp., Feed to recycle gas
H12	200	To 200-V2
H13	200	To 200-V3
H14	200	From 200-C2A/B/C, Feed to 200-V5
H15	200	Reformate from feed prep. Unit
H16	200	200-E15
H17	200	200-EA2

Table A6 Description of Cold Streams

stream	Unit	Description
C1	100	Full range condensate from storage,Feed to DeC5
C2	100	Overhead liq. From CCR, Feed to DeC2 (100V7)
C3	100	Deethanizer off gas
C4	100	FRC, Feed to DeC4
C5	110	H2 rich gas from CCR
C6	110	From water settling drum, To 110-E2
C7	150	Bottom of 150-V1, Feed to reactor
C8	150	Bottom from separator, Feed to striper
C9	200	FRC, Feed to Recator
C10	200	bottom from 200-V27

Appendix B Problem Table Algorithm for Various ΔT_{min} of Reformer Area

DTmin 40

Temp Interval	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17
mCp (kW/C)	38.2207	14.4965	25.4372	169.2	150.224	109.33	105.491	0.176033	273.448	29.3941	5.5896	120.223	100.141	4.17279	82.0322	2.45213	34.1955
C																	
504								0.176033									
359								0.176033									
334								0.176033									
323					150.224			0.176033									
240					150.224			0.176033									
214.02	38.2207				150.224			0.176033									
208.7	38.2207				150.224			0.176033									
204.5	38.2207				150.224			0.176033									
202.21	38.2207				150.224		105.491	0.176033									
200	38.2207			169.2	150.224		105.491	0.176033							82.0322		
189.54	38.2207			169.2	150.224		105.491	0.176033							82.0322		
177	38.2207			169.2	150.224		105.491	0.176033							82.0322		
174.1	38.2207			169.2	150.224		105.491	0.176033							82.0322		
162	38.2207			169.2	150.224		105.491	0.176033							82.0322		
158.61	38.2207			169.2	150.224		105.491								82.0322		
138	38.2207			169.2	150.224		105.491								82.0322		
131	38.2207			169.2	150.224		105.491								82.0322		
112.9	38.2207			169.2	150.224		105.491								82.0322		
111	38.2207			169.2	150.224		105.491			29.3941					82.0322		
101.37	38.2207			169.2			105.491			29.3941					82.0322		34.1955
98	38.2207			169.2		109.33	105.491			29.3941					82.0322		34.1955
97	38.2207			169.2		109.33	105.491			29.3941					82.0322		34.1955
96	38.2207			169.2		109.33	105.491			29.3941					82.0322		34.1955
91.8	38.2207		25.4372	169.2		109.33	105.491			29.3941					82.0322		34.1955
89	38.2207		25.4372	169.2		109.33	105.491			29.3941	5.5896				82.0322		34.1955
84.23	38.2207		25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
83.4	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
83.2	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896						34.1955
83	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
72.28	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
69	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
65.02	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
64.6	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
57	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
56.8	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
43.46	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
40	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
39.54	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896						34.1955
36.19	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896			4.17279			34.1955
36.11	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			34.1955
35	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			
29	38.2207	14.4965	25.4372			109.33			273.448		5.5896		100.141	4.17279			
28.53		14.4965	25.4372						273.448		5.5896		100.141	4.17279			
26.86		14.4965	25.4372								5.5896		100.141	4.17279			
18		14.4965	25.4372								5.5896	120.223	100.141	4.17279			
17.91											5.5896	120.223	100.141	4.17279			
17.79											5.5896		100.141	4.17279			
17.78											5.5896			4.17279			
17.77											5.5896						
-12											5.5896					2.45213	

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10		dHi,Hot	dHi,Cold	Surplus	Sum Surplus	Cascade
167.283	15.2911	1.04541	34.9636	232.056	159.144	138.031	91.9648	0.299507	74.3544		kW	kW	kW	kW	kW
															12309.60
											25.52	0.00	25.52	25.52	12335.12
						138.031					4.40	3450.78	-3446.37	-3420.85	8888.75
						138.031		0.299507			1.94	1521.64	-1519.70	-4940.55	7369.05
						138.031		0.299507			12483.20	11481.43	1001.77	-3938.78	8370.82
				232.056		138.031		0.299507			3907.39	9622.64	-5715.25	-9654.03	2655.57
				232.056		138.031		0.299507			1003.46	1970.46	-966.99	-10621.02	1688.58
				232.056	159.144	138.031		0.299507			792.21	2224.03	-1431.82	-12052.84	256.76
					159.144	138.031		0.299507			431.94	681.22	-249.28	-12302.12	7.48
					159.144	138.031		0.299507			649.99	657.42	-7.43	-12309.55	0.05
					159.144	138.031		0.299507			4846.24	3111.58	1734.66	-10574.89	1734.71
					159.144	138.031		0.299507			6838.61	3730.33	3108.28	-7466.61	4842.99
					159.144	138.031	91.9648	0.299507			1581.50	1129.37	452.12	-7014.48	5295.12
167.283					159.144	138.031	91.9648	0.299507	74.3544		6598.66	5611.90	986.76	-6027.73	6281.87
167.283					159.144	138.031	91.9648	0.299507	74.3544		1848.72	2139.35	-290.63	-6318.36	5991.24
					159.144	138.031	91.9648	0.299507	74.3544		11235.91	13006.49	-1770.58	-8088.94	4220.66
					159.144	138.031	91.9648	0.299507	74.3544		3816.18	3246.56	569.62	-7519.32	4790.28
					159.144	138.031	91.9648		74.3544		9867.54	8389.25	1478.29	-6041.03	6268.57
					159.144	138.031	91.9648		74.3544		1091.67	880.64	211.03	-5830.00	6479.60
					159.144	138.031	91.9648		74.3544		4415.68	4463.45	-47.77	-5877.77	6431.83
					159.144	138.031	91.9648		74.3544		1913.70	1561.98	351.72	-5526.05	6783.55
	15.2911				159.144	138.031	91.9648		74.3544		567.86	478.79	89.08	-5436.97	6872.63
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		567.86	513.75	54.11	-5382.85	6926.75
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		2491.86	2157.75	334.12	-5048.74	7260.86
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		1676.89	1438.50	238.40	-4810.34	7499.26
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		2353.51	2450.58	-97.07	-4907.41	7402.19
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		421.55	426.41	-4.86	-4912.27	7397.33
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		85.17	102.75	-17.58	-4929.84	7379.76
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		139.86	102.75	37.11	-4892.73	7416.87
	15.2911		34.9636		159.144		91.9648		74.3544		7496.62	4027.70	3468.92	-1423.81	10885.79
	15.2911				159.144		91.9648		74.3544		2293.74	1117.67	1176.07	-247.74	12061.86
	15.2911				159.144				74.3544		2783.26	990.18	1793.08	1545.34	13854.94
					159.144				74.3544		293.71	98.07	195.64	1740.98	14050.58
		1.04541			159.144				74.3544		5314.77	1782.53	3532.24	5273.22	17582.82
		1.04541			159.144						139.86	32.04	107.82	5381.04	17690.64
		1.04541									9328.82	13.95	9314.87	14695.91	27005.51
											2419.62	0.00	2419.62	17115.53	29425.13
											243.85	0.00	243.85	17359.38	29668.98
											1789.85	0.00	1789.85	19149.23	31458.83
											50.75	0.00	50.75	19199.99	31509.59
											666.26	0.00	666.26	19866.24	32175.84
											3425.01	0.00	3425.01	23291.26	35600.86
											198.94	0.00	198.94	23490.20	35799.80
											250.23	0.00	250.23	23740.43	36050.03
											2392.73	0.00	2392.73	26133.16	38442.76
											20.71	0.00	20.71	26153.87	38463.47
											13.19	0.00	13.19	26167.06	38476.66
											0.10	0.00	0.10	26167.16	38476.76
											0.06	0.00	0.06	26167.22	38476.82
											239.40	0.00	239.40	26406.62	38716.22

DTmin =45

Temp Interval	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17
mCp (kW/C)	38.2207	14.4965	25.4372	169.2	150.224	109.33	105.491	0.176033	273.448	29.3941	5.5896	120.223	100.141	4.17279	82.0322	2.45213	34.1955
C																	
501.5																	
361.5								0.176033									
336.5								0.176033									
320.5								0.176033									
242.5					150.224			0.176033									
211.52					150.224			0.176033									
211.2	38.2207				150.224			0.176033									
207	38.2207				150.224			0.176033									
199.71	38.2207				150.224			0.176033									
197.5	38.2207				150.224		105.491	0.176033									
187.04	38.2207			169.2	150.224		105.491	0.176033									
179.5	38.2207			169.2	150.224		105.491	0.176033							82.0322		
176.6	38.2207			169.2	150.224		105.491	0.176033							82.0322		
164.5	38.2207			169.2	150.224		105.491	0.176033							82.0322		
156.11	38.2207			169.2	150.224		105.491	0.176033							82.0322		
140.5	38.2207			169.2	150.224		105.491								82.0322		
133.5	38.2207			169.2	150.224		105.491								82.0322		
110.4	38.2207			169.2	150.224		105.491								82.0322		
108.5	38.2207			169.2	150.224		105.491			29.3941					82.0322		
100.5	38.2207			169.2			105.491			29.3941					82.0322		34.1955
99.5	38.2207			169.2			105.491			29.3941					82.0322		34.1955
98.87	38.2207			169.2			105.491			29.3941					82.0322		34.1955
93.5	38.2207			169.2		109.33	105.491			29.3941					82.0322		34.1955
89.3	38.2207		25.4372	169.2		109.33	105.491			29.3941					82.0322		34.1955
86.5	38.2207		25.4372	169.2		109.33	105.491			29.3941	5.5896				82.0322		34.1955
85.5	38.2207		25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
81.73	38.2207		25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
80.9	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
80.7	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896						34.1955
74.78	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
71.5	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
67.52	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
67.1	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
59.5	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
59.3	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
45.96	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
37.5	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
37.04	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896						34.1955
33.69	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896			4.17279			34.1955
33.61	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			34.1955
32.5	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			
26.5	38.2207	14.4965	25.4372			109.33			273.448		5.5896		100.141	4.17279			
26.03		14.4965	25.4372						273.448		5.5896		100.141	4.17279			
24.36		14.4965	25.4372								5.5896		100.141	4.17279			
15.5		14.4965	25.4372								5.5896	120.223	100.141	4.17279			
15.41											5.5896	120.223	100.141	4.17279			
15.29											5.5896		100.141	4.17279			
15.28											5.5896			4.17279			
15.27											5.5896						
-14.5											5.5896					2.45213	

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10		dHi,Hot	dHi,Cold	Surplus	Sum Surplus	Cascade
167.283	15.2911	1.04541	34.9636	232.056	159.144	138.031	91.9648	0.299507	74.3544		kW	kW	kW	kW	kW
															13797.00
											24.64	0.00	24.64	24.64	13821.64
						138.031					4.40	3450.78	-3446.37	-3446.37	10375.27
						138.031		0.299507			2.82	2213.29	-2210.47	-2210.47	8164.80
						138.031		0.299507			11731.20	10789.78	941.42	941.42	9106.22
				232.056		138.031		0.299507			4659.39	11474.57	-6815.18	-6815.18	2291.04
				232.056		138.031		0.299507			60.36	118.52	-58.17	-58.17	2232.88
				232.056	159.144	138.031		0.299507			792.21	2224.03	-1431.82	-1431.82	801.05
					159.144	138.031		0.299507			1375.05	2168.59	-793.54	-793.54	7.51
					159.144	138.031		0.299507			649.99	657.42	-7.43	-7.43	0.08
					159.144	138.031		0.299507			4846.24	3111.58	1734.66	1734.66	1734.74
					159.144	138.031		0.299507			4111.89	2242.96	1868.94	1868.94	3603.67
					159.144	138.031	91.9648	0.299507			1581.50	1129.37	452.12	452.12	4055.80
					159.144	138.031	91.9648	0.299507	74.3544		6598.66	5611.90	986.76	986.76	5042.55
167.283					159.144	138.031	91.9648	0.299507	74.3544		4575.44	5294.73	-719.30	-719.30	4323.26
167.283					159.144	138.031	91.9648	0.299507	74.3544		8510.07	9851.11	-1341.04	-1341.04	2982.22
					159.144	138.031	91.9648	0.299507	74.3544		3816.18	3246.56	569.62	569.62	3551.84
					159.144	138.031	91.9648		74.3544		12593.38	10706.72	1886.66	1886.66	5438.50
					159.144	138.031	91.9648		74.3544		1091.67	880.64	211.03	211.03	5649.53
					159.144	138.031	91.9648		74.3544		3668.27	3707.95	-39.69	-39.69	5609.84
	15.2911				159.144	138.031	91.9648		74.3544		458.53	478.79	-20.25	-20.25	5589.59
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		288.88	323.66	-34.79	-34.79	5554.81
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		3049.43	2758.83	290.60	290.60	5845.40
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		2491.86	2157.75	334.12	334.12	6179.52
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		1676.89	1438.50	238.40	238.40	6417.92
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		493.40	513.75	-20.35	-20.35	6397.57
	15.2911		34.9636		159.144		91.9648		74.3544		1860.12	1416.46	443.66	443.66	6841.22
	15.2911		34.9636		159.144		91.9648		74.3544		421.55	311.85	109.71	109.71	6950.93
	15.2911		34.9636		159.144		91.9648		74.3544		85.17	75.14	10.03	10.03	6960.96
	15.2911		34.9636		159.144		91.9648		74.3544		4139.92	2224.25	1915.67	1915.67	8876.64
	15.2911				159.144		91.9648		74.3544		2293.74	1117.67	1176.07	1176.07	10052.70
	15.2911				159.144				74.3544		2783.26	990.18	1793.08	1793.08	11845.78
					159.144				74.3544		293.71	98.07	195.64	195.64	12041.42
		1.04541			159.144				74.3544		5314.77	1782.53	3532.24	3532.24	15573.66
		1.04541			159.144						139.86	32.04	107.82	107.82	15681.48
		1.04541									9328.82	13.95	9314.87	9314.87	24996.35
											5916.18	0.00	5916.18	5916.18	30912.53
											243.85	0.00	243.85	243.85	31156.38
											1789.85	0.00	1789.85	1789.85	32946.23
											50.75	0.00	50.75	50.75	32996.99
											666.26	0.00	666.26	666.26	33663.24
											3425.01	0.00	3425.01	3425.01	37088.26
											198.94	0.00	198.94	198.94	37287.20
											250.23	0.00	250.23	250.23	37537.43
											2392.73	0.00	2392.73	2392.73	39930.16
											20.71	0.00	20.71	20.71	39950.87
											13.19	0.00	13.19	13.19	39964.06
											0.10	0.00	0.10	0.10	39964.16
											0.06	0.00	0.06	0.06	39964.22
											239.40	0.00	239.40	239.40	40203.62

DTmin =47

Temp Interval	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17
mCp (kW/C)	38.2207	14.4965	25.4372	169.2	150.224	109.33	105.491	0.176033	273.448	29.3941	5.5896	120.223	100.141	4.17279	82.0322	2.45213	34.1955
C																	
500.5																	
362.5								0.176033									
337.5								0.176033									
319.5								0.176033									
243.5					150.224			0.176033									
212.2					150.224			0.176033									
210.52					150.224			0.176033									
208	38.2207				150.224			0.176033									
198.71	38.2207				150.224			0.176033									
196.5	38.2207				150.224		105.491	0.176033									
186.04	38.2207			169.2	150.224		105.491	0.176033									
180.5	38.2207			169.2	150.224		105.491	0.176033							82.0322		
177.6	38.2207			169.2	150.224		105.491	0.176033							82.0322		
165.5	38.2207			169.2	150.224		105.491	0.176033							82.0322		
155.11	38.2207			169.2	150.224		105.491	0.176033							82.0322		
141.5	38.2207			169.2	150.224		105.491								82.0322		
134.5	38.2207			169.2	150.224		105.491								82.0322		
109.4	38.2207			169.2	150.224		105.491								82.0322		
107.5	38.2207			169.2	150.224		105.491			29.3941					82.0322		
101.5	38.2207			169.2			105.491			29.3941					82.0322		34.1955
100.5	38.2207			169.2			105.491			29.3941					82.0322		34.1955
97.87	38.2207			169.2			105.491			29.3941					82.0322		34.1955
92.5	38.2207			169.2		109.33	105.491			29.3941					82.0322		34.1955
88.3	38.2207		25.4372	169.2		109.33	105.491			29.3941					82.0322		34.1955
86.5	38.2207		25.4372	169.2		109.33	105.491			29.3941	5.5896				82.0322		34.1955
85.5	38.2207		25.4372	169.2		109.33	105.491			29.3941	5.5896				82.0322		34.1955
80.73	38.2207		25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
79.9	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
79.7	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896						34.1955
75.78	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
72.5	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
68.52	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
68.1	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
60.5	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
60.3	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
46.96	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
36.5	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
36.04	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896						34.1955
32.69	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896			4.17279			34.1955
32.61	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			34.1955
31.5	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			
25.5	38.2207	14.4965	25.4372			109.33			273.448		5.5896		100.141	4.17279			
25.03		14.4965	25.4372						273.448		5.5896		100.141	4.17279			
23.36		14.4965	25.4372								5.5896		100.141	4.17279			
14.5		14.4965	25.4372								5.5896	120.223	100.141	4.17279			
14.41											5.5896	120.223	100.141	4.17279			
14.29											5.5896		100.141	4.17279			
14.28											5.5896			4.17279			
14.27											5.5896						
-15.5											5.5896					2.45213	

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10		dHi,Hot	dHi,Cold	Surplus	Sum Surplus	Cascade
167.283	15.2911	1.04541	34.9636	232.056	159.144	138.031	91.9648	0.299507	74.3544		kW	kW	kW	kW	kW
															14392.00
											24.29	0.00	24.29	24.29	14416.29
						138.031					4.40	3450.78	-3446.37	-3446.37	10969.92
						138.031		0.299507			3.17	2489.95	-2486.78	-2486.78	8483.14
						138.031		0.299507			11430.40	10513.12	917.28	917.28	9400.42
				232.056		138.031		0.299507			4707.52	11593.10	-6885.58	-6885.58	2514.85
				232.056	159.144	138.031		0.299507			252.67	889.61	-636.94	-636.94	1877.91
				232.056	159.144	138.031		0.299507			475.32	1334.42	-859.09	-859.09	1018.81
					159.144	138.031		0.299507			1752.29	2763.54	-1011.25	-1011.25	7.56
					159.144	138.031		0.299507			649.99	657.42	-7.43	-7.43	0.13
					159.144	138.031		0.299507			4846.24	3111.58	1734.66	1734.66	1734.79
					159.144	138.031		0.299507			3021.21	1648.01	1373.20	1373.20	3107.99
					159.144	138.031	91.9648	0.299507			1581.50	1129.37	452.12	452.12	3560.11
					159.144	138.031	91.9648	0.299507	74.3544		6598.66	5611.90	986.76	986.76	4546.87
167.283					159.144	138.031	91.9648	0.299507	74.3544		5666.12	6556.89	-890.76	-890.76	3656.10
167.283					159.144	138.031	91.9648	0.299507	74.3544		7419.74	8588.95	-1169.22	-1169.22	2486.88
167.283					159.144	138.031	91.9648	0.299507	74.3544		3816.18	4417.54	-601.36	-601.36	1885.52
					159.144	138.031	91.9648		74.3544		13683.71	11633.70	2050.01	2050.01	3935.53
					159.144	138.031	91.9648		74.3544		1091.67	880.64	211.03	211.03	4146.56
					159.144	138.031	91.9648		74.3544		2751.20	2780.97	-29.76	-29.76	4116.80
	15.2911				159.144	138.031	91.9648		74.3544		458.53	478.79	-20.25	-20.25	4096.54
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		1205.94	1351.16	-145.22	-145.22	3951.33
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		3049.43	2758.83	290.60	290.60	4241.92
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		2491.86	2157.75	334.12	334.12	4576.04
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		1078.00	924.75	153.25	153.25	4729.29
	15.2911		34.9636		159.144		91.9648		74.3544		598.89	375.72	223.17	223.17	4952.47
	15.2911		34.9636		159.144		91.9648		74.3544		2353.51	1792.17	561.34	561.34	5513.81
	15.2911		34.9636		159.144		91.9648		74.3544		421.55	311.85	109.71	109.71	5623.52
	15.2911		34.9636		159.144		91.9648		74.3544		85.17	75.14	10.03	10.03	5633.54
	15.2911		34.9636		159.144		91.9648		74.3544		2741.30	1472.81	1268.49	1268.49	6902.03
	15.2911				159.144		91.9648		74.3544		2293.74	1117.67	1176.07	1176.07	8078.10
	15.2911				159.144				74.3544		2783.26	990.18	1793.08	1793.08	9871.18
					159.144				74.3544		293.71	98.07	195.64	195.64	10066.82
		1.04541			159.144				74.3544		5314.77	1782.53	3532.24	3532.24	13599.05
		1.04541			159.144						139.86	32.04	107.82	107.82	13706.88
		1.04541									9328.82	13.95	9314.87	9314.87	23021.75
											7314.80	0.00	7314.80	7314.80	30336.55
											243.85	0.00	243.85	243.85	30580.40
											1789.85	0.00	1789.85	1789.85	32370.25
											50.75	0.00	50.75	50.75	32421.01
											666.26	0.00	666.26	666.26	33087.26
											3425.01	0.00	3425.01	3425.01	36512.28
											198.94	0.00	198.94	198.94	36711.22
											250.23	0.00	250.23	250.23	36961.45
											2392.73	0.00	2392.73	2392.73	39354.18
											20.71	0.00	20.71	20.71	39374.89
											13.19	0.00	13.19	13.19	39388.08
											0.10	0.00	0.10	0.10	39388.18
											0.06	0.00	0.06	0.06	39388.23
											239.40	0.00	239.40	239.40	39627.64

DTmin =47.412

Temp Interval	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17
mCp (kW/C)	38.2207	14.4965	25.4372	169.2	150.224	109.33	105.491	0.176033	273.448	29.3941	5.5896	120.223	100.141	4.17279	82.0322	2.45213	34.1955
C																	
500.294																	
362.706								0.176033									
337.706								0.176033									
319.294								0.176033									
243.706					150.224			0.176033									
212.406					150.224			0.176033									
210.314					150.224			0.176033									
208.206	38.2207				150.224			0.176033									
198.504	38.2207				150.224			0.176033									
196.294	38.2207				150.224		105.491	0.176033									
185.834	38.2207			169.2	150.224		105.491	0.176033									
180.706	38.2207			169.2	150.224		105.491	0.176033							82.0322		
177.806	38.2207			169.2	150.224		105.491	0.176033							82.0322		
165.706	38.2207			169.2	150.224		105.491	0.176033							82.0322		
154.904	38.2207			169.2	150.224		105.491	0.176033							82.0322		
141.706	38.2207			169.2	150.224		105.491								82.0322		
134.706	38.2207			169.2	150.224		105.491								82.0322		
109.194	38.2207			169.2	150.224		105.491								82.0322		
107.294	38.2207			169.2	150.224		105.491			29.3941					82.0322		
101.706	38.2207			169.2			105.491			29.3941					82.0322		34.1955
100.706	38.2207			169.2			105.491			29.3941					82.0322		34.1955
97.664	38.2207			169.2			105.491			29.3941					82.0322		34.1955
92.294	38.2207			169.2		109.33	105.491			29.3941					82.0322		34.1955
88.094	38.2207		25.4372	169.2		109.33	105.491			29.3941					82.0322		34.1955
86.706	38.2207		25.4372	169.2		109.33	105.491			29.3941	5.5896				82.0322		34.1955
85.294	38.2207		25.4372	169.2		109.33	105.491			29.3941	5.5896				82.0322		34.1955
80.524	38.2207		25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
79.694	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
79.494	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896						34.1955
75.986	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
72.706	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
68.726	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
68.306	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
60.706	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
60.506	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
47.166	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
36.294	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
33.834	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896						34.1955
32.484	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896			4.17279			34.1955
32.404	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			34.1955
31.294	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			
25.294	38.2207	14.4965	25.4372			109.33			273.448		5.5896		100.141	4.17279			
24.824		14.4965	25.4372						273.448		5.5896		100.141	4.17279			
23.154		14.4965	25.4372								5.5896		100.141	4.17279			
14.294		14.4965	25.4372								5.5896	120.223	100.141	4.17279			
14.204											5.5896	120.223	100.141	4.17279			
14.084											5.5896		100.141	4.17279			
14.074											5.5896			4.17279			
14.064											5.5896						
-15.706											5.5896					2.45213	

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10		dHi,Hot	dHi,Cold	Surplus	Sum Surplus	Cascade
167.283	15.2911	1.04541	34.9636	232.056	159.144	138.031	91.9648	0.299507	74.3544		kW	kW	kW	kW	kW
															14514.50
											24.22	0.00	24.22	24.22	14538.72
						138.031					4.40	3450.78	-3446.37	-3422.15	11092.35
						138.031		0.299507			3.24	2546.94	-2543.70	-5965.85	8548.65
						138.031		0.299507			11368.44	10456.13	912.31	-5053.54	9460.96
				232.056		138.031		0.299507			4707.52	11593.10	-6885.58	-11939.12	2575.38
				232.056	159.144	138.031		0.299507			314.64	1107.78	-793.14	-12732.26	1782.24
				232.056	159.144	138.031		0.299507			397.61	1116.25	-718.64	-13450.90	1063.60
					159.144	138.031		0.299507			1830.00	2886.10	-1056.10	-14507.00	7.50
					159.144	138.011		0.299507			649.99	657.42	-7.43	-14514.43	0.07
					159.144	138.031		0.299507			4846.24	3111.58	1734.66	-12779.77	1734.73
					159.144	138.031		0.299507			2796.52	1525.45	1271.07	-11508.70	3005.80
					159.144	138.031	91.9648	0.299507			1581.50	1129.37	452.12	-11056.57	3457.93
					159.144	138.031	91.9648	0.299507	74.3544		6598.66	5611.90	986.76	-10069.82	4444.68
167.283					159.144	138.031	91.9648	0.299507	74.3544		5890.81	6816.89	-926.09	-10995.90	3518.60
167.283					159.144	138.031	91.9648	0.299507	74.3544		7195.13	8328.95	-1133.82	-12129.73	2384.77
					159.144	138.031	91.9648	0.299507	74.3544		3816.18	3246.56	569.62	-11560.11	2954.39
					159.144	138.031	91.9648		74.3544		13908.32	11824.66	2083.66	-9476.45	5038.05
					159.144	138.031	91.9648		74.3544		1091.67	880.64	211.03	-9265.42	5249.08
					159.144	138.031	91.9648		74.3544		2562.29	2590.01	-27.72	-9293.14	5221.36
	15.2911				159.144	138.031	91.9648		74.3544		458.53	478.79	-20.25	-9313.39	5201.11
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		1394.86	1562.82	-167.97	-9481.36	5033.14
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		3049.43	2758.83	290.60	-9190.76	5323.74
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		2491.86	2157.75	334.12	-8856.64	5657.86
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		831.26	713.08	118.18	-8738.47	5776.03
	15.2911		34.9636		159.144		91.9648		74.3544		845.63	530.51	315.12	-8423.35	6091.15
	15.2911		34.9636		159.144		91.9648		74.3544		2353.51	1792.17	561.34	-7862.01	6652.49
	15.2911		34.9636		159.144		91.9648		74.3544		421.55	311.85	109.71	-7752.30	6762.20
	15.2911		34.9636		159.144		91.9648		74.3544		85.17	75.14	10.03	-7742.27	6772.23
	15.2911		34.9636		159.144		91.9648		74.3544		2453.19	1318.02	1135.17	-6607.10	7907.40
	15.2911				159.144		91.9648		74.3544		2293.74	1117.67	1176.07	-5431.04	9083.46
	15.2911				159.144				74.3544		2783.26	990.18	1793.08	-3637.96	10876.54
					159.144				74.3544		293.71	98.07	195.64	-3442.32	11072.18
		1.04541			159.144				74.3544		5314.77	1782.53	3532.24	89.92	14604.42
		1.04541			159.144						139.86	32.04	107.82	197.74	14712.24
		1.04541									9328.82	13.95	9314.87	9512.61	24027.11
											7602.92	0.00	7602.92	17115.53	31630.03
											243.85	0.00	243.85	17359.38	31873.88
											1789.85	0.00	1789.85	19149.23	33663.73
											50.75	0.00	50.75	19199.99	33714.49
											666.26	0.00	666.26	19866.24	34380.74
											3425.01	0.00	3425.01	23291.26	37805.76
											198.94	0.00	198.94	23490.20	38004.70
											250.23	0.00	250.23	23740.43	38254.93
											2392.73	0.00	2392.73	26133.16	40647.66
											20.71	0.00	20.71	26153.87	40668.37
											13.19	0.00	13.19	26167.06	40681.56
											0.10	0.00	0.10	26167.16	40681.66
											0.06	0.00	0.06	26167.22	40681.72
											239.40	0.00	239.40	26406.62	40921.12

DTmin =48

Temp Interval	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17
mCp (kW/C)	38.2207	14.4965	25.4372	169.2	150.224	109.33	105.491	0.176033	273.448	29.3941	5.5896	120.223	100.141	4.17279	82.0322	2.45213	34.1955
C																	
500																	
363								0.176033									
338								0.176033									
319								0.176033									
244					150.224			0.176033									
212.7					150.224			0.176033									
210.02					150.224			0.176033									
208.5	38.2207				150.224			0.176033									
198.21	38.2207				150.224			0.176033									
196	38.2207				150.224		105.491	0.176033									
185.54	38.2207			169.2	150.224		105.491	0.176033									
181	38.2207			169.2	150.224		105.491	0.176033							82.0322		
178.1	38.2207			169.2	150.224		105.491	0.176033							82.0322		
166	38.2207			169.2	150.224		105.491	0.176033							82.0322		
154.61	38.2207			169.2	150.224		105.491	0.176033							82.0322		
142	38.2207			169.2	150.224		105.491								82.0322		
135	38.2207			169.2	150.224		105.491								82.0322		
108.9	38.2207			169.2	150.224		105.491								82.0322		
107	38.2207			169.2	150.224		105.491			29.3941					82.0322		
102	38.2207			169.2			105.491			29.3941					82.0322		34.1955
101	38.2207			169.2			105.491			29.3941					82.0322		34.1955
97.37	38.2207			169.2			105.491			29.3941					82.0322		34.1955
92	38.2207			169.2		109.33	105.491			29.3941					82.0322		34.1955
87.8	38.2207		25.4372	169.2		109.33	105.491			29.3941					82.0322		34.1955
87	38.2207		25.4372	169.2		109.33	105.491			29.3941	5.5896				82.0322		34.1955
85	38.2207		25.4372	169.2		109.33	105.491			29.3941	5.5896				82.0322		34.1955
80.23	38.2207		25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
79.4	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
79.2	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896						34.1955
76.28	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
73	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
69.02	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
68.6	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
61	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
60.8	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
47.46	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
36	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
35.54	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896						34.1955
32.19	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896			4.17279			34.1955
32.11	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			34.1955
31	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			
25	38.2207	14.4965	25.4372			109.33			273.448		5.5896		100.141	4.17279			
24.53		14.4965	25.4372						273.448		5.5896		100.141	4.17279			
22.86		14.4965	25.4372								5.5896		100.141	4.17279			
14		14.4965	25.4372	-							5.5896	120.223	100.141	4.17279			
13.91											5.5896	120.223	100.141	4.17279			
13.79											5.5896		100.141	4.17279			
13.78											5.5896			4.17279			
13.77											5.5896						
-16											5.5896					2.45213	

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10		dHi,Hot	dHi,Cold	Surplus	Sum Surplus	Cascade
167.283	15.2911	1.04541	34.9636	232.056	159.144	138.031	91.9648	0.299507	74.3544		kW	kW	kW	kW	kW
															14689.40
											24.12	0.00	24.12	24.12	14713.52
						138.031					4.40	3450.78	-3446.37	-3446.37	11267.14
						138.031		0.299507			3.34	2628.28	-2624.94	-2624.94	8642.21
						138.031		0.299507			11280.00	10374.79	905.21	905.21	9547.42
				232.056		138.031		0.299507			4707.52	11593.10	-6885.58	-6885.58	2661.85
				232.056	159.144	138.031		0.299507			403.07	1419.14	-1016.07	-1016.07	1645.78
				232.056	159.144	138.031		0.299507			286.70	804.89	-518.18	-518.18	1127.59
					159.144	138.031		0.299507			1940.91	3061.01	-1120.11	-1120.11	7.49
					159.144	138.031		0.299507			649.99	657.42	-7.43	-7.43	0.06
					159.144	138.031		0.299507			4846.24	3111.58	1734.66	1734.66	1734.71
					159.144	138.031		0.299507			2475.86	1350.53	1125.33	1125.33	2860.04
					159.144	138.031	91.9648	0.299507			1581.50	1129.37	452.12	452.12	3312.16
167.283					159.144	138.031	91.9648	0.299507	74.3544		6598.66	5611.90	986.76	986.76	4298.92
167.283					159.144	138.031	91.9648	0.299507	74.3544		6211.47	7187.96	-976.50	-976.50	3322.42
					159.144	138.031	91.9648	0.299507	74.3544		6874.57	7957.88	-1083.31	-1083.31	2239.11
					159.144	138.031	91.9648	0.299507	74.3544		3816.18	3246.56	569.62	569.62	2808.73
					159.144	138.031	91.9648		74.3544		14228.88	12097.20	2131.68	2131.68	4940.42
					159.144	138.031	91.9648		74.3544		1091.67	880.64	211.03	211.03	5151.45
	15.2911				159.144	138.031	91.9648		74.3544		2292.67	2317.47	-24.80	-24.80	5126.64
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		458.53	478.79	-20.25	-20.25	5106.39
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		1664.48	1864.91	-200.43	-200.43	4905.96
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		3049.43	2758.83	290.60	290.60	5196.55
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		2491.86	2157.75	334.12	334.12	5530.67
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		479.11	411.00	68.11	68.11	5598.79
	15.2911		34.9636		159.144		91.9648		74.3544		1197.78	751.44	446.34	446.34	6045.13
	15.2911		34.9636		159.144		91.9648		74.3544		2353.51	1792.17	561.34	561.34	6606.47
	15.2911		34.9636		159.144		91.9648		74.3544		421.55	311.85	109.71	109.71	6716.18
	15.2911		34.9636		159.144		91.9648		74.3544		85.17	75.14	10.03	10.03	6726.21
	15.2911		34.9636		159.144		91.9648		74.3544		2041.99	1097.10	944.89	944.89	7671.10
	15.2911				159.144		91.9648		74.3544		2293.74	1117.67	1176.07	1176.07	8847.17
	15.2911				159.144				74.3544		2783.26	990.18	1793.08	1793.08	10640.25
		1.04541			159.144				74.3544		293.71	98.07	195.64	195.64	10835.89
		1.04541			159.144						5314.77	1782.53	3532.24	3532.24	14368.12
		1.04541									139.86	32.04	107.82	107.82	14475.95
											9328.82	13.95	9314.87	9314.87	23790.82
											8014.11	0.00	8014.11	8014.11	31804.93
											243.85	0.00	243.85	243.85	32048.78
											1789.85	0.00	1789.85	1789.85	33838.63
											50.75	0.00	50.75	50.75	33889.39
											666.26	0.00	666.26	666.26	34555.64
											3425.01	0.00	3425.01	3425.01	37980.66
											198.94	0.00	198.94	198.94	38179.60
											250.23	0.00	250.23	250.23	38429.83
											2392.73	0.00	2392.73	2392.73	40822.56
											20.71	0.00	20.71	20.71	40843.27
											13.19	0.00	13.19	13.19	40856.46
											0.10	0.00	0.10	0.10	40856.56
											0.06	0.00	0.06	0.06	40856.62
											239.40	0.00	239.40	239.40	41096.02

DTmin =50

Temp Interval	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17
mCp (kW/C)	38.2207	14.4965	25.4372	169.2	150.224	109.33	105.491	0.176033	273.448	29.3941	5.5896	120.223	100.141	4.17279	82.0322	2.45213	34.1955
C																	
499								0.176033									
364								0.176033									
339								0.176033									
318					150.224			0.176033									
245					150.224			0.176033									
213.7					150.224			0.176033									
209.5					150.224			0.176033									
209.02	38.2207				150.224			0.176033									
197.21	38.2207				150.224		105.491	0.176033									
195	38.2207			169.2	150.224		105.491	0.176033							82.0322		
184.54	38.2207			169.2	150.224		105.491	0.176033							82.0322		
182	38.2207			169.2	150.224		105.491	0.176033							82.0322		
179.1	38.2207			169.2	150.224		105.491	0.176033							82.0322		
167	38.2207			169.2	150.224		105.491	0.176033							82.0322		
153.61	38.2207			169.2	150.224		105.491								82.0322		
143	38.2207			169.2	150.224		105.491								82.0322		
136	38.2207			169.2	150.224		105.491								82.0322		
107.9	38.2207			169.2	150.224		105.491								82.0322		
106	38.2207			169.2	150.224		105.491			29.3941					82.0322		
103	38.2207			169.2			105.491			29.3941					82.0322		34.1955
102	38.2207			169.2			105.491			29.3941					82.0322		34.1955
96.37	38.2207			169.2			105.491			29.3941					82.0322		34.1955
91	38.2207			169.2		109.33	105.491			29.3941					82.0322		34.1955
88	38.2207		25.4372	169.2		109.33	105.491			29.3941					82.0322		34.1955
86.8	38.2207		25.4372	169.2		109.33	105.491			29.3941					82.0322		34.1955
84	38.2207		25.4372	169.2		109.33	105.491			29.3941	5.5896,				82.0322		34.1955
79.23	38.2207		25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
78.4	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896				82.0322		34.1955
78.2	38.2207	14.4965	25.4372	169.2		109.33				29.3941	5.5896						34.1955
77.28	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
74	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
70.02	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
69.6	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
62	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
61.8	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
48.46	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
35	38.2207	14.4965	25.4372	169.2		109.33			273.448	29.3941	5.5896						34.1955
34.54	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896						34.1955
31.19	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896			4.17279			34.1955
31.11	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			34.1955
30	38.2207	14.4965	25.4372			109.33			273.448	29.3941	5.5896		100.141	4.17279			
24	38.2207	14.4965	25.4372			109.33			273.448		5.5896		100.141	4.17279			
23.53		14.4965	25.4372						273.448		5.5896		100.141	4.17279			
21.86		14.4965	25.4372								5.5896		100.141	4.17279			
13		14.4965	25.4372								5.5896	120.223	100.141	4.17279			
12.91											5.5896	120.223	100.141	4.17279			
12.79											5.5896		100.141	4.17279			
12.78											5.5896			4.17279			
12.77											5.5896						
-17											5.5896					2.45213	

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10		dHi,Hot	dHi,Cold	Surplus	Sum Surplus	Cascade
167.283	15.2911	1.04541	34.9636	232.056	159.144	138.031	91.9648	0.299507	74.3544		kW	kW	kW	kW	kW
															15284.40
											23.76	0.00	23.76	23.76	15308.16
						138.031					4.40	3450.78	-3446.37	-3446.37	11861.79
						138.031		0.299507			3.70	2904.94	-2901.24	-2901.24	8960.55
						138.031		0.299507			10979.20	10098.13	881.08	881.08	9841.62
				232.056		138.031		0.299507			4707.52	11593.10	-6885.58	-6885.58	2956.05
				232.056	159.144	138.031		0.299507			631.68	2224.03	-1592.35	-1592.35	1363.70
					159.144	138.031		0.299507			72.19	142.79	-70.60	-70.60	1293.10
					159.144	138.031		0.299507			2227.61	3513.17	-1285.56	-1285.56	7.54
					159.144	138.031		0.299507			649.99	657.42	-7.43	-7.43	0.11
					159.144	138.031		0.299507			4846.24	3111.58	1734.66	1734.66	1734.76
					159.144	138.031		0.299507			1385.17	755.59	629.59	629.59	2364.35
					159.144	138.031	91.9648	0.299507			1581.50	1129.37	452.12	452.12	2816.48
					159.144	138.031	91.9648	0.299507	74.3544		6598.66	5611.90	986.76	986.76	3803.23
167.283					159.144	138.031	91.9648	0.299507	74.3544		7302.16	8450.12	-1147.96	-1147.96	2655.27
167.283					159.144	138.031	91.9648	0.299507	74.3544		5784.23	6695.72	-911.49	-911.49	1743.78
					159.144	138.031	91.9648	0.299507	74.3544		3816.18	3246.56	569.62	569.62	2313.40
					159.144	138.031	91.9648		74.3544		15319.22	13024.19	2295.03	2295.03	4608.43
					159.144	138.031	91.9648		74.3544		1091.67	880.64	211.03	211.03	4819.46
					159.144	138.031	91.9648		74.3544		1375.60	1390.48	-14.88	-14.88	4804.58
	15.2911				159.144	138.031	91.9648		74.3544		458.53	478.79	-20.25	-20.25	4784.32
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		2581.54	2892.41	-310.86	-310.86	4473.46
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		3049.43	2758.83	290.60	290.60	4764.06
	15.2911		34.9636		159.144	138.031	91.9648		74.3544		1779.90	1541.25	238.66	238.66	5002.71
	15.2911		34.9636		159.144		91.9648		74.3544		711.96	450.86	261.10	261.10	5263.81
	15.2911		34.9636		159.144		91.9648		74.3544		1676.89	1052.01	624.88	624.88	5888.69
	15.2911		34.9636		159.144		91.9648		74.3544		2353.51	1792.17	561.34	561.34	6450.03
	15.2911		34.9636		159.144		91.9648		74.3544		421.55	311.85	109.71	109.71	6559.74
	15.2911		34.9636		159.144		91.9648		74.3544		85.17	75.14	10.03	10.03	6569.77
	15.2911		34.9636		159.144		91.9648		74.3544		643.37	345.66	297.71	297.71	6867.48
	15.2911				159.144		91.9648		74.3544		2293.74	1117.67	1176.07	1176.07	8043.55
	15.2911				159.144				74.3544		2783.26	990.18	1793.08	1793.08	9836.62
					159.144				74.3544		293.71	98.07	195.64	195.64	10032.27
		1.04541			159.144				74.3544		5314.77	1782.53	3532.24	3532.24	13564.50
		1.04541			159.144						139.86	32.04	107.82	107.82	13672.32
		1.04541									9328.82	13.95	9314.87	9314.87	22987.20
											9412.73	0.00	9412.73	9412.73	32399.93
											243.85	0.00	243.85	243.85	32643.78
											1789.85	0.00	1789.85	1789.85	34433.63
											50.75	0.00	50.75	50.75	34484.39
											666.26	0.00	666.26	666.26	35150.64
											3425.01	0.00	3425.01	3425.01	38575.66
											198.94	0.00	198.94	198.94	38774.60
											250.23	0.00	250.23	250.23	39024.83
											2392.73	0.00	2392.73	2392.73	41417.56
											20.71	0.00	20.71	20.71	41438.27
											13.19	0.00	13.19	13.19	41451.46
											0.10	0.00	0.10	0.10	41451.56
											0.06	0.00	0.06	0.06	41451.62
											239.40	0.00	239.40	239.40	41691.02

APPENDIX C Result of Column from Pro II

Table C1-1 Feed Stream for Unit 100-V1

STREAM 113

			TOTAL	VAPOR	LIQUID
RATE,		KG-MOL/HR	2657.83	235.004	2422.83
TEMPERATURE,		C	140	140	140
PRESSURE,		BAR(GA)	4.76	4.76	4.76
MOLECULAR		WEIGHT	97.5739	74.5598	99.8061
FRACTION				0.0884	0.9116
ENTHALPY,		BTU/KG-MOL	28973.7	43020.8	27611.2
CP,		BTU/KG-C	2.2088	2.0728	2.222
MOLAR	FLOWRATES,	KG-MOL/HR			
1	-	PROPANE	39.04	18.2294	20.8106
2	-	IC4	49.39	16.6971	32.6929
3	-	NC4	165.36	50.8495	114.511
4	-	IC5	140.48	28.1744	112.306
5	-	NC5	156.08	28.1916	127.888
6	-	CP	16.06	2.0624	13.9976
7	-	22DMB	2.64	0.409	2.231
8	-	23DMB	7.93	0.982	6.948
9	-	2MP	52.84	6.3501	46.4899
10	-	3MP	44.91	4.9476	39.9624
11	-	NC6	155.87	15.1992	140.671
12	-	MCP	72.06	6.0193	66.0407
13	-	CH	61.38	4.354	57.026
14	-	BENZENE	94.55	7.8427	86.7073
15	-	22DMP	88.79	7.7151	81.0749
16	-	HEPTANE	81.99	4.3559	77.6341
17	-	ECP	229.1	9.959	219.141
18	-	TOLUENE	130.78	5.5136	125.266
19	-	224P	69.3	4.1794	65.1206
20	-	OCTANE	50.2	1.3948	48.8052
21	-	ECH	105.4	2.132	103.268
22	-	EBENZENE	26.21	0.6145	25.5955
23	-	PXYLENE	26.21	0.6016	25.6084
24	-	MXYLENE	67.84	1.5353	66.3047
25	-	OXYLENE	33.92	0.7092	33.2108
26	-	M4EZ	87.28	1.166	86.114
27	-	C9H12	34.14	0.6551	33.4849
28	-	124MBENZ	83.52	0.8544	82.6656
29	-	C10H10	484.56	3.3099	481.25

MOLAR	COMPOSITIONS				
1	-	PROPANE	0.0147	0.0776	0.00859
2	-	IC4	0.0186	0.0711	0.0135
3	-	NC4	0.0622	0.2164	0.0473
4	-	IC5	0.0529	0.1199	0 0464
5	-	NC5	0.0587	0.12	0.0528
6	-	CP	0.00604	0.00878	0.00578
7	-	22DMB	0.00099	0.00174	0.00092
8	-	23DMB	0.00298	0.00418	0.00287
9	-	2MP	0.0199	0.027	0.0192
10	-	3MP	0.0169	0.0211	0.0165
11	-	NC6	0.0586	0.0647	0.0581
12	-	MCP	0.0271	0.0256	0.0273
13	-	CH	0.0231	0.0185	0.0235
14	-	BENZENE	0.0356	0.0334	0.0358
15	-	22DMP	0.0334	0.0328	0.0335
16	-	HEPTANE	0.0308	0.0185	0.032
17	-	ECP	0.0862	0.0424	0.0904
18	-	TOLUENE	0.0492	0.0235	0.0517
19	-	224P	0.0261	0.0178	0.0269
20	-	OCTANE	0.0189	0.00594	0.0201
21	-	ECH	0.0397	0.00907	0.0426
22	-	EBENZENE	0.00986	0.00262	0.0106
23	-	PXYLENE	0.00986	0.00256	0.0106
24	-	MXYLENE	0.0255	0.00653	0.0274
25	-	OXYLENE	0.0128	0.00302	0.0137
26	-	M4EZ	0.0328	0.00496	0.0355
27	-	C9H12	0.0128	0.00279	0.0138
28	-	124MBENZ	0.0314	0.00364	0.0341
29	-	C10H10	0.1823	0.0141	0.1986

Table C1-2 Feed Stream for Unit 100-V3

STREAM151					
			TOTAL	VAPOR	LIQUID
RATE,	KG-MOL/HR		1939.23	399.302	1539.93
TEMPERATURE.	C		164	164	164
PRESSURE,	BAR(GA)		2.22	2.22	2.22
MOLECULAR	WEIGHT		108.114	98.2308	110.676
FRACTION				0.2059	0.7941
ENTHALPY,	BTU/KG-MOL		40122.6	59710.7	35043.4
CP,	BTU/KG-C		2.164	1.9782	2.2122
MOLAR	FLOWRATES,KG-MOL/HR				
1	-	PROPANE	3.5E-06	2.9E-06	5.6E-07
2	-	IC4	0	0	0
3	-	NC4	1.4E-05	1E-05	3.7E-06
4	-	IC5	0	0	0
5	-	NC5	0.0019	0.00114	0.00076
6	-	CP	0.69	0.3408	0.3492
7	-	22DMB	0.69	0.3918	0.2982
8	-	23DMB	3.99	2.0066	1.9834
9	-	2MP	27.49	13.6188	13.8712
10	-	3MP	27.04	12.7373	14.3027
11	-	NC6	106.1	46.3662	59.7338
12	-	MCP	53.93	20.9134	33.0166
13	-	CH	52	17.7985	34.2015
14	-	BENZENE	72.43	26.9053	45.5247
15	-	22DMP	86.06	35.9804	50.0796
16	-	HEPTANE	81.99	24.4486	57.5414
17	-	ECP	227.45	56.4043	171.046
18	-	TOLUENE	130.78	30.3501	100.43
19	-	224P	69.3	23.3403	45.9597
20	-	OCTANE	50.2	9.3209	40.8791
21	-	ECH	105.41	14.3243	91.0857
22	-	EBENZENE	26.21	3.8246	22.3854
23	-	PXYLENE	26.21	3.7577	22.4523
24	-	MXYLENE	67.84	9.6151	58.2249
25	-	OXYLENE	33.92	4.4428	29.4772
26	-	M4EZ	87.28	7.8751	79.4049
27	-	INDENE	34.14	4.2783	29.8617
28	-	124MBENZ	83.52	6.0251	77.4949
29	-	DECANE	484.56	24.2347	460.325

MOLAR	COMPOSITIONS				
1	-	PROPANE	1.8E-09	7.4E-09	3.6E-10
2	-	IC4	0	0	0
3	-	NC4	7.2E-09	2.6E-08	2.4E-09
4	-	IC5	0	0	0
5	-	NC5	9.8E-07	2.9E-06	4.9E-07
6	-	CP	0.00036	0.00085	0.00023
7	-	22DMB	0.00036	0.00098	0.00019
8	-	23DMB	0.00206	0.00503	0.00129
9	-	2MP	0.0142	0.0341	0.00901
10	-	3MP	0.0139	0.0319	0.00929
11	-	NC6	0.0547	0.1161	0.0388
12	-	MCP	0.0278	0.0524	0.0214
13	-	CH	0.0268	0.0446	0.0222
14	-	BENZENE	0.0373	0.0674	0.0296
15	-	22DMP	0.0444	0.0901	0.0325
16	-	HEPTANE	0.0423	0.0612	0.0374
17	-	ECP	0.1173	0.1413	0.1111
18	-	TOLUENE	0.0674	0.076	0.0652
19	-	224P	0.0357	0.0585	0.0298
20	-	OCTANE	0.0259	0.0233	0.0265
21	-	ECH	0.0544	0.0359	0.0591
22	-	EBENZENE	0.0135	0.00958	0.0145
23	-	PXYLENE	0.0135	0.00941	0.0146
24	-	MXYLENE	0.035	0.0241	0.0378
25	-	OXYLENE	0.0175	0.0111	0.0191
26	-	M4EZ	0.045	0.0197	0.0516
27	-	INDENE	0.0176	0.0107	0.0194
28	-	124MBENZ	0.0431	0.0151	0.0503
29	-	DECANE	0.2499	0.0607	0.2989

Table C1-3 Feed Stream for Unit 100-V5

STREAM 305

			TOTAL	LIQUID
RATE,	KG-MOL/HR		718.63	718.63
TEMPERATURE	C		76	76
PRESSURE,	BAR(GA)		5.79	5.79
MOLECULAR	WEIGHT		69.1322	69.1322
FRACTION				1
ENTHALPY,	BTU/KG-MOL		11435.5	11435.5
CP,	BTU/KG-C		2.7573	2.7573
MOLAR	FLOWRATES	KG-MOL/HR		
1	-	C1	0	0
2	-	C3	39.04	39.04
3	-	IC4	49.39	49.39
4	-	NC4	165.36	165.36
5	-	IC5	140.48	140.48
6	-	NC5	156.08	156.08
7	-	CP	15.37	15.37
8	-	22DMB	1.96	1.96
9	-	23DMB	3.94	3.94
10	-	2MP	25.35	25.35
11	-	3MP	17.87	17.87
12	-	NC6	49.77	49.77
13	-	MCP	18.13	18.13
14	-	CH	9.38	9.38
15	-	BENZENE	22.13	22.13
16	-	22DMP	2.73	2.73
17	-	ECP	1.65	1.65
18	-	H2	0	0
19	-	C2	0	0

MOLAR	COMPOSITIONS			
1	-	C1	0	0
2	-	C3	0.0543	0.0543
3	-	IC4	0.0687	0.0687
4	-	NC4	0.2301	0.2301
5	-	IC5	0.1955	0.1955
6	-	NC5	0.2172	0.2172
7	-	CP	0.0214	0.0214
8	-	22DMB	0.00273	0.00273
9	-	23DMB	0.00548	0.00548
10	-	2MP	0.0353	0.0353
11	-	3MP	0.0249	0.0249
12	-	NC6	0.0693	0.0693
13	-	MCP	0.0252	0.0252
14	-	CH	0.0131	0.0131
15	-	BENZENE	0.0308	0.0308
16	-	22DMP	0.0038	0.0038
17	-	ECP	0.0023	0.0023
18	-	H2	0	0
19	-	C2	0	0

Table C1-4 Feed Stream for Unit 100-V7

STREAM 513

TOTAL	LIQUID			
RATE,	KG-MOL/HR		362.151	362.151
TEMPERATURE	C		78	78
PRESSURE,	BAR(GA)		25.7	25.7
MOLECULAR	WEIGHT		54.3726	54.3726
FRACTION				1
ENTHALPY,	BTU/KG-MOL		10553.4	10553.4
CP,	BTU/KG-C		2.7365	2.7365
MOLAR	FLOWRATES	KG-MOL/HR		
1	-	C1	0.34	0.34
2	-	C3	79.21	79.21
3	-	IC4	69.3	69.3
4	-	NC4	196.17	196.17
5	-	IC5	5.59	5.59
6	-	NC5	0.3	0.3
7	-	CP	0.054	0.054
8	-	22DMB	8.8E-05	8.8E-05
9	-	23DMB	4.1E-08	4.1E-08
10	-	2MP	9.6E-08	9.6E-08
11	-	3MP	9.8E-09	9.8E-09
12	-	NC6	1.4E-09	1.4E-09
13	-	MCP	4.5E-11	4.5E-11
14	-	CH	0	0
15	-	BENZENE	0.027	0.027
16	-	22DMP	0	0
17	-	ECP	0	0
18	-	H2	0.14	0.14
19	-	C2	11.02	11.02

MOLAR	COMPOSITIONS			
1	-	C1	0.00094	0.00094
2	-	C3	0.2187	0.2187
3	-	IC4	0.1914	0.1914
4	-	NC4	0.5417	0.5417
5	-	IC5	0.0154	0.0154
6	-	NC5	0.00083	0.00083
7	-	CP	0.00015	0.00015
8	-	22DMB	2.4E-07	2.4E-07
9	-	23DMB	1.1E-10	1.1E-10
10	-	2MP	2.7E-10	2.7E-10
11	-	3MP	2.7E-11	2.7E-11
12	-	NC6	3.9E-12	3.9E-12
13	-	MCP	1.2E-13	1.2E-13
14	-	CH	0	0
15	-	BENZENE	7.5E-05	7.5E-05
16	-	22DMP	0	0
17	-	ECP	0	0
18	-	H2	0.00039	0.00039
19	-	C2	0.0304	0.0304

Table C1-5 Feed Stream for Unit 150-V4

STREAM 306

			TOTAL	VAPOR	LIQUID
RATE,	KG-MOL/HR		1438.879	9.4493	1429.43
TEMPERATURE,	C		157	157	157
PRESSURE,	BAR(GA)		12.2	12.2	12.2
MOLECULAR	WEIGHT		102.1428	32.5971	102.6025
FRACTION				6.57E-03	9.93E-01
ENTHALPY,	BTU/KG-MOL		33427.4	23330.19	33494.15
CP,	BTU/KG-C		2.5692	2.3984	2.5704
MOLAR	FLOWRATES, KG-MOL/HR				
1	-	H2O	2.94	0.1318	2.8082
2	-	H2S	0.45	0.0215	0.4285
3	-	NH3	0.000097	7.51E-06	8.95E-05
4	-	H2	20.22	5.8492	14.3708
5	-	C1	2.78	0.3888	2.3912
6	-	C2	2.32	0.1313	2.1887
7	-	C3	1.64	0.0494	1.5906
8	-	IC4	0.27	0.004915	0.2651
9	-	NC4	0.79	0.0128	0.7772
10	-	IC5	0.47	0.004542	0.4655
11	-	NC5	0.032	0.000276	0.0317
12	-	C5H10	0.0092	5.61E-05	0.009144
13	-	22DMB	0.014	0.000101	0.0139
14	-	23DMB	0.17	0.000971	0.169
15	-	2MP	1.91	0.0106	1.8994
16	-	3MP	7.17	0.0365	7.1335
17	-	NC6	58.72	0.2641	58.4559
18	-	C6H14	0.014	6.3E-05	0.0139
19	-	MCP	40.94	0.1583	40.7817
20	-	CH	46.34	0.1516	46.1884
21	-	BENZENE	57.13	0.2248	56.9052
22	-	22DMP	4.39	0.0174	4.3726
23	-	24DMP	3.8	0.0146	3.7854
24	-	33DMP	1.46	0.004694	1.4553
25	-	23DMP	9.51	0.0278	9.4822
26	-	2MHX	26.48	0.0795	26.4005
27	-	3MHX	34.09	0.0962	33.9938
28	-	3EPENT	3.37	0.008991	3.361
29	-	NC7	85.74	0.2105	85.5295
30	-	11CP	41.06	0.1174	40.9426
31	-	MCH	148.87	0.3076	148.5624
32	-	ECP	49.42	0.0994	49.3206
33	-	TOLUENE	139.75	0.2781	139.4719
34	-	22DMHX	74.44	0.1613	74.2787
35	-	OCTANE	54.16	0.071	54.089
36	-	112MCP	47.95	0.0762	47.8738
37	-	11MCH	66.24	0.0899	66.1501
38	-	EBENZENE	28.18	0.0315	28.1485
39	-	PXYLENE	28.17	0.0309	28.1391
40	-	MXYLENE	73.06	0.0792	72.9808
41	-	OXYLENE	36.46	0.0366	36.4234
42	-	22DMHP	47.55	0.0566	47.4934
43	-	NONANE	47.44	0.0343	47.4057
44	-	BCYPNTAN	18.35	0.0115	18.3385
45	-	PRPCYC6	17.65	0.0112	17.6388
46	-	IPRBNZN	3.66	0.002907	3.6571
47	-	PRBENZEN	5.24	0.003241	5.2368
48	-	1M3EBNZN	11.59	0.007831	11.5822
49	-	1M4EBNZN	7.81	0.005046	7.805
50	-	135MBENZ	9.27	0.005147	9.2649
51	-	1M2EBNZN	4.76	0.003161	4.7568

52	-	124MBENZ	18.91	0.009627	18.9004
53	-	123MBENZ	3.54	0.001631	3.5384
54	-	DECANE	38.02	0.0153	38.0047
55	-	BCYHXAN	1.36	0.000454	1.3595
56	-	IBCYHXAN	0.94	0.000406	0.9396
57	-	ODEBZ	1.86	0.000679	1.8593

MOLAR	COMPOSITIONS				
1	-	H2O	2.04E-03	1.39E-02	1.96E-03
2	-	H2S	3.13E-04	2.27E-03	3.00E-04
3	-	NH3	6.74E-08	7.95E-07	6.26E-08
4	-	H2	1.41E-02	6.19E-01	1.01E-02
5	-	C1	1.93E-03	4.11E-02	1.67E-03
6	-	C2	1.61E-03	1.39E-02	1.53E-03
7	-	C3	1.14E-03	5.23E-03	1.11E-03
8	-	IC4	1.88E-04	5.20E-04	1.85E-04
9	-	NC4	5.49E-04	1.35E-03	5.44E-04
10	-	IC5	3.27E-04	4.81E-04	3.26E-04
11	-	NC5	2.22E-05	2.92E-05	2.22E-05
12	-	C5H10	6.39E-06	5.94E-06	6.40E-06
13	-	22DMB	9.73E-06	1.07E-05	9.72E-06
14	-	23DMB	1.18E-04	1.03E-04	1.18E-04
15	-	2MP	1.33E-03	1.12E-03	1.33E-03
16	-	3MP	4.98E-03	3.86E-03	4.99E-03
17	-	NC6	4.08E-02	2.80E-02	4.09E-02
18	-	C6H14	9.73E-06	6.66E-06	9.75E-06
19	-	MCP	2.85E-02	1.68E-02	2.85E-02
20	-	CH	3.22E-02	1.60E-02	3.23E-02
21	-	BENZENE	3.97E-02	2.38E-02	3.98E-02
22	-	22DMP	3.05E-03	1.84E-03	3.06E-03
23	-	24DMP	2.64E-03	1.55E-03	2.65E-03
24	-	33DMP	1.01E-03	4.97E-04	1.02E-03
25	-	23DMP	6.61E-03	2.94E-03	6.63E-03
26	-	2MHX	1.84E-02	8.42E-03	1.85E-02
27	-	3MHX	2.37E-02	1.02E-02	2.38E-02
28	-	3EPENT	2.34E-03	9.51E-04	2.35E-03
29	-	NC7	5.96E-02	2.23E-02	5.98E-02
30	-	11CP	2.85E-02	1.24E-02	2.86E-02
31	-	MCH	1.04E-01	3.26E-02	1.04E-01
32	-	ECP	3.43E-02	1.05E-02	3.45E-02
33	-	TOLUENE	9.71E-02	2.94E-02	9.76E-02
34	-	22DMHX	5.17E-02	1.71E-02	5.20E-02
35	-	OCTANE	3.76E-02	7.52E-03	3.78E-02
36	-	112MCP	3.33E-02	8.06E-03	3.35E-02
37	-	11MCH	4.60E-02	9.51E-03	4.63E-02
38	-	EBENZENE	1.96E-02	3.34E-03	1.97E-02
39	-	PXYLENE	1.96E-02	3.26E-03	1.97E-02
40	-	MXYLENE	5.08E-02	8.38E-03	5.11E-02
41	-	OXYLENE	2.53E-02	3.87E-03	2.55E-02
42	-	22DMHP	3.30E-02	5.99E-03	3.32E-02
43	-	NONANE	3.30E-02	3.63E-03	3.32E-02
44	-	BCYPNTAN	1.28E-02	1.22E-03	1.28E-02
45	-	PRPCYC6	1.23E-02	1.19E-03	1.23E-02
46	-	IPRBNZN	2.54E-03	3.08E-04	2.56E-03
47	-	PRBENZEN	3.64E-03	3.43E-04	3.66E-03
48	-	1M3EBNZN	8.05E-03	8.29E-04	8.10E-03
49	-	1M4EBNZN	5.43E-03	5.34E-04	5.46E-03
50	-	135MBENZ	6.44E-03	5.45E-04	6.48E-03
51	-	1M2EBNZN	3.31E-03	3.34E-04	3.33E-03
52	-	124MBENZ	1.31E-02	1.02E-03	1.32E-02
53	-	123MBENZ	2.46E-03	1.73E-04	2.48E-03
54	-	DECANE	2.64E-02	1.62E-03	2.66E-02
55	-	BCYHXAN	9.45E-04	4.81E-05	9.51E-04
56	-	IBCYHXAN	6.53E-04	4.29E-05	6.57E-04
57	-	ODEBZ	1.29E-03	7.18E-05	1.30E-03

Table C1-6 Feed Stream for Unit 200-V7

STREAM 1420

			TOTAL	LIQUID
RATE,	KG-MOL/HR		1426.58	1426.58
TEMPERATURE,	C		154.1	154.1
PRESSURE,	BAR(GA)		11.82	11.82
MOLECULAR	WEIGHT		92.3878	92.3878
FRACTION				1
ENTHALPY,	BTU/KG-MOL		26901.5	26901.5
CP,	BTU/KG-C		2.1274	2.1274
MOLAR	FLOWRATES,	KG-MOL/HR		
1	-	H2O	0.0044	0.0044
2	-	H2	4.69	4.69
3	-	C1	1.43	1.43
4	-	C2	7.56	7.56
5	-	C3	29.9	29.9
6	-	IC4	20.97	20.97
7	-	NC4	36.7	36.7
8	-	IC5	25.79	25.79
9	-	NC5	16.62	16.62
10	-	CP	4.33	4.33
11	-	22DMB	9.35	9.35
12	-	23DMB	4.93	4.93
13	-	2MP	38.77	38.77
14	-	3MP	27.6	27.6
15	-	NC6	35.92	35.92
16	-	C6H14	16.46	16.46
17	-	MCP	3.01	3.01
18	-	CH	0.34	0.34
19	-	BENZENE	188.97	188.97
20	-	22DMP	0.56	0.56
21	-	24DMP	3.52	3.52
22	-	223MB	0.56	0.56
23	-	33DMP	0.99	0.99
24	-	23DMP	0.57	0.57
25	-	2MHXAN	4.12	4.12
26	-	3MHXAN	6.12	6.12
27	-	3EPENT	0.85	0.85
28	-	HEPTANE	5.29	5.29
29	-	CYHEPTAN	3.2	3.2
30	-	11CP	0.58	0.58
31	-	MCH	0.29	0.29
32	-	ECP	0.59	0.59
33	-	TOLUENE	438.42	438.42
34	-	22DMHX	2.87	2.87
35	-	OCTANE	0.76	0.76
36	-	COCT	0.51	0.51
37	-	112MCP	0.38	0.38
38	-	11MCH	0.13	0.13
39	-	EBENZENE	61.19	61.19
40	-	P-XYLENE	64.47	64.47
41	-	M-XYLENE	136.72	136.72
42	-	O-XYLENE	84.68	84.68
43	-	IPRBNZN	2.29	2.29
44	-	PRBENZEN	7.96	7.96
45	-	1M3EBNZN	24.23	24.23

46	-	1M4EBNZN	10.36	10.36
47	-	135MBENZ	11.69	11.69
48	-	1M2EBNZN	9.64	9.64
49	-	124MBENZ	43.28	43.28
50	-	123MBENZ	10.13	10.13
51	-	INDAN	3.44	3.44
52	-	ODEBZ	12.85	12.85

MOLAR	COMPOSITIONS			
1	-	H2O	3.1E-06	3.1E-06
2	-	H2	0.00329	0.00329
3	-	C1	0.001	0.001
4	-	C2	0.0053	0.0053
5	-	C3	0.021	0.021
6	-	IC4	0.0147	0.0147
7	-	NC4	0.0257	0.0257
8	-	IC5	0.0181	0.0181
9	-	NC5	0.0117	0.0117
10	-	CP	0.00304	0.00304
11	-	22DMB	0.00655	0.00655
12	-	23DMB	0.00346	0.00346
13	-	2MP	0.0272	0.0272
14	-	3MP	0.0193	0.0193
15	-	NC6	0.0252	0.0252
16	-	C6H14	0.0115	0.0115
17	-	MCP	0.00211	0.00211
18	-	CH	0.00024	0.00024
19	-	BENZENE	0.1325	0.1325
20	-	22DMP	0.00039	0.00039
21	-	24DMP	0.00247	0.00247
22	-	223MB	0.00039	0.00039
23	-	33DMP	0.00069	0.00069
24	-	23DMP	0.0004	0.0004
25	-	2MHXAN	0.00289	0.00289
26	-	3MHXAN	0.00429	0.00429
27	-	3EPENT	0.0006	0.0006
28	-	HEPTANE	0.00371	0.00371
29	-	CYHEPTAN	0.00224	0.00224
30	-	11CP	0.00041	0.00041
31	-	MCH	0.0002	0.0002
32	-	ECP	0.00041	0.00041
33	-	TOLUENE	0.3073	0.3073
34	-	22DMHX	0.00201	0.00201
35	-	OCTANE	0.00053	0.00053
36	-	COCT	0.00036	0 00036
37	-	112MCP	0.00027	0.00027
38	-	11MCH	9.1E-05	9.1E-05
39	-	EBENZENE	0.0429	0.0429
40	-	P-XYLENE	0.0452	0.0452
41	-	M-XYLENE	0.0958	0.0958
42	-	O-XYLENE	0.0594	0.0594
43	-	IPRBNZN	0.00161	0.00161
44	-	PRBENZEN	0.00558	0.00558
45	-	1M3EBNZN	0.017	0.017
46	-	1M4EBNZN	0.00726	0.00726
47	-	135MBENZ	0.00819	0.00819
48	-	1M2EBNZN	0.00676	0.00676
49	-	124MBENZ	0.0303	0.0303
50	-	123MBENZ	0.0071	0.0071
51	-	INDAN	0.00241	0.00241
52	-	ODEBZ	0.00901	0.00901

Table C2-1 Result of Unit 100-V1

COLUMN SUMMARY

TRAY	TEMP DEG	PRESSURE BAR(GA)	NET LIQUID	FLOW VAPOR KG-MOL/HR	RATES FEED	PRODUCT	HEATER DUTIES MM WATT
1C	52	4.21	937.8			724.7L	-13.1141
2	96.2	4.41	1045.7	1662.5			
3	106.8	4.42	1044.5	1770.4			
4	111.6	4.43	1041.6	1769.2			
5	114	4.44	1038.8	1766.3			
6	115.3	4.45	1036.4	1763.5			
7	116.1	4.46	1034.5	1761.1			
8	116.6	4.47	1032.9	1759.2			
9	117	4.48	1031.5	1757.6			
10	117.4	4.49	1030.3	1756.2			
11	117.6	4.49	1029.2	1755			
12	117.9	4.5	1028.2	1753.9			
13	118.1	4.51	1027.3	1752.9			
14	118.4	4.52	1026.5	1752			
15	118.6	4.53	1025.7	1751.2			
16	118.8	4.54	1025	1750.4			
17	119	4.55	1024.2	1749.7			
18	119.2	4.56	1023.4	1748.9			
19	119.4	4.57	1022.4	1748.1			
20	119.7	4.58	1021.1	1747.1			
21	119.9	4.59	1019.3	1745.8			
22	120.2	4.6	1016.6	1744			
23	120.6	4.61	1012.5	1741.3			
24	121.1	4.62	1006.1	1737.2			
25	121.8	4.63	996.1	1730.8			
26	122.8	4.64	980.3	1720.8			
27	124.3	4.65	953.6	1705			
28	126.7	4.65	898.9	1678.3			
29	131.7	4.66	762.5	1623.6	246.3V		
30	145.8	4.67	3316.8	1240.9	2411.5L		
31	151	4.68	3414.6	1383.6			
32	154.4	4.69	3487.2	1481.5			
33	156.7	4.7	3536.6	1554.1			
34	158.3	4.71	3571.7	1603.5			
35	159.5	4.72	3597.4	1638.6			
36	160.3	4.73	3616.6	1664.3			
37	161	4.74	3631.1	1683.5			
38	161.5	4.75	3642.1	1697.9			
39	161.8	4.76	3650.7	1709			
40	162.1	4.77	3657.6	1717.6			
41	162.4	4.78	3663.3	1724.5			

42	162.6	4.79	3668.1	1730.1		
43	162.7	4.8	3672.2	1734.9		
44	162.9	4.81	3676	1739.1		
45	163	4.82	3679.5	1742.9		
46	163.1	4.82	3682.8	1746.3		
47	163.3	4.83	3685.9	1749.6		
48	163.4	4.84	3689	1752.8		
49	163.5	4.85	3692	1755.9		
50	163.6	4.86	3695	1758.9		
51	163.7	4.87	3698	1761.9		
52	163.9	4.88	3701	1764.9		
53	164	4.89	3704.1	1767.9		
54	164.1	4.9	3707.1	1770.9		
55	164.3	4.91	3710.2	1774		
56	164.4	4.92	3713.4	1777.1		
57	164.6	4.93	3716.6	1780.3		
58	164.7	4.94	3720	1783.5		
59	164.9	4.95	3723.4	1786.8		
60	165.1	4.96	3726.9	1790.2		
61	165.3	4.97	3730.5	1793.7		
62	165.5	4.98	3734.2	1797.4		
63	165.8	4.98	3738.1	1801.1		
64	166.1	4.99	3742	1804.9		
65	166.5	5	3745.9	1808.9		
66	167.1	5.01	3749.3	1812.8		
67	168	5.02	3750.8	1816.2		
68	169.5	5.03	3745	1817.7		
69	172.5	5.04	3709.6	1811.9		
70	179.6	5.05	3570.2	1776.5		
71S	190.1	5.06	5544.8	91.7	1933.1L	
72R	201	5.11	3999.4	1545.4		15.6413

Table C2-2 Result of Unit 100-V3

COLUMN SUMMARY

TRAY	TEMP DEG	PRESSURE BAR(GA)	NET LIQUID	FLOW VAPOR KG-MOL/HR	RATES FEED	PRODUCT	HEATER DUTIES MM WATT
1C	107	0.48	754.9			1424.3L	-24.6596
2	154.2	1.38	784	2179.2			
3	165	1.39	752.7	2208.3			
4	169.6	1.4	731	2177			
5	172.2	1.41	715.6	2155.3			
6	173.8	1.42	704.9	2139.9			
7	174.9	1.43	697.2	2129.1			
8	175.7	1.44	691.6	2121.5			
9	176.4	1.45	687.5	2115.9			
10	176.8	1.46	684.5	2111.8			
11	177.2	1.47	682.1	2108.7			
12	177.5	1.48	680.2	2106.4			
13	177.8	1.49	678.7	2104.5			
14	178	1.5	677.5	2103			
15	178.2	1.51	676.4	2101.8			
16	178.4	1.52	675.4	2100.7			
17	178.5	1.53	674.6	2099.7			
18	178.7	1.54	673.8	2098.8			
19	178.8	1.55	673	2098			
20	179	1.56	672.3	2097.3			
21	179.1	1.57	671.6	2096.6			
22	179.3	1.58	670.9	2095.9			
23	179.4	1.59	670.3	2095.2			
24	179.5	1.6	669.6	2094.5			
25	179.7	1.61	680.4	2093.9	513.6V		
26	185.7	1.62	2171.4	1589.1	1423.6L		
27	200.4	1.63	2261.6	1656.4			
28	208.4	1.64	2311.8	1746.7			
29	212.8	1.65	2336.2	1796.9			
30	215.5	1.66	2348.5	1821.3			
31	217.4	1.67	2355.2	1833.6			
32	218.7	1.68	2358.9	1840.3			
33	219.7	1.69	2361.2	1843.9			
34	220.5	1.7	2362.6	1846.2			
35	221.3	1.71	2363.6	1847.6			
36	221.9	1.72	2364.2	1848.6			
37	222.6	1.73	2364.4	1849.3			
38	223.2	1.74	2364.3	1849.5			
39	223.8	1.75	2364.3	1849.4			
40	224.4	1.76	2364.4	1849.3			
41	225	1.77	2364.8	1849.5			
42	225.7	1.78	2365	1849.8			

43	226.4	1.79	2365.1	1850.1		
44	227.1	1.8	2365.1	1850.1		
45	227.9	1.81	2365.6	1850.2		
46	228.7	1.82	2366.7	1850.7		
47	229.5	1.83	2368.2	1851.8		
48	230.4	1.84	2369.7	1853.2		
49	231.3	1.85	2371.1	1854.7		
50	232.2	1.86	2372.7	1856.2		
51	233.1	1.87	2381	1857.8		
52R	233.4	1.85		1866	514.9L	19.138

Table C2-3 Result of Unit 100-V5

COLUMN SUMMARY

TRAY	TEMP DEG	PRESSURE BAR(GA)	NET LIQUID	FLOW VAPOR KG-MOL/HR	RATES FEED	PRODUCT	HEATER DUTIES MM WATT
1C	47	5.35	546.5			253.0L	-4.1694
2	53.7	5.37	552.8	799.5			
3	56.1	5.39	555.1	805.8			
4	57	5.41	555.8	808.2			
5	57.4	5.42	555.9	808.8			
6	57.7	5.44	555.9	808.9			
7	57.9	5.46	555.8	808.9			
8	58	5.48	555.7	808.9			
9	58.2	5.5	555.5	808.8			
10	58.4	5.52	555.1	808.5			
11	58.7	5.53	554.4	808.1			
12	59	5.55	553.3	807.4			
13	59.3	5.57	551.6	806.3			
14	59.9	5.59	548.9	804.6			
15	60.6	5.61	545.2	802			
16	61.5	5.63	540	798.2			
17	62.8	5.64	533.3	793			
18	64.5	5.66	525.4	786.3			
19	66.5	5.68	516.7	778.4			
20	68.8	5.7	507.8	769.7			
21	71.2	5.72	499.2	760.9			
22	73.7	5.74	490.1	752.2			
23	76.3	5.75	478.7	743.1			
24	79.4	5.77	461.7	731.7			
25	83.6	5.79	1238.6	714.7	718.6L		
26	85.3	5.81	1248.7	773			
27	86.4	5.83	1254	783.1			
28	87.2	5.85	1257	788.4			
29	87.9	5.87	1258.8	791.4			
30	88.6	5.88	1260.2	793.2			
31	89.4	5.9	1261.3	794.6			
32	90.4	5.92	1262.5	795.7			
33	91.6	5.94	1263.8	796.8			
34	92.9	5.96	1265.6	798.2			
35	94.5	5.98	1268.2	800			
36	96.3	5.99	1271.8	802.6			
37	98.1	6.01	1276.5	806.2			
38	100	6.03	1282.1	810.8			
39	101.8	6.05	1288.2	816.4			
40	103.4	6.07	1294.5	822.6			
41	104.8	6.09	1300.3	828.9			
42	105.9	6.1	1305.5	834.7			

43	106.9	6.12	1310	839.9		
44	107.7	6.14	1313.6	844.4		
45	108.4	6.16	1316.4	848		
46	108.9	6.18	1318.3	850.8		
47	109.5	6.2	1318.7	852.7		
48	110.3	6.21	1316.5	853.1		
49	111.4	6.23	1308.5	850.9		
50	113.7	6.25	1291.9	842.9		
51S	116	6.27	2228.9	0	465.6L	
52R	118	6.17	1402.7	826.2		4.9498

Table C2-4 Result of Unit 100-V7

COLUMN SUMMARY

TRAY	TEMP DEG	PRESSURE BAR(GA)	NET LIQUID	FLOW VAPOR KG-MOL/HR	RATES FEED	PRODUCT	HEATER DUTIES MM WATT
1C	40.5	24.41	59.8		11.7M	22.7V	-0.1832
2	56.9	24.61	58.9	70.8			
3	68.7	24.61	57.7	69.9			
4	78.6	24.61	57	68.8			
5	87	24.61	56.7	68			
6	93.7	24.61	521.7	67.8	362.2L		
7	94	24.61	524.2	170.6			
8	94.1	24.61	525.1	173.1			
9	94.2	24.61	525.5	174			
10	94.2	24.61	525.7	174.4			
11	94.2	24.61	525.9	174.6			
12	94.3	24.61	526.2	174.8			
13	94.3	24.61	526.5	175.1			
14	94.4	24.61	526.8	175.3			
15	94.5	24.62	527.3	175.7			
16	94.6	24.62	527.9	176.2			
17	94.8	24.62	528.8	176.8			
18	95	24.62	529.8	177.6			
19	95.3	24.62	531.3	178.7			
20	95.6	24.62	533.1	180.2			
21	96.1	24.62	535.5	182			
22	96.7	24.62	538.6	184.4			
23	97.7	24.62	542.5	187.4			
24	99	24.62	547.7	191.4			
25	101.2	24.62	554.5	196.6			
26R	105.1	24.62	203.4			351.1L	0.6959

Table C2-5 Result of Unit 150-V4

COLUMN SUMMARY

TRAY	TEMP DEG	PRESSURE BAR(GA)	NET LIQUID KG-MOL/HR	FLOW VAPOR KG-MOL/HR	RATES FEED KG-MOL/HR	PRODUCT KG-MOL/HR	HEATER DUTIES MM WATT
1C	50	10.3	282.6			30.7V 2.6W	-3.3048
2	157	10.6	493	315.9			
3	169.7	10.61	517.5	526.3			
4	175.9	10.62	509.7	550.7			
5	182.3	10.64	491.4	543			
6	190.5	10.65	465.2	524.7	14.4V		
7	203	10.66	2783.7	484	1424.4L		
8	205.8	10.67	2877.2	1378.1			
9	206.2	10.69	2888.7	1471.6			
10	206.3	10.7	2892.5	1483.1			
11	206.4	10.71	2894.9	1486.9			
12	206.5	10.72	2897	1489.3			
13	206.6	10.74	2898.9	1491.4			
14	206.8	10.75	2900.9	1493.4			
15	206.9	10.76	2902.9	1495.3			
16	207	10.77	2904.9	1497.3			
17	207.2	10.79	2907.1	1499.3			
18	207.4	10.8	2909.5	1501.5			
19	207.7	10.81	2912.2	1503.9			
20	208.2	10.82	2915.1	1506.6			
21	208.7	10.84	2918.3	1509.5			
22	209.7	10.85	2921	1512.7			
23	211.1	10.86	2920.7	1515.4			
24	213.7	10.87	2909.2	1515.1			
25	218.7	10.89	2862.1	1503.6			
26S	220.9	10.9	2183.2	9.3		1405.6L	
27R	230	11	736	1447.2			10.436

Table C2-6 Result of Unit 200-V7

COLUMN SUMMARY

TRAY	TEMP DEG	PRESSURE BAR(GA)	NET LIQUID	FLOW VAPOR	RATES FEED	PRODUCT	HEATER DUTIES MM WATT
			KG-MOL/HR				
1C	37.8	10.04	416.3			24.6V 72.4L 0.0W	-2.6065
2	66.3	10.34	477.3	513.3			
3	73.2	10.35	485.5	574.3			
4	76.1	10.37	488.2	582.5			
5	77.6	10.38	489	585.2			
6	78.3	10.4	489.1	586.1			
7	78.8	10.41	489	586.2			
8	79.1	10.42	488.8	586			
9	79.3	10.44	488.5	585.8			
10	79.5	10.45	488.2	585.6			
11	79.7	10.47	487.8	585.3			
12	80	10.48	487.1	584.9			
13	80.3	10.5	486	584.2			
14	80.7	10.51	483.9	583			
15	81.3	10.52	480.1	580.9			
16	82.4	10.54	473.2	577.1			
17	84.4	10.55	460.7	570.3			
18	87.9	10.57	437.9	557.7			
19	94.2	10.58	398.8	534.9			
20	105.8	10.59	337.6	495.8			
21	126.4	10.61	258	434.7	2.6V		
22	161.2	10.62	1881.1	352.5	1424.0L		
23	166.3	10.64	1958.3	551.6			
24	170.3	10.65	2012.3	628.8			
25	174.1	10.67	2058.7	682.8			
26	177.8	10.68	2100.1	729.2			
27	181.7	10.69	2136.4	770.5			
28	186.4	10.71	2165.4	806.8			
29	193.3	10.72	2183.3	835.9			
30	205.3	10.74	2194.6	853.7			
31S	209.5	10.75	1381.8	10.2		1329.5L	
32R	228	10.68	526.9	854.9			7.1531

Table C3-1 Enthalpy at Each Tray in 100-V1

TRAY ENTHALPIES

TRAY	MM LIQUID	WATT VAPOR
1	2.077	0
2	4.872	16.797
3	5.624	19.591
4	5.959	20.344
5	6.118	20.679
6	6.2	20.838
7	6.247	20.921
8	6.278	20.968
9	6.3	20.998
10	6.32	21.021
11	6.337	21.04
12	6.354	21.057
13	6.37	21.074
14	6.387	21.09
15	6.404	21.107
16	6.422	21.124
17	6.439	21.141
18	6.456	21.158
19	6.474	21.175
20	6.49	21.193
21	6.506	21.209
22	6.519	21.225
23	6.529	21.238
24	6.532	21.248
25	6.525	21.251
26	6.5	21.245
27	6.432	21.219
28	6.225	21.151
29	5.559	20.944
30	28.009	17.173
31	30.127	20.16
32	31.709	22.278
33	32.824	23.86
34	33.633	24.975
35	34.232	25.784
36	34.68	26.382

TRAY	MM LIQUID	WATT VAPOR
37	35.018	26.83
38	35.276	27.169
39	35.477	27.427
40	35.636	27.627
41	35.765	27.786
42	35.875	27.916
43	35.97	28.025
44	36.055	28.12
45	36.134	28.206
46	36.208	28.284
47	36.279	28.358
48	36.349	28.43
49	36.418	28.499
50	36.487	28.568
51	36.555	28.637
52	36.625	28.706
53	36.695	28.775
54	36.767	28.846
55	36.841	28.918
56	36.917	28.991
57	36.995	29.067
58	37.077	29.145
59	37.162	29.227
60	37.252	29.312
61	37.349	29.402
62	37.453	29.499
63	37.57	29.603
64	37.705	29.72
65	37.868	29.855
66	38.078	30.018
67	38.365	30.228
68	38.77	30.515
69	39.314	30.92
70	39.999	31.463
71	67.382	1.71
72	52.584	30.439

Table C3-2 Enthalpy at Each Tray in 100-V3

TRAY ENTHALPIES

TRAY	MM LIQUID	WATT VAPOR
1	4.552	0
2	7.378	37.801
3	7.781	40.628
4	7.874	41.031
5	7.888	41.124
6	7.884	41.137
7	7.878	41.134
8	7.873	41.128
9	7.869	41.123
10	7.866	41.119
11	7.864	41.117
12	7.862	41.114
13	7.86	41.113
14	7.858	41.111
15	7.857	41.109
16	7.855	41.108
17	7.854	41.106
18	7.852	41.104
19	7.851	41.103
20	7.849	41.101
21	7.848	41.1
22	7.846	41.098
23	7.844	41.096
24	7.842	41.094
25	7.975	41.092
26	26.559	32.354
27	30.643	37.006
28	33.049	41.089
29	34.4	43.495
30	35.208	44.847
31	35.729	45.655
32	36.087	46.177
33	36.352	46.533
34	36.558	46.797
35	36.731	47.003
36	36.883	47.178
37	37.022	47.332
38	37.154	47.47
39	37.288	47.6
40	37.432	47.734
41	37.588	47.879
42	37.752	48.038
43	37.925	48.204
44	38.113	48.376
45	38.322	48.561
46	38.556	48.77
47	38.809	49.007
48	39.075	49.265
49	39.35	49.533
50	39.633	49.806
51	40.029	50.085
52	8.689	50.478

Table C3-3 Enthalpy at Each Tray in 100-V5

TRAY ENTHALPIES

TRAY	MM LIQUID	WATT VAPOR
1	0.992	0
2	1.185	5.62
3	1.256	5.814
4	1.282	5.885
5	1.294	5.911
6	1.3	5.922
7	1.305	5.929
8	1.31	5.934
9	1.314	5.938
10	1.319	5.943
11	1.323	5.947
12	1.329	5.952
13	1.335	5.957
14	1.343	5.964
15	1.354	5.972
16	1.368	5.982
17	1.386	5.996
18	1.412	6.015
19	1.444	6.04
20	1.483	6.073
21	1.526	6.112
22	1.568	6.155
23	1.603	6.196
24	1.628	6.232
25	4.678	6.257
26	4.845	6.898

TRAY	MM LIQUID	WATT VAPOR
27	4.945	7.065
28	5.015	7.165
29	5.074	7.235
30	5.135	7.294
31	5.203	7.355
32	5.283	7.423
33	5.38	7.503
34	5.498	7.6
35	5.637	7.717
36	5.796	7.856
37	5.971	8.016
38	6.154	8.191
39	6.334	8.374
40	6.503	8.555
41	6.653	8.725
42	6.782	8.875
43	6.889	9.004
44	6.978	9.111
45	7.05	9.199
46	7.11	9.271
47	7.162	9.331
48	7.212	9.384
49	7.27	9.434
50	7.378	9.492
51	13.074	0
52	8.424	9.6

Table C3-4 Enthalpy at Each Tray in 100-V7

TRAY ENTHALPIES

TRAY	MM LIQUID	WATT VAPOR
----	----------	----------
1	0.0771	0.06556
2	0.114	0.321
3	0.143	0.358
4	0.169	0.387
5	0.194	0.413
6	1.983	0.438
7	2.001	1.107
8	2.007	1.125
9	2.01	1.131
10	2.012	1.134
11	2.014	1.136
12	2.016	1.138
13	2.019	1.14
14	2.022	1.143
15	2.027	1.147
16	2.033	1.151
17	2.041	1.157
18	2.052	1.166
19	2.066	1.176
20	2.085	1.19
21	2.109	1.209
22	2.141	1.233
23	2.186	1.266
24	2.251	1.31
25	2.353	1.375
26	1.572	1.477

Table C3-5 Enthalpy at Each Tray in 150-V4

TRAY ENTHALPIES

TRAY	MM	WATT
	LIQUID	VAPOR
----	----------	----------
1	0.67	0.07626
2	4.251	4.053
3	4.957	7.635
4	5.16	8.34
5	5.282	8.543
6	5.417	8.666
7	36.375	8.693
8	38.217	25.663
9	38.46	27.505
10	38.545	27.747
11	38.602	27.832
12	38.652	27.89
13	38.701	27.94
14	38.752	27.989
15	38.807	28.039
16	38.87	28.095
17	38.945	28.158
18	39.037	28.232
19	39.158	28.325
20	39.322	28.446
21	39.55	28.609
22	39.88	28.838
23	40.365	29.168
24	41.094	29.653
25	42.229	30.381
26	32.848	0.191
27	11.958	31.326

Table C3-6 Enthalpy at Each Tray in 200-V7

TRAY ENTHALPIES

TRAY	MM	WATT
	LIQUID	VAPOR
----	----------	----------
1	0.574	0.108
2	1.276	3.389
3	1.466	4.091
4	1.549	4.28
5	1.588	4.364
6	1.607	4.403
7	1.618	4.422
8	1.625	4.433
9	1.63	4.44
10	1.634	4.445
11	1.637	4.449
12	1.641	4.452
13	1.644	4.456
14	1.648	4.459
15	1.654	4.463
16	1.66	4.469
17	1.669	4.475
18	1.677	4.483
19	1.681	4.492
20	1.661	4.495
21	1.59	4.476
22	15.718	4.38
23	17.074	7.286
24	18.137	8.642
25	19.12	9.704
26	20.067	10.688
27	21.001	11.634
28	21.958	12.569
29	23.076	13.526
30	24.968	14.645
31	16.188	0.178
32	6.982	16.359

Appendix D Location and Description of Each Stream for Aromatics Area.

Table D1 Location of Streams at Unit 430

HEX	STREAM
430-E3	H1:C1
430-EA9	H1:AIR
430-E10	H1:CW
430-E1	H2:C2
430-EA3	H3:AIR
430-E2	MP:C2
430-H1	HEATER:C3

Table D2 Location of Streams at Unit 540

HEX	STREAM
540-E2	H4:CW
540-E1	H5:C4
540-EA1	H6:AIR
540-E4	H6:CW

Table D3 Location of Streams at Unit 431

HEX	STREAM
431-E2	H7:C5
431-EA2	H8:AIR
431-EA1	H9:AIR
431-E5	H9:CW
431-EA3	H10:AIR
431-E3	HP:C5
431-E4	MP:C23
431-E6	MP:C24

Table D4 Location of Streams at Unit 380

HEX	STREAM
380-EA1	H11:AIR
380-E1	H11:CW
380-E4	H12:C6
380-E3	H13:AIR
380-E5	H13:CW
380-H2	HEATER:C7

Table D5 Location of Streams at Unit 432

HEX	STREAM
432-EA3	H14:AIR
432-E4	H14:CW
432-E8	H15:C8
432-EA5	H16:AIR
432-EA14	H17:AIR
432-EA6	H18:AIR
432-E7	H18:CW
432-EA10	H19:AIR
432-E12	H20:C9
432-H1	HEATER:C10

Table D6 Location of Streams at Unit 500

HEX	STREAM
500-E6	H21:C11
500-EA8	H22:AIR
500-E9	H23:C12
500-EA11	H24:AIR
500-E12	H25:C13
500-EA13	H25:AIR
500-E14	H25:CW
500-EA17	H26:AIR
500-E15	H27:C14
500-E16	H28:C15

Table D7 Location of Streams at Unit 320

HEX	STREAM
320-EA1	H29:AIR
320-E1	H30:C16
320-E6	H31:C16
320-E7	H32:C17
320-E5	H32:C16
320-E8	H33:C16
320-EA2	H33:AIR
320-E9	H33:CW
320-E17	H34:C19
320-E18	H34:CW
320-E16	H35:C20
320-H2	HEATER:C18

Table D8 Location of Streams at Unit 390

HEX	STREAM
390-E3	H36:C21
390-EA2	H37:AIR
390-H2	HEATER:C22

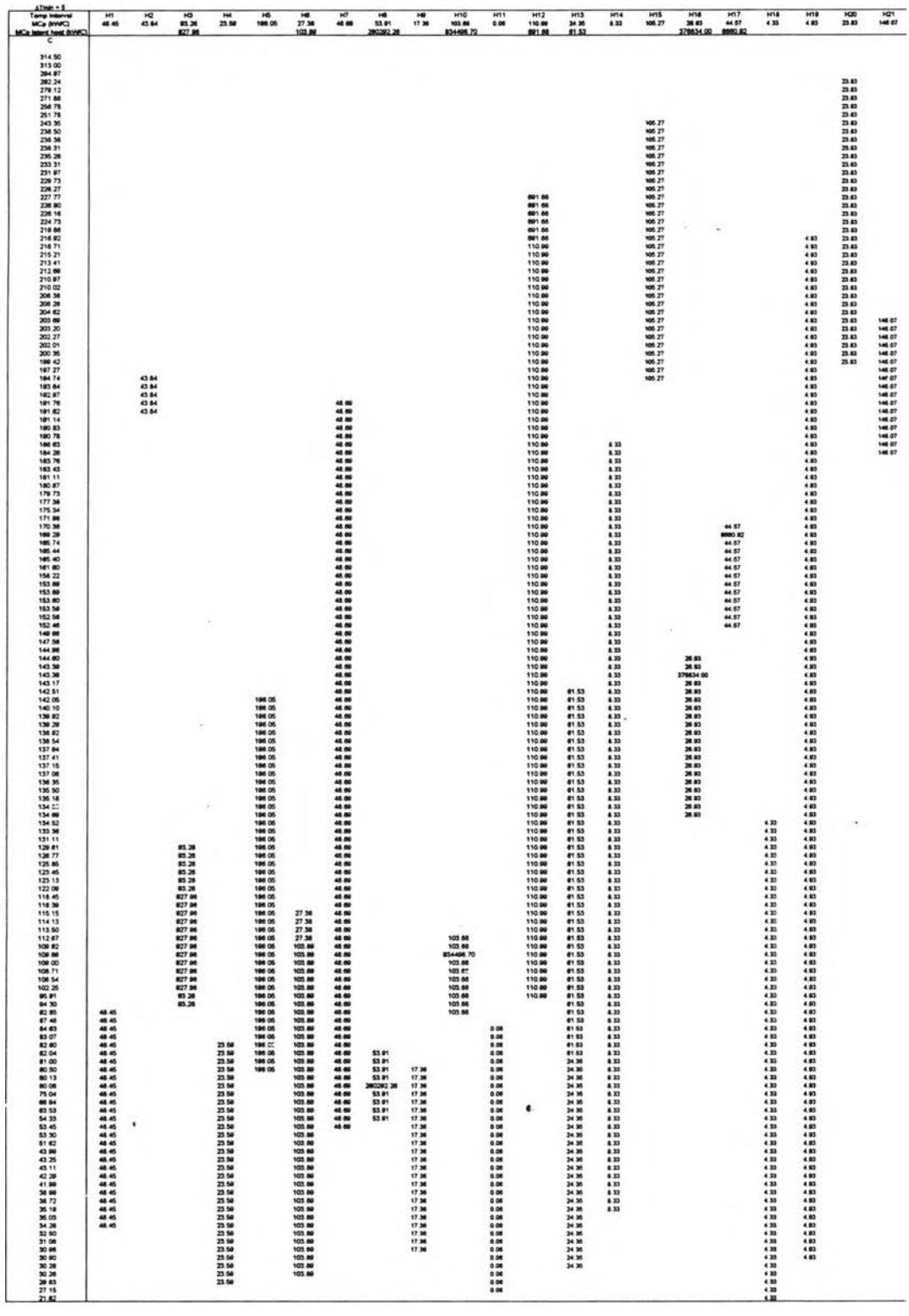
Table D9 Description of Hot Streams

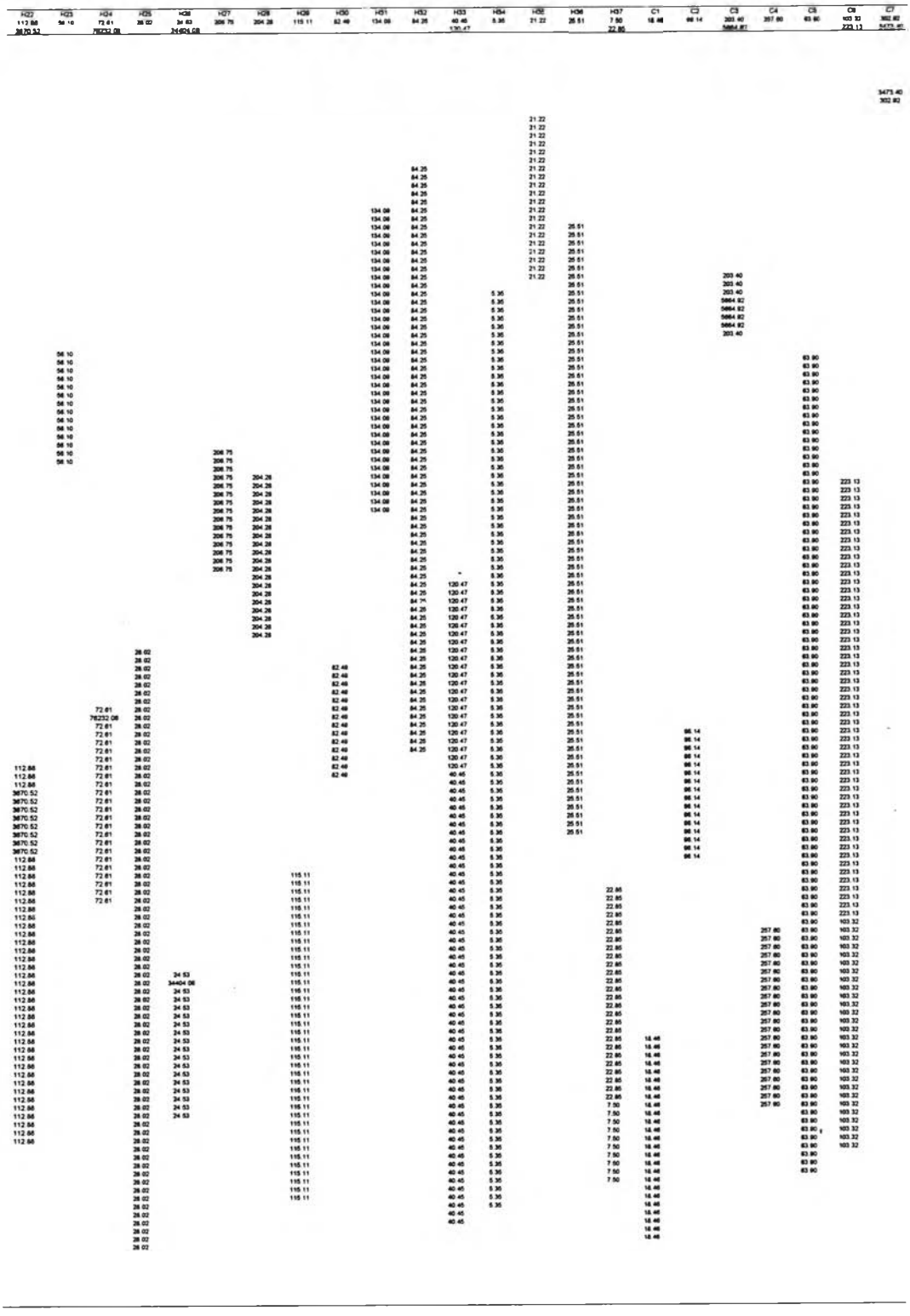
stream	Unit	Description
H1	430	Top product of 430-V1
H2	430	Bottom product of 430-V1
H3	430	From 430-V1 to 430-V2
H4	540	top product of 540-V3
H5	540	top product of 540-V5
H6	540	From 500-V5 to 540-V6
H7	431	From 431V1 to 431-V2
H8	431	From 431-V2 to 431-V3
H9	431	Product of 431-V2 to bezene storage
H10	431	From 431-V4 to 431-V5
H11	380	From 380-TK1
H12	380	Bottom product of 380-V5
H13	380	From 380-V5 to 380-V6
H14	432	Top product of 432-V1 to storage 945-TK5
H15	432	Bottom of 432-V1
H16	432	From 432-V3 to 432-V4
H17	432	From 432-V5 to 432-V6
H18	432	Top product of 432-V3
H19	432	Bottom product of 432-V5
H20	432	Bottom product of 432-V7
H21	500	Bottom product of 500-V7
H22	500	From 500-V7 to 500-V9
H23	500	Bottom product of 500-V11
H24	500	From 500-V11 to 500-V12
H25	500	Bottom product of 500-V13
H26	500	From 500-V13 to 500-V14
H27	500	Stream from xylene rerun column
H28	500	From 500-V3 to 500-M3,M4
H29	320	From 320-E2 to 320-V2
H30	320	Feed from parex unit 500-V8 to 320-E2
H31	320	Parex feed from xylene fractionation 432-P9 to 500-M1
H32	320	Bottom product of 320-V5
H33	320	From 320-V5 to 320-V6
H34	320	Bottom of 320-V7
H35	320	Column bottoms from xylene splitter column
H36	390	Bottom product of 390-V3
H37	390	From 390-V3 to 390-V4

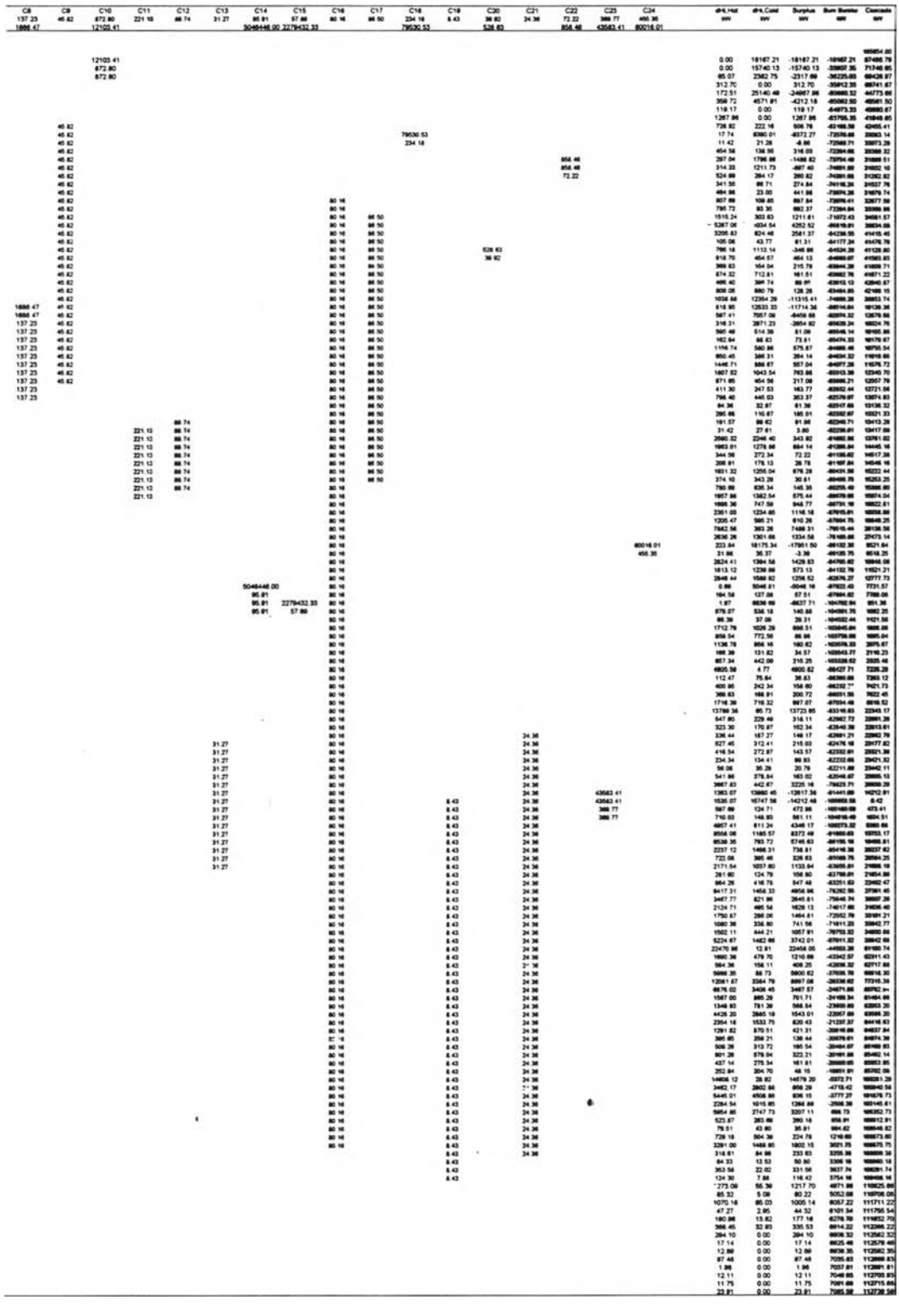
Table D10 Description of Cold Streams

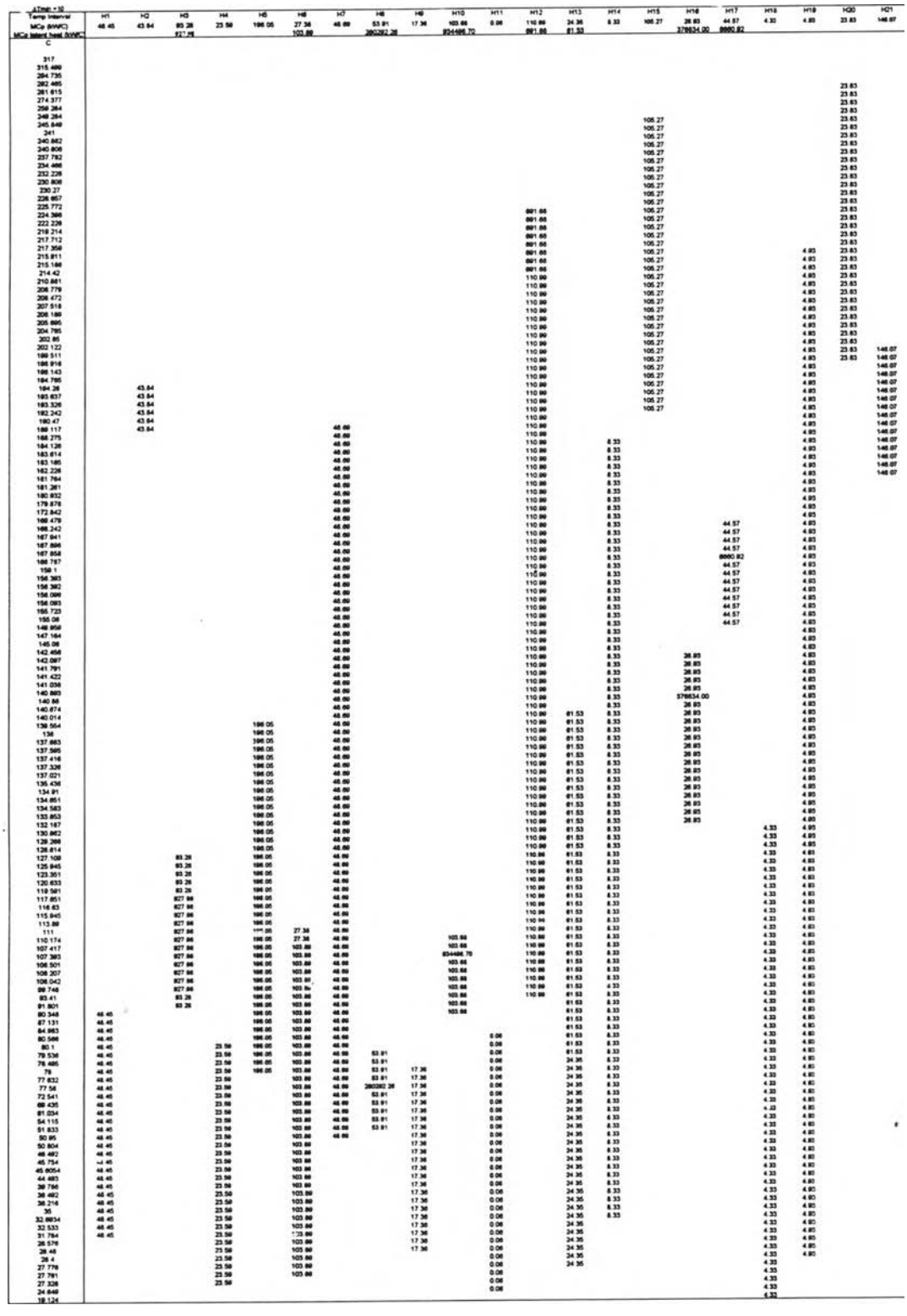
stream	Unit	Description
C1	430	Imported reformate from storade to CCr platformating 200-V7
C2	430	Feed of unit 430-V1
C3	430	430-H1
C4	540	Bottom of 540-V3 to 540-V5
C5	431	From 431-TK1 to 431-V1
C6	380	Feed of unit 380-V5
C7	432	432-H1
C8	432	432-E8
C9	432	Splitter bottoms from feed preperation unit 430-V5 to 432-V7
C10	432	432-H3
C11	500	Feed for 500-V7
C12	500	Feed for 500-V11
C13	500	Feed for 500-V13
C14	500	Finishing column xylene bottoms reboiler
C15	500	Finishing column desorbent reboiler
C16	320	From 320-V2 to feed for 320-V5
C17	320	From 320-V4 deheptanizer bottoms to xylene fractionation unit 432-V7
C18	320	320-H2
C19	320	Feed for 320-V7
C20	320	Stabilizer reboiler
C21	390	Feed for 390-V3
C22	390	390-H2
C23	431	Bezene column reboiler
C24	431	Toluene column reboiler

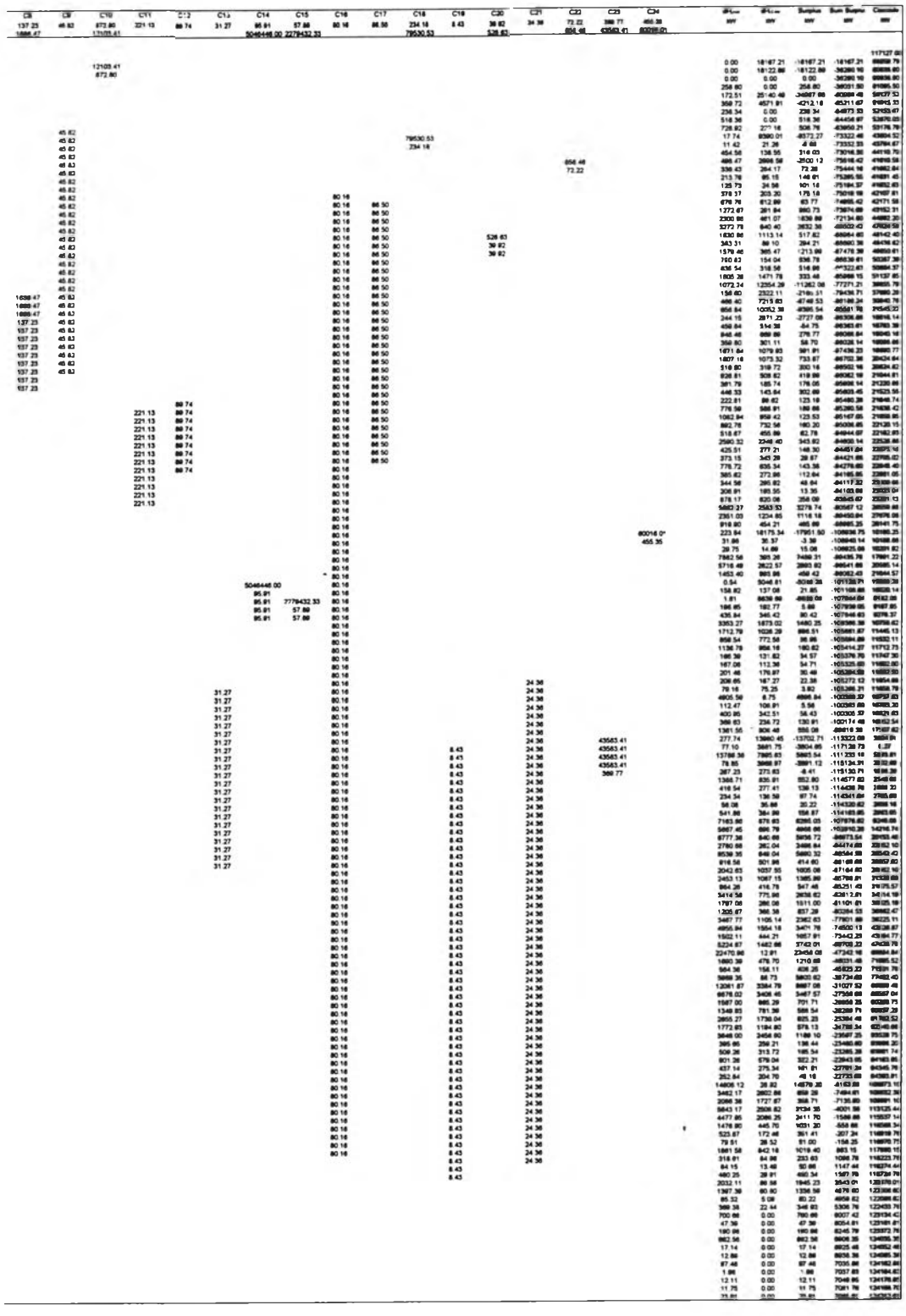
Appendix E Problem Table Algorithm for Various ΔT_{min} of Aromatics Area

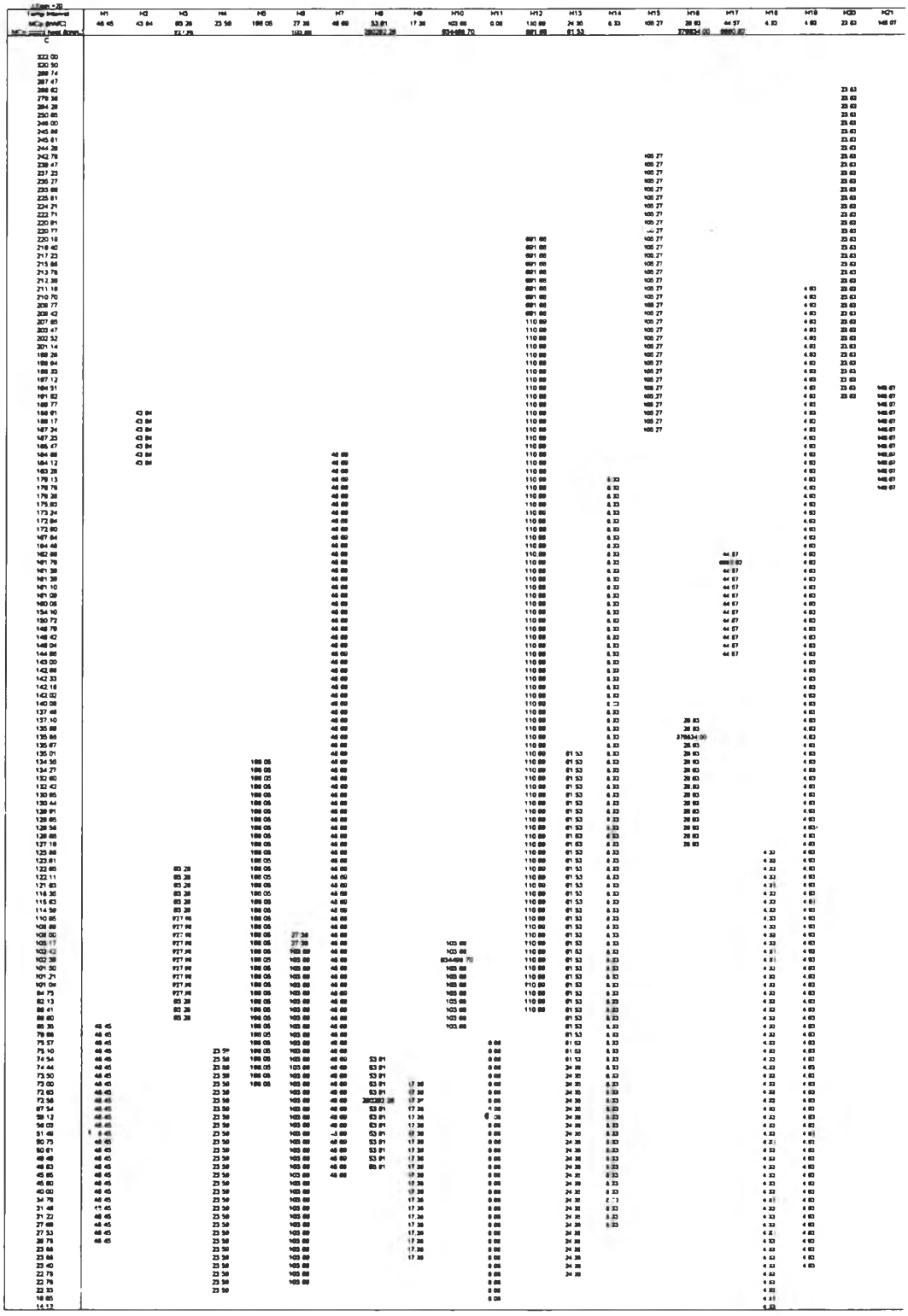


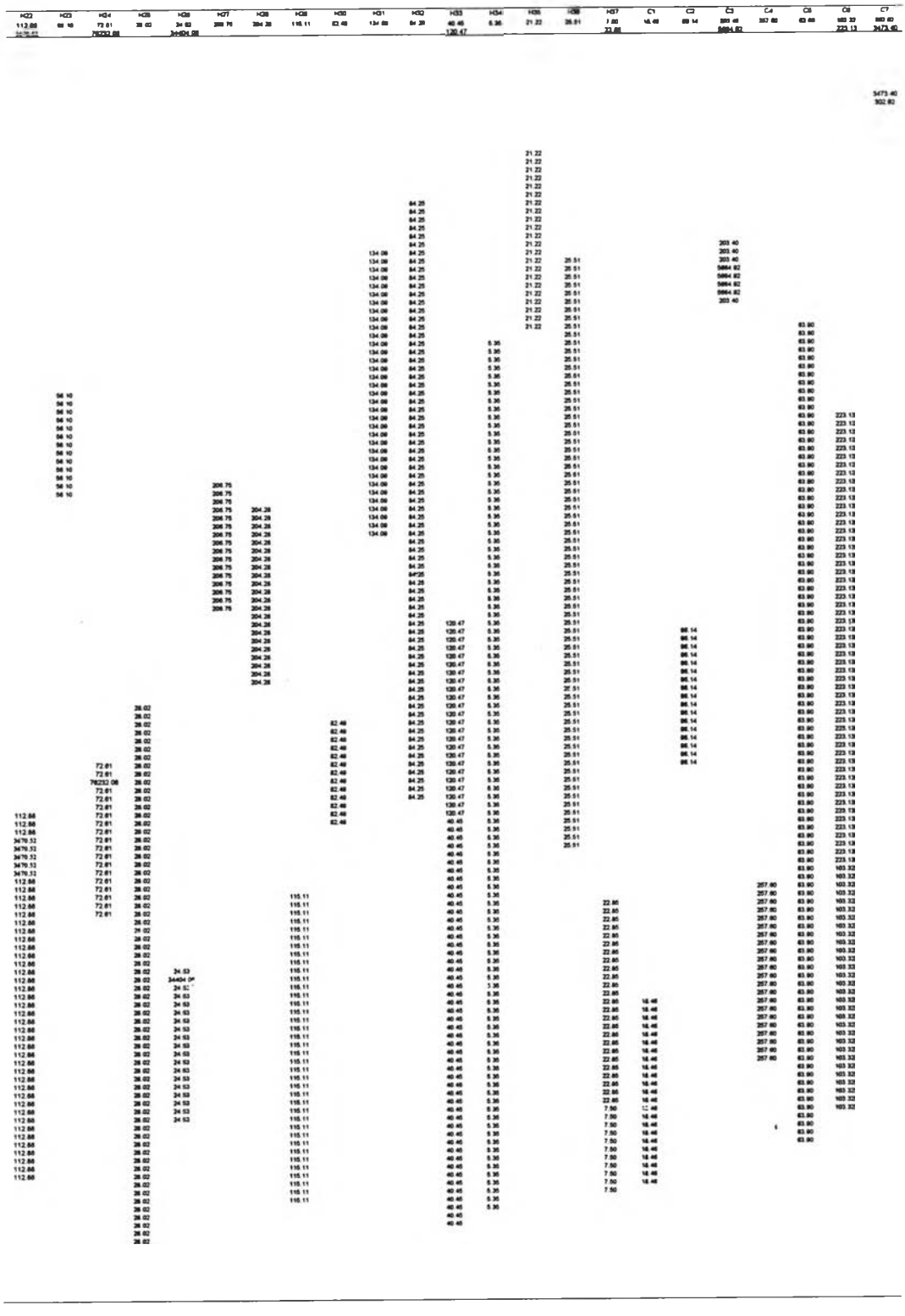


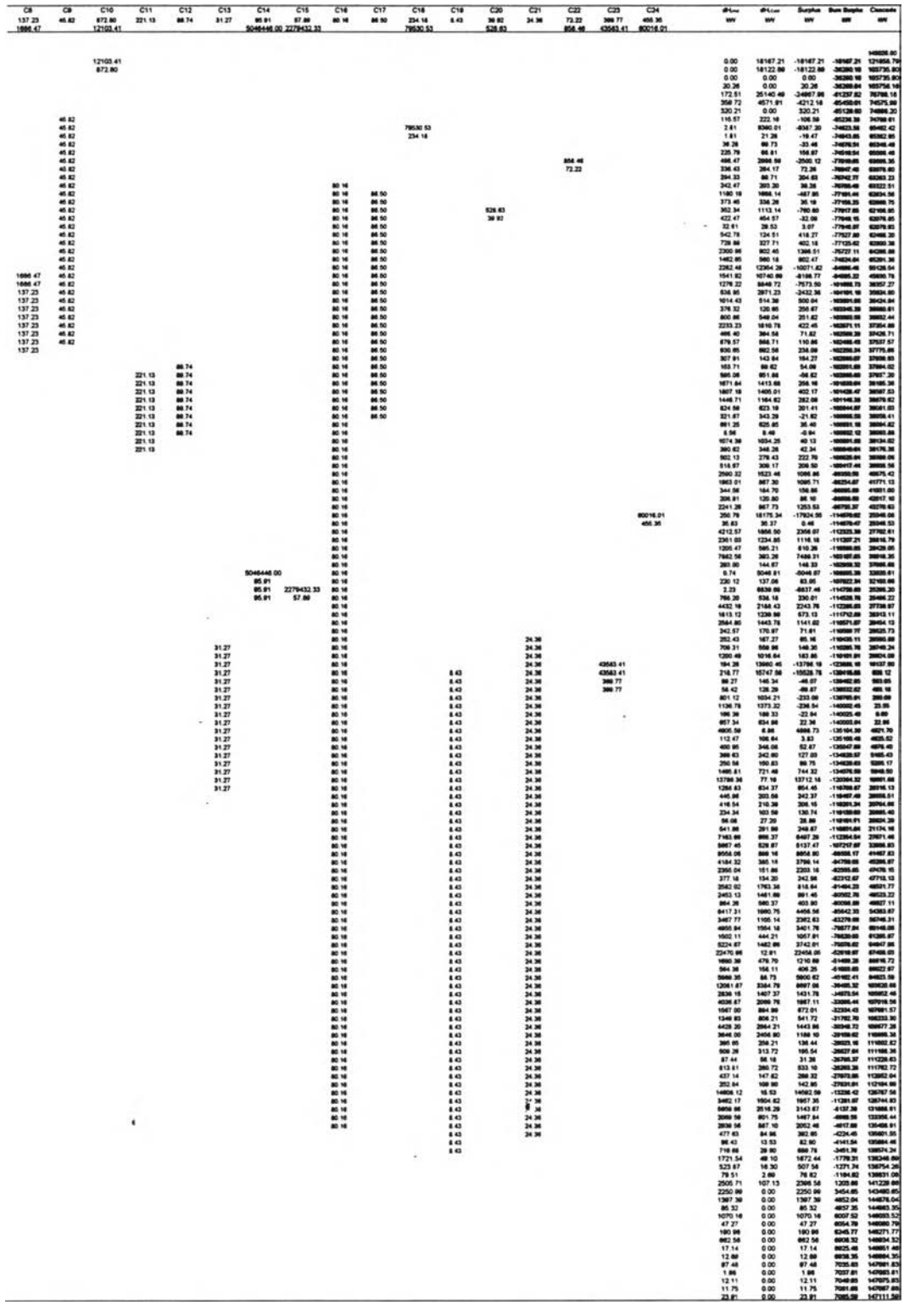


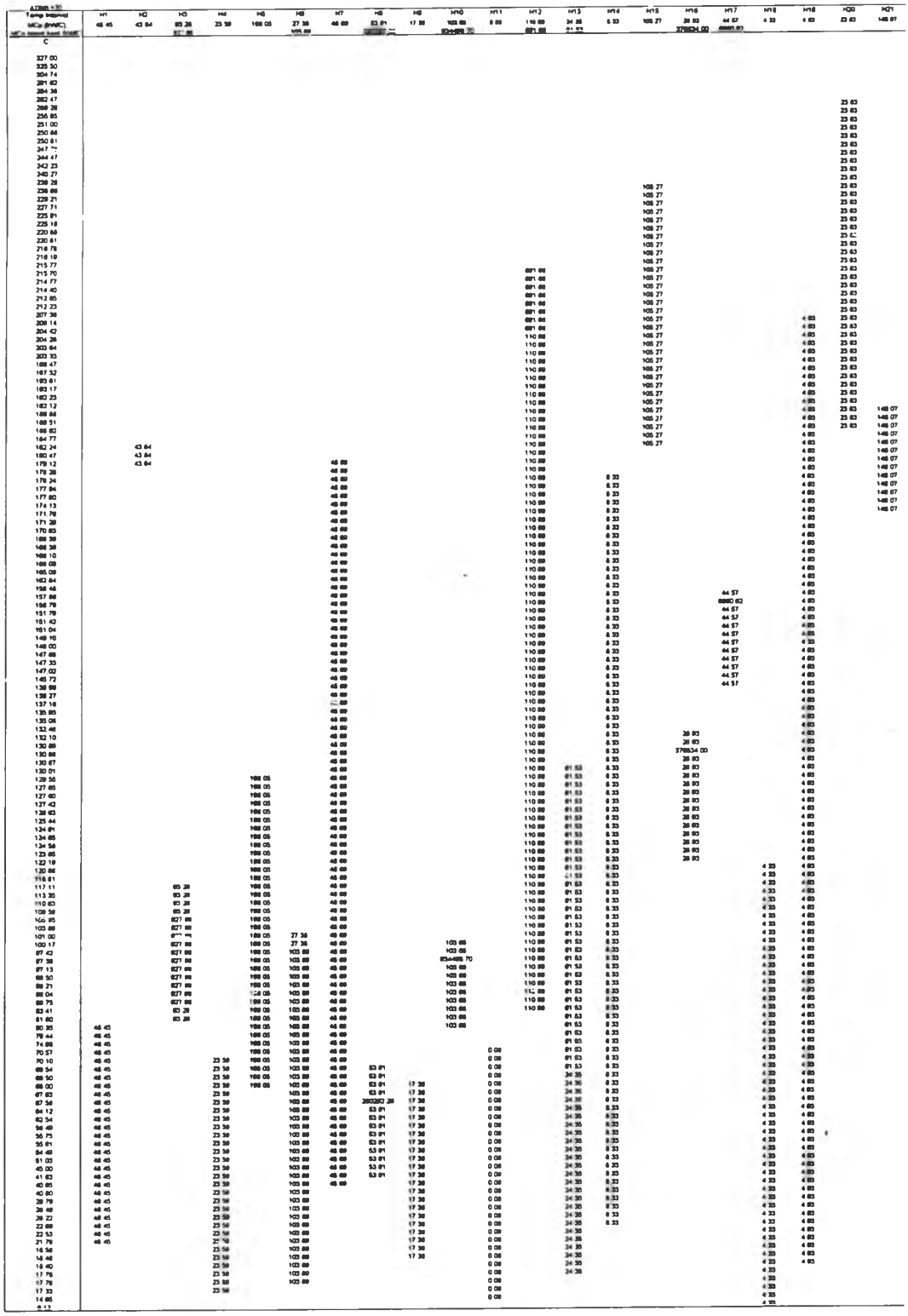


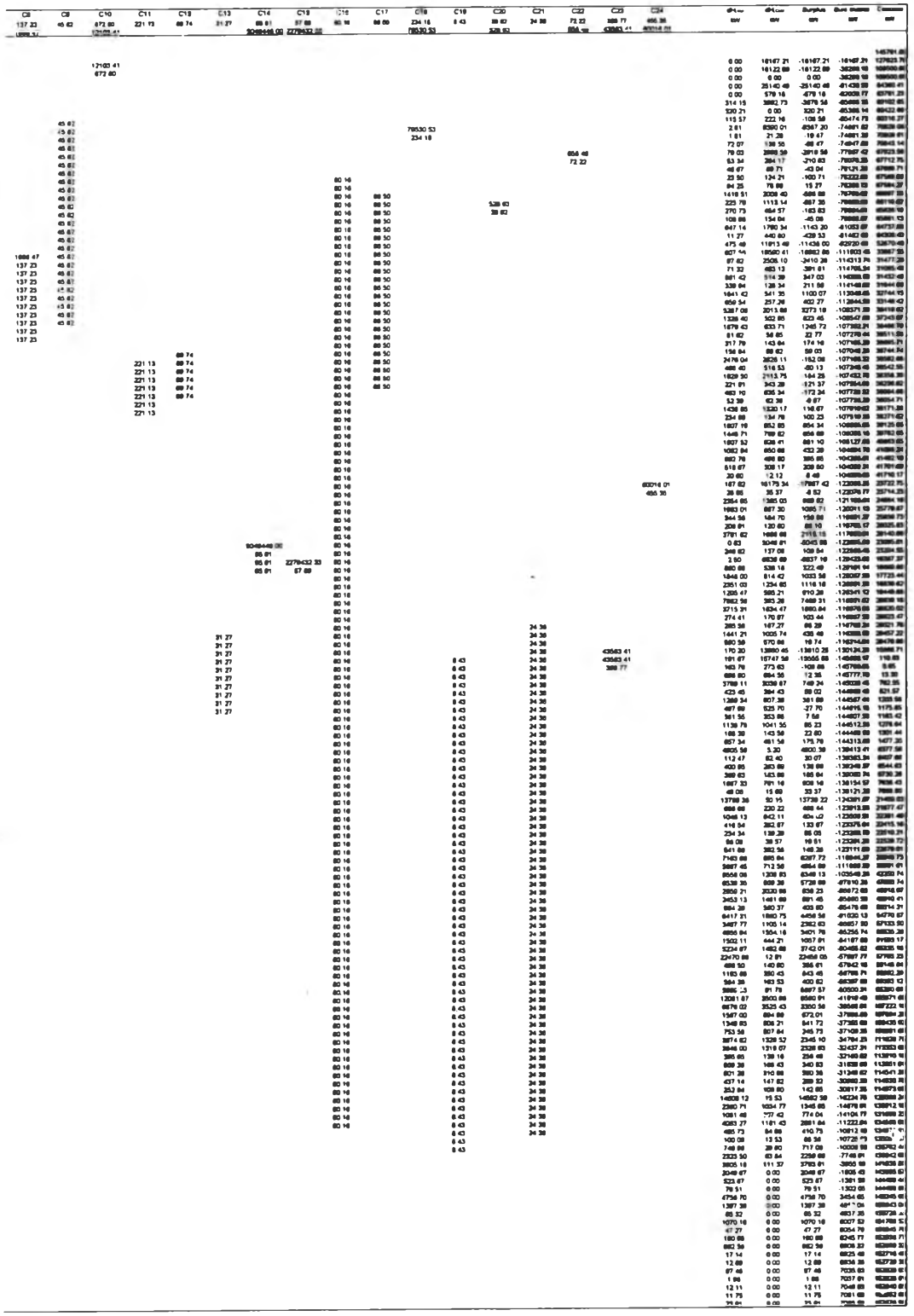


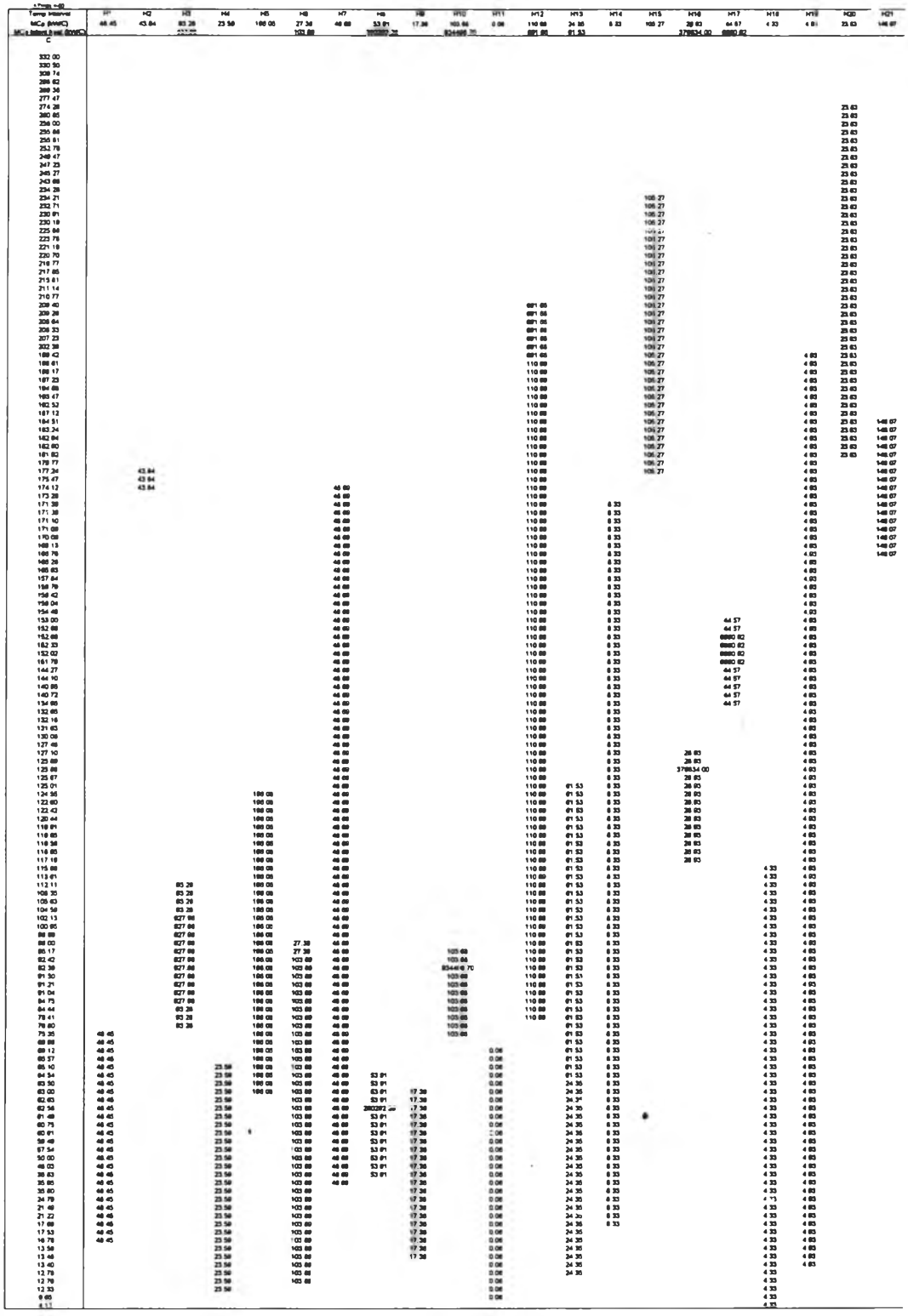


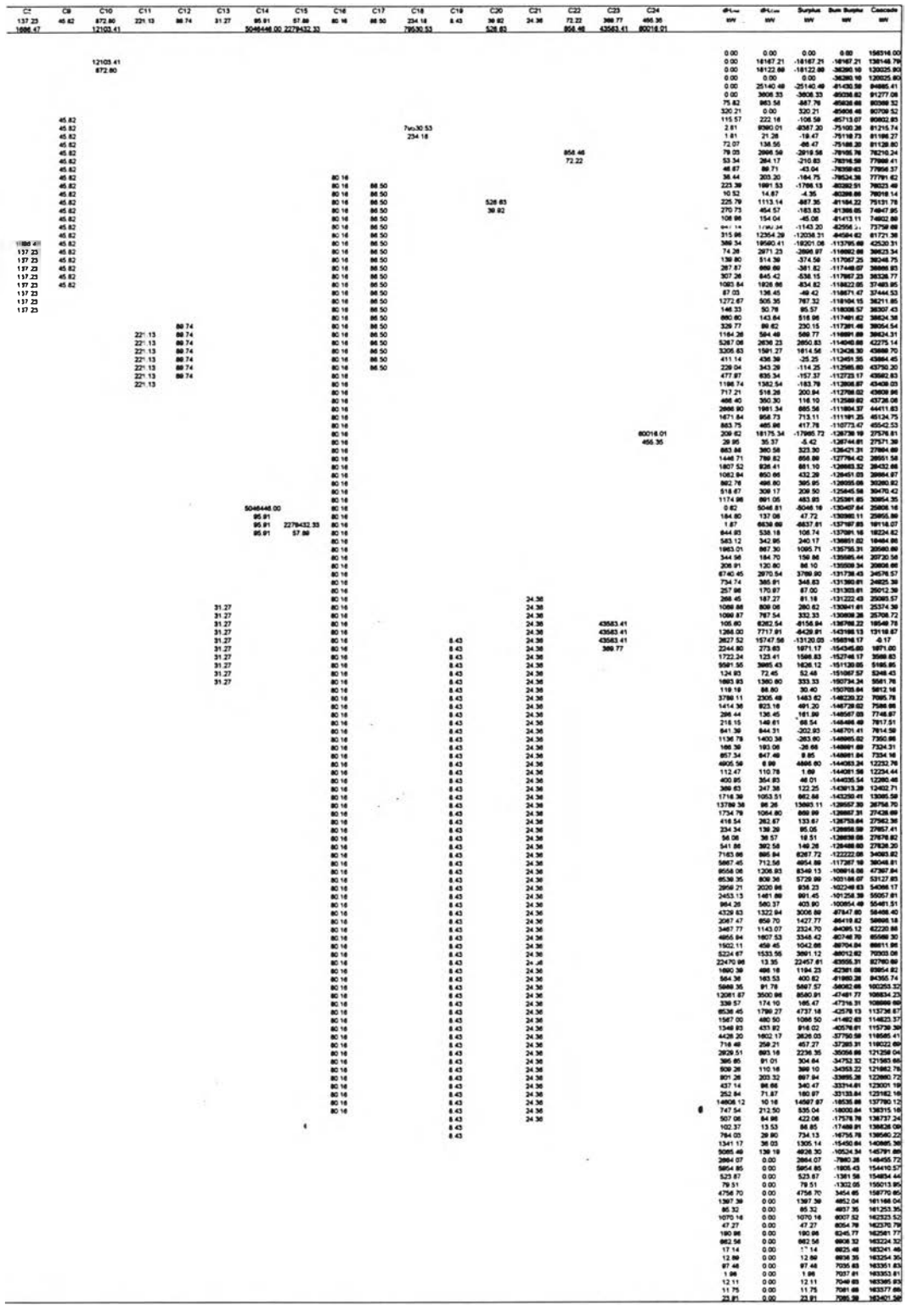


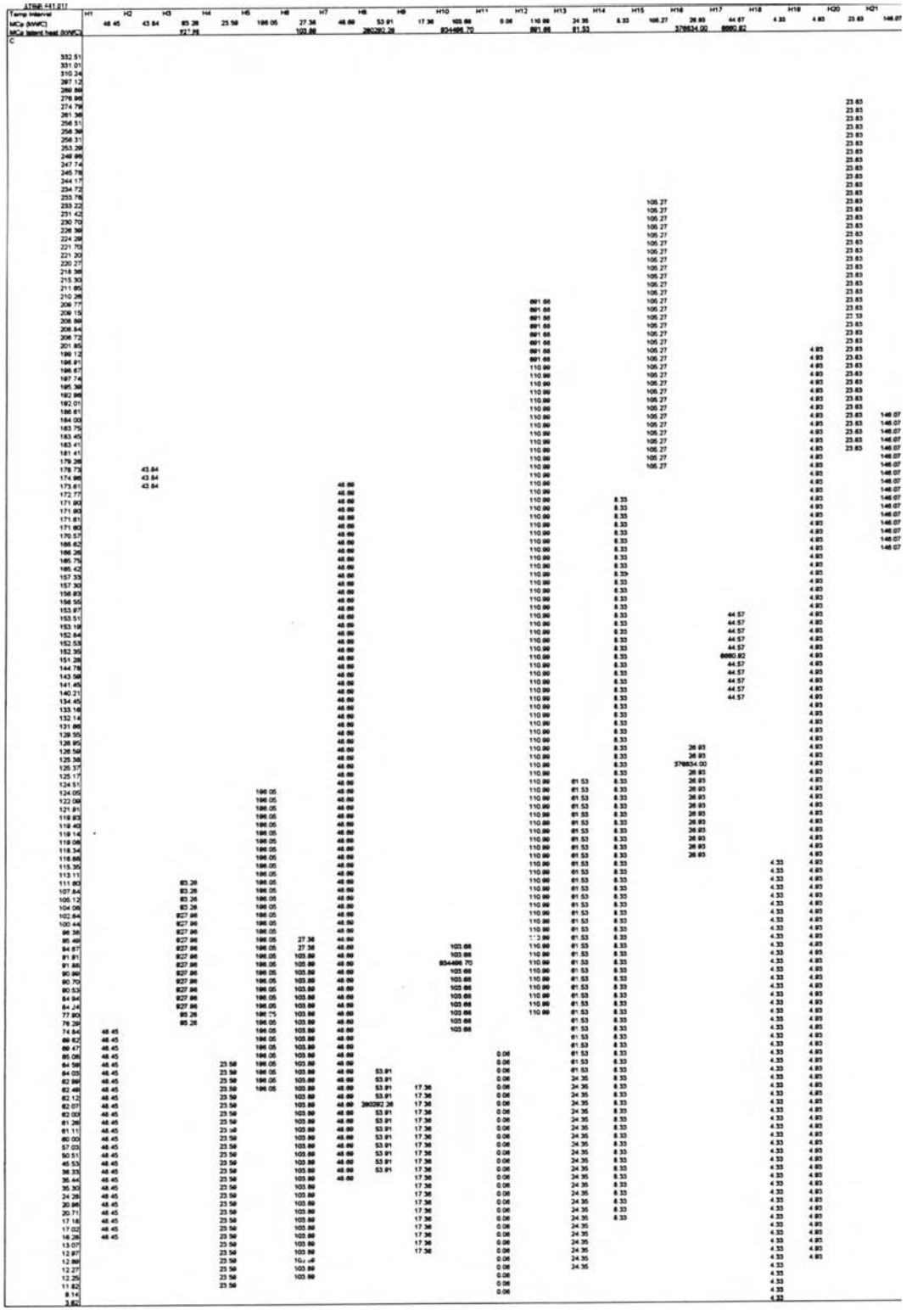


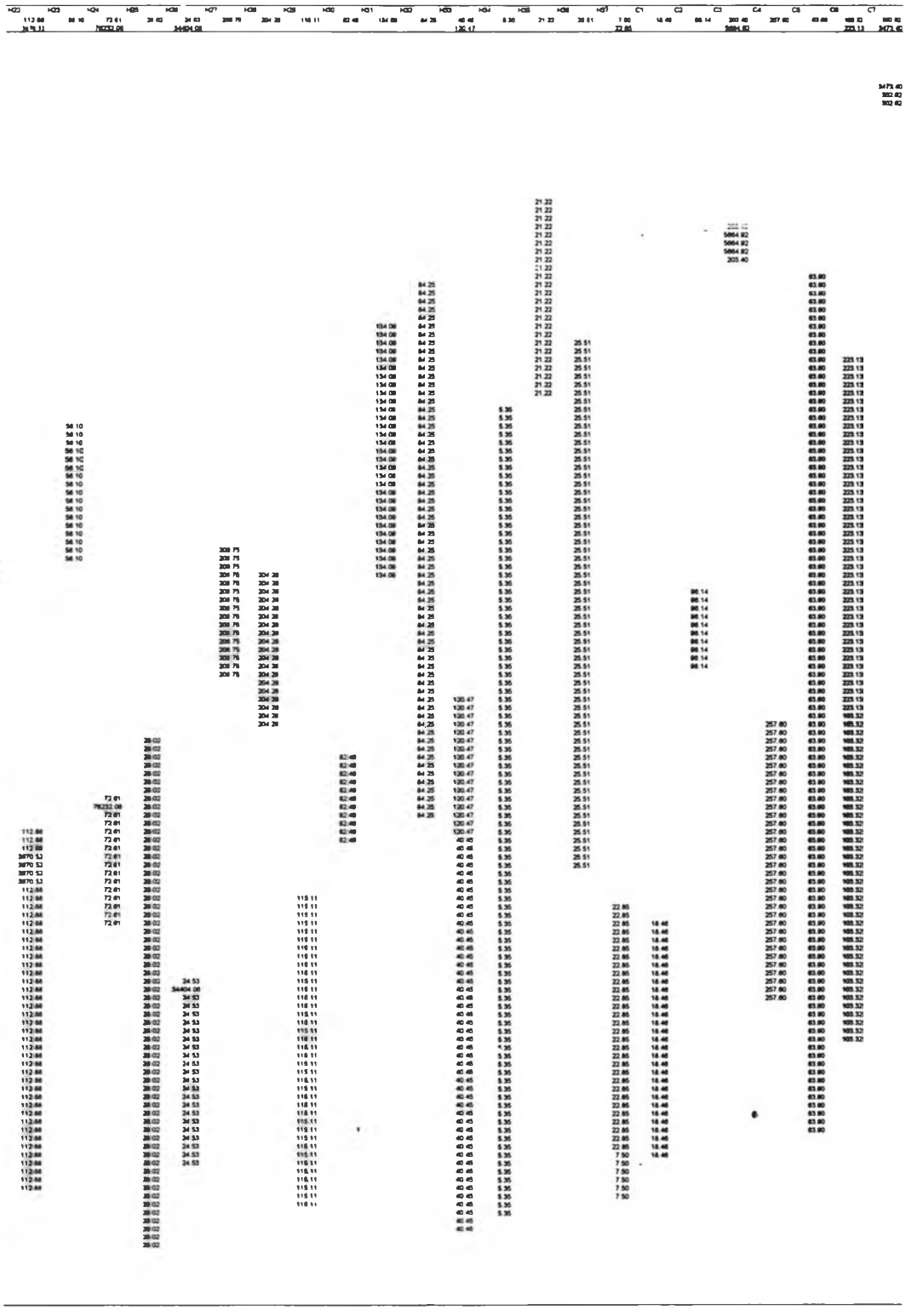


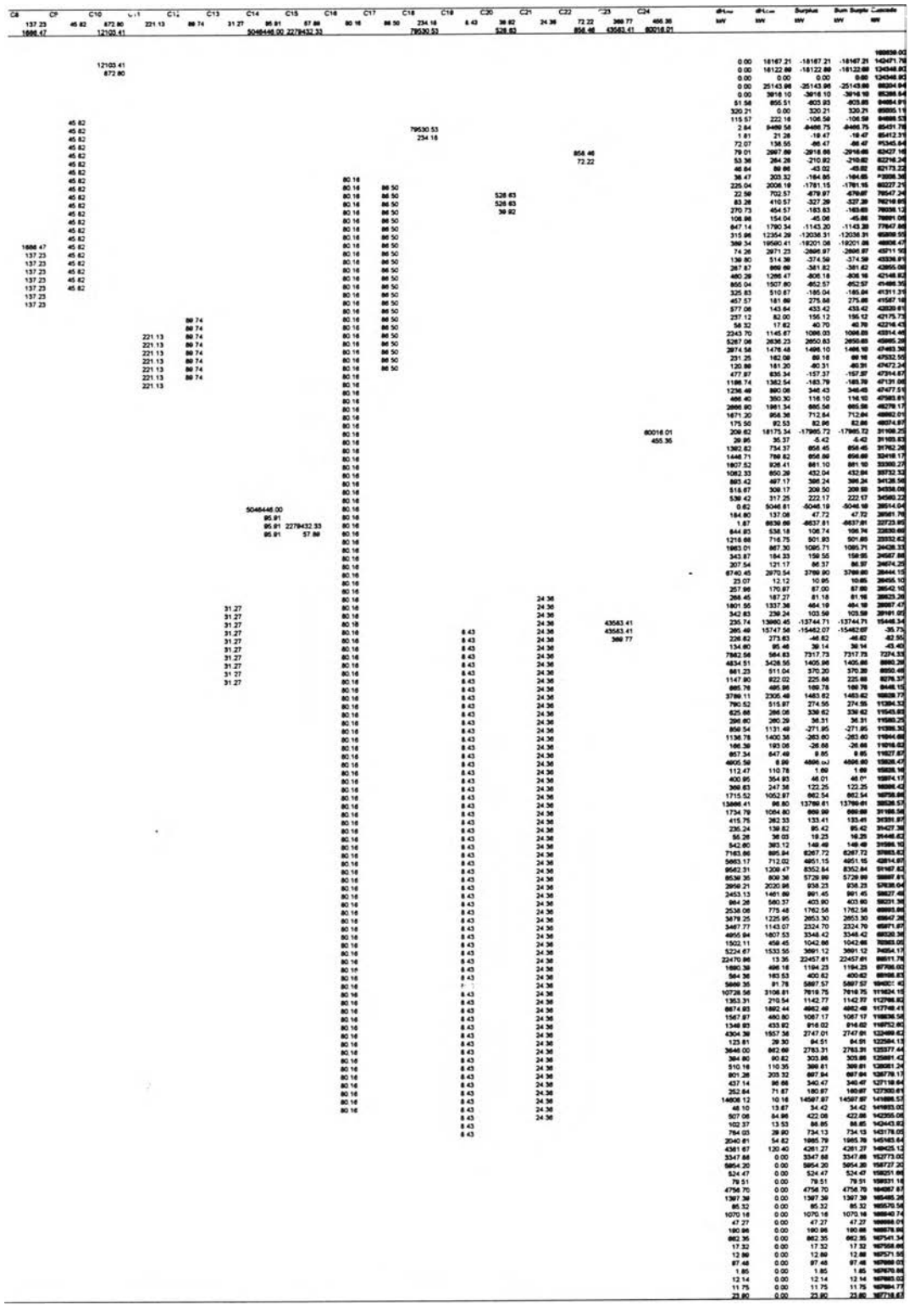












Appendix F Hot and Cold Composite Curves Calculation for Minimum Area at any ΔT_{min}

Table F1 Hot Composite Curve Calculation for Minimum Area at any ΔTmin

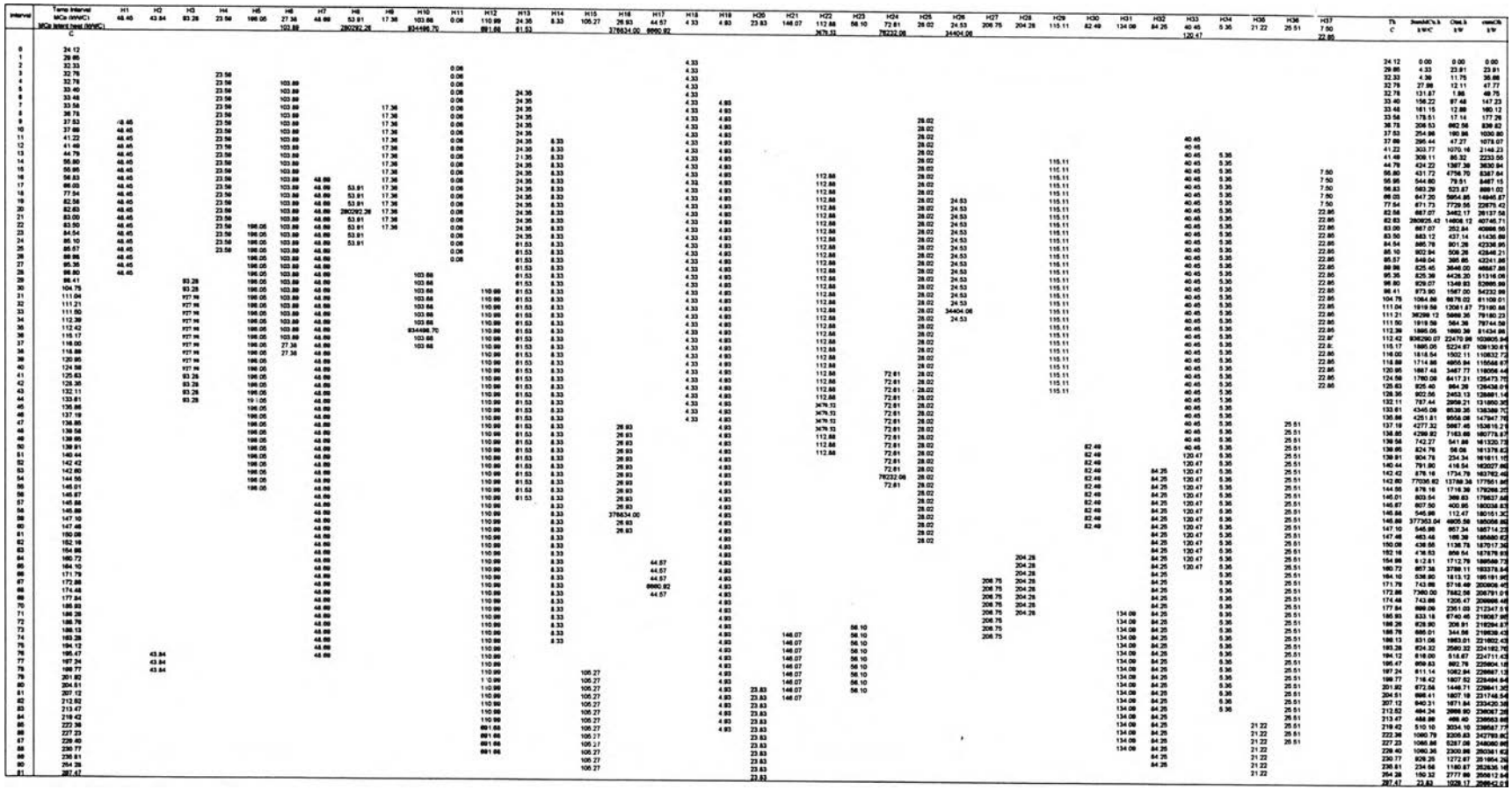


Table F2 Cold Composite Curve Calculation for Minimum Area at any ΔTmin

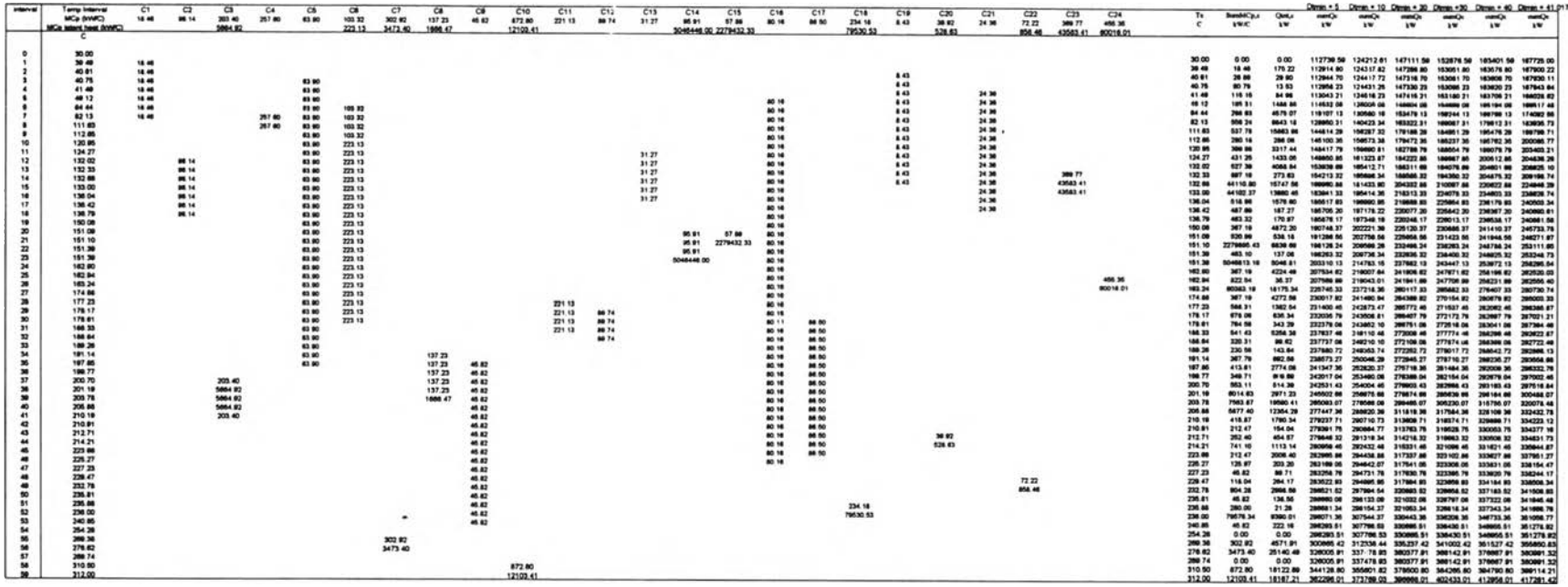


Table F3 Calculation of Target Area at Δtmin = 5°C

i	Thi C	Tci C	CumQi kW	SumMCp,h kW/C	SumMCp,c kW/C	Sum(MCp,h/h) m2	Sum(MCp,c/c) m2	Sum(Q/h) m2C	LMTDi C	A m2
0	117.30	30.00	112739.59	1797.35	0.00	1797.35	0.00	0.00	0.00	0.00
1	117.40	39.49	112914.80	1797.35	18.46	1797.35	18.46	350.43	82.52	4.25
2	117.42	40.61	112944.70	1797.35	28.89	1797.35	28.89	59.80	77.36	0.77
3	117.43	40.75	112958.23	1797.35	90.79	1797.35	90.79	27.05	76.74	0.35
4	117.47	41.49	113043.21	1797.35	115.15	1797.35	115.15	169.96	76.33	2.23
5	118.30	49.12	114532.06	1797.35	195.31	1797.35	195.31	2977.71	72.53	41.05
6	118.89	52.65	115588.67	1797.35	298.63	1797.35	298.63	2113.21	67.70	31.21
7	120.05	64.27	119056.44	1769.97	298.63	1769.97	298.63	7105.05	61.33	115.84
8	121.14	64.44	119107.13	1842.58	298.63	1842.58	298.63	402.13	56.69	7.09
9	124.59	75.88	125473.75	1842.58	556.24	1842.58	556.24	12733.22	52.60	242.06
10	125.63	77.61	126438.01	1007.88	556.24	1007.88	556.24	2014.48	48.36	41.65
11	128.35	82.02	128891.14	985.04	556.24	985.04	556.24	5130.46	47.17	108.77
12	128.78	82.13	128950.31	869.93	556.24	869.93	556.24	428.33	46.49	9.21
13	132.11	87.52	131850.35	869.93	537.78	869.93	537.78	5800.07	45.61	127.17
14	133.61	99.68	138389.70	4427.57	537.78	4427.57	537.78	13202.85	39.02	338.40
15	135.14	111.63	144814.29	4334.29	537.78	4334.29	537.78	13034.61	28.40	458.94
16	135.21	112.65	145100.35	4334.29	280.18	4334.29	280.18	572.12	23.03	24.84
17	135.86	119.77	147947.76	4334.29	399.98	4334.29	399.98	5694.82	19.14	297.51
18	135.99	120.95	148417.79	4359.80	399.98	4359.80	399.98	1049.35	15.57	67.42
19	136.32	124.27	149850.85	4359.80	431.25	4359.80	431.25	2866.11	13.50	212.35
20	137.19	131.41	153615.21	4359.80	527.39	4359.80	527.39	7528.73	8.54	881.83
21	137.29	132.02	153939.69	4382.40	527.39	4382.40	527.39	786.38	5.52	142.40
22	137.35	132.33	154213.32	4382.40	897.16	4382.40	897.16	547.27	5.15	106.28
23	138.85	132.47	160778.87	4382.40	44110.80	4382.40	44110.80	13131.10	5.68	2313.12
24	139.58	132.49	161320.73	824.76	44110.80	824.76	44110.80	1143.94	6.73	169.96
25	139.65	132.49	161376.82	824.76	44110.80	824.76	44110.80	112.17	7.13	15.73
26	139.91	132.49	161611.15	904.78	44110.80	904.78	44110.80	468.68	7.29	64.30
27	140.44	132.50	162027.69	791.90	44110.80	791.90	44110.80	833.08	7.67	108.59
28	142.42	132.54	163762.49	876.16	44110.80	876.16	44110.80	3469.58	8.87	391.26
29	142.50	132.68	169980.88	77035.62	44110.80	77035.62	44110.80	12396.79	9.84	1259.39
30	142.60	132.86	177551.86	77035.62	44102.37	77035.62	44102.37	15181.97	9.78	1552.88
31	144.55	132.89	179268.25	876.16	44102.37	876.16	44102.37	3432.78	10.67	321.69
32	145.01	132.90	179637.88	803.54	44102.37	803.54	44102.37	739.26	11.88	62.20
33	145.67	132.91	180038.83	607.50	44102.37	607.50	44102.37	801.90	12.43	64.49
34	145.88	132.91	180151.30	545.96	44102.37	545.96	44102.37	224.94	12.86	17.49
35	145.89	133.00	183941.33	377353.04	44102.37	377353.04	44102.37	7580.06	12.93	586.33
36	145.89	135.15	185056.89	377353.04	518.96	377353.04	518.96	2231.12	11.78	189.33
37	146.74	136.04	185517.93	545.96	518.96	545.96	518.96	922.08	10.72	86.00
38	147.08	136.42	185705.20	545.96	487.69	545.96	487.69	374.54	10.68	35.07
39	147.10	136.44	185714.23	545.96	463.32	545.96	463.32	18.05	10.66	1.69
40	147.45	136.79	185876.17	463.48	463.32	463.48	463.32	323.88	10.66	30.40
41	147.46	136.80	185880.62	463.48	367.19	463.48	367.19	8.90	10.65	0.84
42	150.06	139.90	187017.39	436.55	367.19	436.55	367.19	2273.55	10.40	218.51
43	152.16	142.24	187876.93	408.53	367.19	408.53	367.19	1719.08	10.04	171.19
44	154.96	148.90	189589.73	612.81	367.19	612.81	367.19	3425.59	8.96	382.46
45	156.72	150.06	190748.37	657.38	367.19	657.38	367.19	2317.29	7.34	315.88
46	157.54	151.09	191288.55	657.38	520.99	657.38	520.99	1076.37	6.55	164.24
47	160.72	151.09	193378.84	657.38	2279895.43	657.38	2279895.43	4184.57	7.93	527.55
48	164.10	151.09	195191.96	536.90	2279895.43	536.90	2279895.43	3626.25	11.23	322.83
49	168.05	151.10	198126.24	743.66	2279895.43	743.66	2279895.43	5868.56	14.89	394.11
50	168.23	151.39	198263.32	743.66	463.10	743.66	463.10	274.15	16.89	16.23
51	171.79	151.39	200908.45	743.66	5046813.19	743.66	5046813.19	5290.26	18.56	285.04
52	172.11	151.39	203310.13	7360.00	5046813.19	7360.00	5046813.19	4803.36	20.56	233.66
53	172.69	162.90	207534.62	7360.00	367.19	7360.00	367.19	8448.97	14.58	579.57
54	172.69	162.94	207569.99	7360.00	822.54	7360.00	822.54	70.74	9.77	7.24
55	172.86	162.96	208791.01	7360.00	60383.19	7360.00	60383.19	2442.05	9.82	248.59
56	174.48	162.98	209996.48	743.66	60383.19	743.66	60383.19	2410.93	10.68	225.80
57	177.84	163.02	212347.51	699.09	60383.19	699.09	60383.19	4702.06	13.09	359.22
58	185.93	163.13	219087.96	833.18	60383.19	833.18	60383.19	13480.89	18.53	727.69
59	186.26	163.14	219294.87	628.90	60383.19	628.90	60383.19	413.82	22.96	18.02
60	186.76	163.14	219639.43	685.01	60383.19	685.01	60383.19	689.12	23.37	29.48
61	189.13	163.17	221602.43	831.08	60383.19	831.08	60383.19	3926.01	24.77	158.50
62	193.28	163.22	224192.76	624.32	60383.19	624.32	60383.19	5180.65	27.96	185.32
63	194.12	163.22	224711.43	616.00	60383.19	616.00	60383.19	1037.34	30.47	34.04
64	195.47	163.24	225604.18	659.83	60383.19	659.83	60383.19	1785.51	31.56	56.58
65	195.70	163.24	225745.33	611.14	60383.19	611.14	60383.19	282.29	32.34	8.73
66	197.24	165.81	226687.13	611.14	367.19	611.14	367.19	1883.60	31.94	58.96
67	199.77	170.73	228494.64	716.42	367.19	716.42	367.19	3615.03	30.22	119.63
68	201.92	174.67	229941.35	672.58	367.19	672.58	367.19	2893.43	28.13	102.85
69	202.03	174.88	230017.92	696.41	367.19	696.41	367.19	153.12	27.20	5.63
70	204.01	177.23	231400.45	696.41	588.31	696.41	588.31	2765.07	26.97	102.54
71	204.51	177.74	231748.54	696.41	678.06	696.41	678.06	696.18	26.78	26.00
72	204.96	178.17	232035.79	640.31	678.06	640.31	678.06	574.50	26.78	21.45
73	205.50	178.61	232379.08	640.31	764.56	640.31	764.56	686.57	26.84	25.58
74	207.12	180.54	233420.38	640.31	541.43	640.31	541.43	2082.60	26.73	77.90
75	212.52	185.46	236087.28	494.24	541.43	494.24	541.43	5333.80	26.82	198.88
76	213.47	186.32	236553.68	488.89	541.43	488.89	541.43	932.80	27.10	34.42
77	215.60	188.33	237637.46	510.10	541.43	510.10	541.43	2167.57	27.21	79.66
78	215.79	188.64	237737.08	510.10	320.31	510.10	320.31	199.23	27.21	7.32
79	216.07	189.26	237880.72	510.10	230.56	510.10	230.56	287.28	26.98	10.65
80	217.43	191.14	238573.27	510.10	367.79	510.10	367.79	1385.11	26.55	52.17
81	219.42	193.60	239587.77	510.10	413.61	510.10	413.61	2029.01	26.06	77.87
82	221.03	197.85	241347.35	1090.79	413.61	1090.79	413.61	3519.14	24.48	143.76
83	221.65	199.77	242017.04	1090.79	349.71	1090.79	349.71	1339.38	22.53	59.46
84	222.12	200.70	242531.43	1090.79	553.11	1090.79	553.11	1028.78	21.65	47.51
85	222.36	200.74	242793.60	1090.79	6014.63	1090.79	6014.63	524.35	21.52	24.36
86	224.85	201.19	245502.86	1085.86	6014.63	1085.86	6014.63	5418.10	22.63	239.45
87	227.23	201.54	248080.66	1085.86	7563.87	1085.86	7563.87	5221.62	24.66	211.72
88	229.40	201.84	250381.62	1080.35	7563.87	1080.35	7563.87	4601.91	26.61	172.93
89	230.77	202.01	251654.29	926.25	7563.87	926.25	7563.87	2545.35	28.15	90.41
90	235.81	202.17	252835.16	234.58	7563.87	234.58	7563.87	2361.73	31.14	75.85
91	254.28	202.53	255612.84	150.32	7563.87	150.32	7563.87	5555.37	42.05	132.13
92	297.47	202.67	256642.01	23.83	7563.87	23.83	7563.87	2058.34	71.11	28.94
		203.78	265027.46						Total area	18430.92

Table F4 Calculation of Target Area at Δtmin = 10°C

i	Thi C	Tci C	CumQi kW	SumMCp,h kW/C	SumMCp,c kW/C	Sum(MCp,h/h) m2	Sum(MCp,c/c) m2	Sum(Q/h) m2C	LMTDi C	A m2
0	123.87	30.00	124212.61	1760.09	0.00	1760.09	0.00	0.00	0.00	0.00
1	123.97	39.49	124387.82	1760.09	18.46	1760.09	18.46	350.43	89.10	3.93
2	123.99	40.69	124417.72	1760.09	26.89	1760.09	26.89	61.95	83.89	0.74
3	124.00	40.75	124431.25	1760.09	90.79	1760.09	90.79	19.79	83.28	0.24
4	124.05	41.49	124516.23	1760.09	115.15	1760.09	115.15	169.96	82.90	2.05
5	124.59	46.39	125473.75	1760.09	195.31	1760.09	195.31	1915.03	80.36	23.83
6	125.17	49.12	126005.08	925.40	195.31	925.40	195.31	1062.68	77.12	13.78
7	125.63	50.56	126438.01	925.40	298.63	925.40	298.63	865.85	75.56	11.46
8	128.35	58.78	128891.14	902.55	298.63	902.55	298.63	4906.27	72.29	67.87
9	130.50	64.44	130580.16	787.44	298.63	787.44	298.63	3378.03	67.80	49.82
10	132.11	66.72	131850.35	787.44	556.24	787.44	556.24	2540.39	65.73	38.65
11	133.61	78.47	138389.70	4345.09	556.24	4345.09	556.24	13078.71	60.12	217.55
12	134.09	82.13	140423.34	4251.81	556.24	4251.81	556.24	4087.27	53.53	75.97
13	135.86	96.12	147947.76	4251.81	537.78	4251.81	537.78	15048.85	45.58	330.18
14	137.19	106.66	153615.21	4277.32	537.78	4277.32	537.78	11334.89	34.93	324.50
15	137.81	111.63	156287.32	4299.92	537.78	4299.92	537.78	5344.21	28.30	188.86
16	137.87	112.65	156573.38	4299.92	280.18	4299.92	280.18	572.12	25.70	22.26
17	138.65	120.95	159890.81	4299.92	399.98	4299.92	399.98	6634.88	21.24	312.36
18	138.85	123.00	160778.87	4299.92	431.25	4299.92	431.25	1776.12	16.76	105.99
19	139.58	124.26	161320.73	742.27	431.25	742.27	431.25	1083.72	15.58	69.54
20	139.59	124.27	161323.87	824.76	431.25	824.76	431.25	6.27	15.32	0.41
21	139.65	124.37	161376.82	824.76	527.39	824.76	527.39	105.89	15.30	6.92
22	139.91	124.81	161611.15	904.78	527.39	904.78	527.39	468.68	15.19	30.85
23	140.44	125.60	162027.69	791.90	527.39	791.90	527.39	833.08	14.96	55.67
24	142.42	128.89	163762.49	876.16	527.39	876.16	527.39	3469.58	14.17	244.88
25	142.44	132.02	165412.71	77035.62	527.39	77035.62	527.39	3300.45	11.90	277.29
26	142.44	132.33	165686.34	77035.62	897.16	77035.62	897.16	547.27	10.26	53.31
27	142.60	132.59	177551.86	77035.62	44110.80	77035.62	44110.80	23731.03	10.06	2359.56
28	144.55	132.63	179268.25	876.16	44110.80	876.16	44110.80	3432.78	10.93	314.01
29	145.01	132.64	179837.88	803.54	44110.80	803.54	44110.80	739.26	12.14	60.87
30	145.67	132.65	180038.83	607.50	44110.80	607.50	44110.80	801.90	12.69	63.17
31	145.88	132.65	180151.30	545.96	44110.80	545.96	44110.80	224.94	13.12	17.14
32	145.88	132.68	181433.90	377353.04	44110.80	377353.04	44110.80	2565.20	13.21	194.14
33	145.89	132.77	185056.89	377353.04	44102.37	377353.04	44102.37	7245.98	13.16	550.43
34	147.10	132.78	185714.23	545.96	44102.37	545.96	44102.37	1314.68	13.71	95.87
35	147.46	132.78	185880.62	463.48	44102.37	463.48	44102.37	332.78	14.49	22.96
36	150.06	132.81	187017.39	436.55	44102.37	436.55	44102.37	2273.55	15.93	142.75
37	152.16	132.83	187876.93	408.53	44102.37	408.53	44102.37	1719.08	18.27	94.08
38	154.96	132.87	189589.73	612.81	44102.37	612.81	44102.37	3425.59	20.68	165.63
39	160.72	132.95	193378.84	657.38	44102.37	657.38	44102.37	7578.22	24.82	305.30
40	164.10	132.99	195191.96	536.90	44102.37	536.90	44102.37	3626.25	29.41	123.32
41	164.40	133.00	195414.35	743.66	44102.37	743.66	44102.37	444.78	31.25	14.23
42	166.52	136.04	196990.95	743.66	518.96	743.66	518.96	3153.20	30.94	101.92
43	166.77	136.42	197178.22	743.66	487.69	743.66	487.69	374.54	30.41	12.31
44	167.00	136.79	197349.19	743.66	463.32	743.66	463.32	341.93	30.28	11.29
45	171.79	146.48	200908.45	743.66	367.19	743.66	367.19	7118.52	27.68	257.14
46	171.97	150.06	202221.39	7360.00	367.19	7360.00	367.19	2625.89	23.56	111.44
47	172.04	151.09	202759.58	7360.00	520.99	7360.00	520.99	1076.37	21.42	50.25
48	172.86	151.10	208791.01	7360.00	2279895.43	7360.00	2279895.43	12062.87	21.35	564.97
49	173.94	151.10	209599.26	743.66	2279895.43	743.66	2279895.43	1616.50	22.30	72.48
50	174.13	151.39	209736.34	743.66	463.10	743.66	463.10	274.15	22.79	12.03
51	174.48	151.39	209996.48	743.66	5046813.19	743.66	5046813.19	520.28	22.91	22.71
52	177.84	151.39	212347.51	699.09	5046813.19	699.09	5046813.19	4702.06	24.73	190.14
53	180.77	151.39	214783.15	833.18	5046813.19	833.18	5046813.19	4871.28	27.89	174.69
54	185.84	162.90	219007.64	833.18	367.19	833.18	367.19	8448.97	26.02	324.68
55	185.88	162.94	219043.01	833.18	822.54	833.18	822.54	70.74	22.94	3.08
56	185.93	162.94	219087.96	833.18	60383.19	833.18	60383.19	89.90	22.96	3.91
57	186.26	162.95	219294.87	628.90	60383.19	628.90	60383.19	413.82	23.15	17.87
58	186.76	162.95	219839.43	685.01	60383.19	685.01	60383.19	689.12	23.56	29.25
59	189.13	162.98	221602.43	831.08	60383.19	831.08	60383.19	3926.01	24.96	157.29
60	193.28	163.03	224192.76	624.32	60383.19	624.32	60383.19	5180.65	28.15	184.06
61	194.12	163.03	224711.43	616.00	60383.19	616.00	60383.19	1037.34	30.66	33.83
62	195.47	163.05	225604.18	659.83	60383.19	659.83	60383.19	1785.51	31.75	56.24
63	197.24	163.07	226687.13	611.14	60383.19	611.14	60383.19	2165.89	33.29	65.06
64	199.77	163.10	228494.64	716.42	60383.19	716.42	60383.19	3615.03	35.41	102.10
65	201.92	163.12	229941.35	672.58	60383.19	672.58	60383.19	2893.43	37.72	76.71
66	204.51	163.15	231748.54	696.41	60383.19	696.41	60383.19	3614.37	40.06	90.22
67	207.12	163.18	233420.38	640.31	60383.19	640.31	60383.19	3343.68	42.64	78.42
68	212.52	163.22	236087.28	494.24	60383.19	494.24	60383.19	5333.80	46.57	114.54
69	213.47	163.23	236553.68	488.89	60383.19	488.89	60383.19	932.80	49.77	18.74
70	214.78	163.24	237218.35	510.10	60383.19	510.10	60383.19	1329.35	50.88	26.12
71	219.42	169.69	239587.77	510.10	367.19	510.10	367.19	4738.85	50.62	93.61
72	221.16	174.88	241490.94	1090.79	367.19	1090.79	367.19	3808.33	47.99	79.32
73	222.36	177.09	242793.60	1090.79	588.31	1090.79	588.31	2605.33	45.77	56.92
74	222.43	177.23	242873.47	1085.86	588.31	1085.86	588.31	159.74	45.24	3.53
75	223.02	178.17	243508.81	1085.86	678.06	1085.86	678.06	1270.68	45.03	28.22
76	223.33	178.61	243852.10	1085.86	764.56	1085.86	764.56	686.57	44.79	15.33
77	227.23	186.42	248080.66	1085.86	541.43	1085.86	541.43	8457.12	42.73	197.91
78	228.20	188.33	249110.48	1060.35	541.43	1060.35	541.43	2059.65	40.34	51.06
79	228.29	188.64	249210.10	1060.35	320.31	1060.35	320.31	199.23	39.76	5.01
80	228.43	189.26	249353.74	1060.35	230.56	1060.35	230.56	287.28	39.41	7.29
81	229.08	191.14	250046.29	1060.35	387.79	1060.35	387.79	1385.11	38.55	35.93
82	229.40	191.95	250381.62	1060.35	413.61	1060.35	413.61	670.65	37.69	17.79
83	230.77	195.03	251654.29	926.25	413.61	926.25	413.61	2545.35	36.59	69.57
84	235.74	197.85	252820.37	234.58	413.61	234.58	413.61	2332.16	36.81	63.36
85	235.81	197.89	252835.16	234.58	349.71	234.58	349.71	29.57	37.90	0.78
86	240.16	199.77	253490.06	150.32	349.71	150.32	349.71	1309.81	39.14	33.46
87	243.58	200.70	254004.45	150.32	553.11	150.32	553.11	1028.78	41.63	24.71
88	254.28	200.96	255612.84	150.32	6014.63	150.32	6014.63	3216.78	47.92	67.13
89	297.47	201.13	256642.01	23.83	6014.63	23.83	6014.63	2058.34	72.72	28.31
		201.19	256975.68						Total area	10895.15

Table F5 Calculation of Target Area at Δtmin = 20°C

i	Thi C	Tci C	CumQi kW	SumMCp,h kW/C	SumMCp,c kW/C	Sum(MCp,h/h) m2	Sum(MCp,c/c) m2	Sum(Q/h) m2C	LMTDi C	A m2
0	135.67	30.00	147111.59	4251.81	0.00	4251.81	0.00	0.00	0.00	0.00
1	135.71	39.49	147286.80	4251.81	18.46	4251.81	18.46	350.43	100.87	3.47
2	135.71	40.61	147316.70	4251.81	26.89	4251.81	26.89	59.80	95.66	0.63
3	135.72	40.75	147330.23	4251.81	90.79	4251.81	90.79	27.05	95.04	0.28
4	135.74	41.49	147415.21	4251.81	115.15	4251.81	115.15	169.96	94.60	1.80
5	135.86	44.22	147947.76	4251.81	195.31	4251.81	195.31	1065.11	92.94	11.46
6	136.09	49.12	148904.06	4277.32	195.31	4277.32	195.31	1912.60	89.29	21.42
7	137.16	64.44	153479.13	4277.32	298.63	4277.32	298.63	9150.15	79.63	114.90
8	137.19	64.68	153615.21	4277.32	556.24	4277.32	556.24	272.15	72.61	3.75
9	138.85	77.56	160778.87	4299.92	556.24	4299.92	556.24	14327.32	66.74	214.66
10	139.58	78.53	161320.73	742.27	556.24	742.27	556.24	1083.72	61.17	17.72
11	139.65	78.63	161376.82	824.76	556.24	824.76	556.24	112.17	61.03	1.84
12	139.91	79.05	161611.15	904.78	556.24	904.78	556.24	468.68	60.94	7.69
13	140.44	79.80	162027.69	791.90	556.24	791.90	556.24	833.08	60.74	13.71
14	141.91	82.13	163322.31	876.16	556.24	876.16	556.24	2589.24	60.21	43.01
15	142.42	82.95	163762.49	876.16	537.78	876.16	537.78	880.34	59.62	14.76
16	142.60	108.59	177551.86	77035.62	537.78	77035.62	537.78	27578.75	45.56	605.39
17	144.46	111.63	179186.29	876.16	537.78	876.16	537.78	3268.86	33.41	97.83
18	144.55	111.92	179268.25	876.16	280.18	876.16	280.18	163.92	32.73	5.01
19	144.81	112.65	179472.35	803.54	280.18	803.54	280.18	408.20	32.39	12.60
20	145.01	113.06	179637.88	803.54	399.98	803.54	399.98	331.06	32.05	10.33
21	145.67	114.07	180038.83	607.50	399.98	607.50	399.98	801.90	31.78	25.23
22	145.88	114.35	180151.30	545.96	399.98	545.96	399.98	224.94	31.57	7.13
23	145.89	120.95	182789.79	377353.04	399.98	377353.04	399.98	5276.99	28.11	187.74
24	145.89	124.27	184222.85	377353.04	431.25	377353.04	431.25	2866.11	23.24	123.31
25	145.89	125.85	185056.89	377353.04	527.39	377353.04	527.39	1668.08	20.82	80.11
26	147.10	127.10	185714.23	545.96	527.39	545.96	527.39	1314.68	20.02	65.66
27	147.46	127.41	185880.62	463.48	527.39	463.48	527.39	332.78	20.02	16.62
28	150.06	129.57	187017.39	436.55	527.39	436.55	527.39	2273.55	20.27	112.17
29	152.16	131.20	187876.93	408.53	527.39	408.53	527.39	1719.08	20.73	82.93
30	152.87	132.02	188311.69	612.81	527.39	612.81	527.39	869.51	20.91	41.58
31	153.32	132.33	188585.32	612.81	897.16	612.81	897.16	547.27	20.92	26.16
32	154.96	132.35	189589.73	612.81	44110.80	612.81	44110.80	2008.81	21.79	92.18
33	160.72	132.43	193378.84	657.38	44110.80	657.38	44110.80	7578.22	25.34	299.02
34	164.10	132.48	195191.96	536.90	44110.80	536.90	44110.80	3626.25	29.93	121.18
35	171.79	132.61	200908.45	743.66	44110.80	743.66	44110.80	11432.97	35.27	324.17
36	172.25	132.68	204332.88	7360.00	44110.80	7360.00	44110.80	6848.86	39.38	173.94
37	172.86	132.78	208791.01	7360.00	44102.37	7360.00	44102.37	8916.27	39.82	223.91
38	174.48	132.81	209996.48	743.66	44102.37	743.66	44102.37	2410.93	40.87	59.00
39	177.84	132.86	212347.51	699.09	44102.37	699.09	44102.37	4702.06	43.30	108.59
40	185.00	133.00	218313.33	833.18	44102.37	833.18	44102.37	11931.63	48.40	246.50
41	185.93	134.49	219087.96	833.18	518.96	833.18	518.96	1549.26	51.72	29.95
42	186.26	134.89	219294.87	628.90	518.96	628.90	518.96	413.82	51.40	8.05
43	186.76	135.56	219639.43	685.01	518.96	685.01	518.96	689.12	51.29	13.44
44	187.07	136.04	219889.93	831.08	518.96	831.08	518.96	501.00	51.12	9.80
45	187.29	136.42	220077.20	831.08	487.69	831.08	487.69	374.54	50.95	7.35
46	187.50	136.79	220248.17	831.08	463.32	831.08	463.32	341.93	50.79	6.73
47	189.13	140.48	221602.43	831.08	367.19	831.08	367.19	2708.53	49.67	54.53
48	193.28	147.53	224192.76	624.32	367.19	624.32	367.19	5180.65	47.18	109.81
49	194.12	148.95	224711.43	616.00	367.19	616.00	367.19	1037.34	45.46	22.82
50	194.74	150.06	225120.37	659.83	367.19	659.83	367.19	817.89	44.92	18.21
51	195.47	150.99	225604.18	659.83	520.99	659.83	520.99	967.62	44.58	21.71
52	195.56	151.09	225658.55	611.14	520.99	611.14	520.99	108.74	44.47	2.45
53	197.24	151.09	226687.13	611.14	2279895.43	611.14	2279895.43	2057.14	45.30	45.41
54	199.77	151.09	228494.64	716.42	2279895.43	716.42	2279895.43	3615.03	47.40	76.27
55	201.92	151.09	229941.35	672.58	2279895.43	672.58	2279895.43	2893.43	49.74	58.17
56	204.51	151.10	231748.54	696.41	2279895.43	696.41	2279895.43	3614.37	52.11	69.36
57	205.68	151.10	232498.24	640.31	2279895.43	640.31	2279895.43	1499.40	54.00	27.77
58	205.90	151.39	232635.32	640.31	463.10	640.31	463.10	274.15	54.54	5.03
59	207.12	151.39	233420.38	640.31	5046813.19	640.31	5046813.19	1570.12	55.11	28.49
60	212.52	151.39	236087.28	494.24	5046813.19	494.24	5046813.19	5333.80	58.39	91.35
61	213.47	151.39	236553.68	488.89	5046813.19	488.89	5046813.19	932.80	61.60	15.14
62	215.68	151.39	237682.13	510.10	5046813.19	510.10	5046813.19	2256.91	63.18	35.72
63	219.42	156.58	239587.77	510.10	367.19	510.10	367.19	3811.29	63.56	59.96
64	221.55	162.90	241906.62	1090.79	367.19	1090.79	367.19	4637.69	60.72	76.38
65	221.58	162.94	241941.99	1090.79	822.54	1090.79	822.54	70.74	58.64	1.21
66	222.36	162.96	242793.60	1090.79	60383.19	1090.79	60383.19	1703.23	59.02	28.86
67	227.23	163.04	248080.66	1085.86	60383.19	1085.86	60383.19	10574.11	61.76	171.20
68	229.40	163.08	250381.62	1060.35	60383.19	1060.35	60383.19	4601.91	65.25	70.53
69	230.77	163.10	251654.29	926.25	60383.19	926.25	60383.19	2545.35	66.99	38.00
70	235.81	163.12	252835.16	234.58	60383.19	234.58	60383.19	2361.73	70.15	33.67
71	254.28	163.17	255612.84	150.32	60383.19	150.32	60383.19	5555.37	81.55	68.12
72	297.47	163.18	256642.01	23.83	60383.19	23.83	60383.19	2058.34	111.31	18.49
		163.24	260117.33						Total area	4943.36

Table F6 Calculation of Target Area at $\Delta t_{min} = 30^{o}C$

i	Thi C	Tci C	CumQi kW	SumMCp,h kW/C	SumMCp,c kW/C	Sum(MCp,h/h) m2	Sum(MCp,c/c) m2	Sum(Q/h) m2C	LMTDi C	A m2
0	137.01	30.00	152876.59	4277.32	0.00	4277.32	0.00	0.00	0.00	0.00
1	137.06	39.49	153051.80	4277.32	18.46	4277.32	18.46	350.43	102.22	3.43
2	137.06	40.61	153081.70	4277.32	26.89	4277.32	26.89	59.80	97.01	0.62
3	137.07	40.75	153095.23	4277.32	90.79	4277.32	90.79	27.05	96.38	0.28
4	137.09	41.49	153180.21	4277.32	115.15	4277.32	115.15	169.96	95.95	1.77
5	137.19	43.72	153615.21	4277.32	195.31	4277.32	195.31	870.00	94.53	9.20
6	137.43	49.12	154669.06	4299.92	195.31	4299.92	195.31	2107.70	90.87	23.20
7	138.50	64.44	159244.13	4299.92	298.63	4299.92	298.63	9150.15	80.98	112.99
8	138.85	67.19	160778.87	4299.92	556.24	4299.92	556.24	3069.47	72.85	42.13
9	139.58	68.17	161320.73	742.27	556.24	742.27	556.24	1083.72	71.54	15.15
10	139.65	68.27	161376.82	824.76	556.24	824.76	556.24	112.17	71.40	1.57
11	139.91	68.69	161611.15	904.78	556.24	904.78	556.24	468.68	71.30	6.57
12	140.44	69.44	162027.69	791.90	556.24	791.90	556.24	833.08	71.11	11.72
13	142.42	72.56	163762.49	876.16	556.24	876.16	556.24	3469.58	70.43	49.27
14	142.49	82.13	169087.31	77035.62	556.24	77035.62	556.24	10649.66	64.99	163.87
15	142.60	97.87	177551.86	77035.62	537.78	77035.62	537.78	16929.09	52.15	324.63
16	144.55	101.06	179268.25	876.16	537.78	876.16	537.78	3432.78	44.11	77.83
17	145.01	101.75	179637.88	803.54	537.78	803.54	537.78	739.26	43.38	17.04
18	145.67	102.50	180038.83	607.50	537.78	607.50	537.78	801.90	43.22	18.55
19	145.88	102.70	180151.30	545.96	537.78	545.96	537.78	224.94	43.18	5.21
20	145.89	111.63	184951.29	377353.04	537.78	377353.04	537.78	9599.99	38.55	249.04
21	145.89	112.01	185056.89	377353.04	280.18	377353.04	280.18	211.19	34.07	6.20
22	146.22	112.65	185237.35	545.96	280.18	545.96	280.18	360.93	33.73	10.70
23	147.10	113.84	185714.23	545.96	399.98	545.96	399.98	953.75	33.41	28.54
24	147.46	114.26	185880.62	463.48	399.98	463.48	399.98	332.78	33.23	10.02
25	150.06	117.10	187017.39	436.55	399.98	436.55	399.98	2273.55	33.08	68.73
26	152.16	119.25	187876.93	408.53	399.98	408.53	399.98	1719.08	32.94	52.19
27	153.27	120.95	188554.79	612.81	399.98	612.81	399.98	1355.72	32.62	41.56
28	154.96	123.34	189589.73	612.81	431.25	612.81	431.25	2069.87	31.97	64.75
29	155.56	124.27	189987.85	657.38	431.25	657.38	431.25	796.24	31.46	25.31
30	160.72	130.70	193378.84	657.38	527.39	657.38	527.39	6781.98	30.66	221.22
31	162.02	132.02	194076.69	536.90	527.39	536.90	527.39	1395.70	30.01	46.50
32	162.53	132.33	194350.32	536.90	897.16	536.90	897.16	547.27	30.10	18.18
33	164.10	132.35	195191.96	536.90	44110.80	536.90	44110.80	1683.28	30.97	54.34
34	171.79	132.47	200908.45	743.66	44110.80	743.66	44110.80	11432.97	35.40	322.97
35	172.86	132.65	208791.01	7360.00	44110.80	7360.00	44110.80	15765.13	39.76	396.54
36	174.48	132.68	209996.48	743.66	44110.80	743.66	44110.80	2410.93	41.00	58.81
37	174.62	132.68	210097.88	699.09	44110.80	699.09	44110.80	202.80	41.87	4.84
38	177.84	132.73	212347.51	699.09	44102.37	699.09	44102.37	4499.27	43.51	103.42
39	185.93	132.89	219087.96	833.18	44102.37	833.18	44102.37	13480.89	48.97	275.29
40	186.26	132.89	219294.87	628.90	44102.37	628.90	44102.37	413.82	53.21	7.78
41	186.76	132.90	219639.43	685.01	44102.37	685.01	44102.37	689.12	53.62	12.85
42	189.13	132.94	221602.43	831.08	44102.37	831.08	44102.37	3926.01	55.02	71.36
43	193.09	133.00	224078.33	624.32	44102.37	624.32	44102.37	4951.79	58.12	85.21
44	193.28	133.22	224192.76	624.32	518.96	624.32	518.96	228.86	60.07	3.81
45	194.12	134.22	224711.43	616.00	518.96	616.00	518.96	1037.34	59.98	17.30
46	195.47	135.94	225604.18	659.83	518.96	659.83	518.96	1785.51	59.71	29.90
47	195.55	136.04	225654.93	611.14	518.96	611.14	518.96	101.49	59.52	1.71
48	195.86	136.42	225842.20	611.14	487.69	611.14	487.69	374.54	59.48	6.30
49	196.14	136.79	226013.17	611.14	463.32	611.14	463.32	341.93	59.39	5.76
50	197.24	138.63	226687.13	611.14	367.19	611.14	367.19	1347.92	58.98	22.85
51	199.77	143.55	228494.64	716.42	367.19	716.42	367.19	3615.03	57.41	62.97
52	201.92	147.49	229941.35	672.58	367.19	672.58	367.19	2893.43	55.32	52.31
53	203.27	150.06	230885.37	696.41	367.19	696.41	367.19	1888.03	53.82	35.08
54	204.04	151.09	231423.55	696.41	520.99	696.41	520.99	1076.37	53.08	20.28
55	204.51	151.09	231748.54	696.41	2279895.43	696.41	2279895.43	649.97	53.18	12.22
56	207.12	151.09	233420.38	640.31	2279895.43	640.31	2279895.43	3343.68	54.71	61.11
57	212.52	151.10	236087.28	494.24	2279895.43	494.24	2279895.43	5333.80	58.68	90.89
58	213.47	151.10	236553.68	488.89	2279895.43	488.89	2279895.43	932.80	61.90	15.07
59	216.82	151.10	238263.24	510.10	2279895.43	510.10	2279895.43	3419.13	64.04	53.39
60	217.09	151.39	238400.32	510.10	463.10	510.10	463.10	274.15	65.71	4.17
61	219.42	151.39	239587.77	510.10	5046813.19	510.10	5046813.19	2374.91	66.86	35.52
62	222.36	151.39	242793.60	1090.79	5046813.19	1090.79	5046813.19	6411.66	69.49	92.27
63	222.96	151.39	243447.13	1085.86	5046813.19	1085.86	5046813.19	1307.05	71.27	18.34
64	226.85	162.90	247671.62	1085.86	367.19	1085.86	367.19	8448.97	67.69	124.82
65	226.88	162.94	247706.99	1085.86	822.54	1085.86	822.54	70.74	63.95	1.11
66	227.23	162.95	248080.66	1085.86	60383.19	1085.86	60383.19	747.35	64.11	11.66
67	229.40	162.99	250381.62	1060.35	60383.19	1060.35	60383.19	4601.91	65.34	70.43
68	230.77	163.01	251654.29	926.25	60383.19	926.25	60383.19	2545.35	67.09	37.94
69	235.81	163.03	252835.16	234.58	60383.19	234.58	60383.19	2361.73	70.24	33.62
70	254.28	163.07	255612.84	150.32	60383.19	150.32	60383.19	5555.37	81.65	68.04
71	297.47	163.09	256642.01	23.83	60383.19	23.83	60383.19	2058.34	111.40	18.48
		163.24	265882.33						Total area	4128.75

Table F7 Calculation of Target Area at $\Delta tmin = 40^{o}C$

I	Thi C	Tci C	CumQi kW	SumMCp,h kW/C	SumMCp,c kW/C	Sum(MCp,h/h) m2	Sum(MCp,c/c) m2	Sum(Q/h) m2C	LMTDi C	A m2
0	142.00	30.00	163401.59	876.16	0.00	876.16	0.00	0.00	0.00	0.00
1	142.20	39.49	163576.80	876.16	18.46	876.16	18.46	350.43	107.29	3.27
2	142.24	40.61	163606.70	876.16	26.89	876.16	26.89	59.80	102.17	0.59
3	142.25	40.75	163620.23	876.16	90.79	876.16	90.79	27.05	101.57	0.27
4	142.35	41.49	163705.21	876.16	115.15	876.16	115.15	169.96	101.18	1.68
5	142.42	41.79	163762.49	876.16	195.31	876.16	195.31	114.55	100.74	1.14
6	142.43	43.12	165194.06	77035.62	195.31	77035.62	195.31	2863.15	96.93	29.54
7	142.49	64.44	169769.13	77035.62	298.63	77035.62	298.63	9150.15	85.46	107.07
8	142.60	78.43	177551.86	77035.62	556.24	77035.62	556.24	15565.45	70.89	219.58
9	144.55	81.51	179268.25	876.16	556.24	876.16	556.24	3432.78	63.60	53.97
10	144.98	82.13	179612.31	803.54	556.24	803.54	556.24	688.12	62.95	10.93
11	145.01	82.18	179637.88	803.54	537.78	803.54	537.78	51.14	62.84	0.81
12	145.67	82.92	180038.83	607.50	537.78	607.50	537.78	801.90	62.79	12.77
13	145.88	83.13	180151.30	545.96	537.78	545.96	537.78	224.94	62.75	3.58
14	145.89	92.26	185056.89	377353.04	537.78	377353.04	537.78	9811.18	58.07	168.94
15	147.10	93.48	185714.23	545.96	537.78	545.96	537.78	1314.68	53.63	24.51
16	147.46	93.79	185880.62	463.48	537.78	463.48	537.78	332.78	53.64	6.20
17	150.06	95.90	187017.39	436.55	537.78	436.55	537.78	2273.55	53.91	42.17
18	152.16	97.50	187876.93	408.53	537.78	408.53	537.78	1719.08	54.41	31.59
19	154.96	100.68	189589.73	612.81	537.78	612.81	537.78	3425.59	54.47	62.89
20	160.72	107.73	193378.84	657.38	537.78	657.38	537.78	7578.22	53.63	141.30
21	164.10	111.10	195191.96	536.90	537.78	536.90	537.78	3626.25	53.00	68.42
22	164.48	111.63	195476.29	743.66	537.78	743.66	537.78	568.66	52.93	10.74
23	164.87	112.65	195762.35	743.66	280.18	743.66	280.18	572.12	52.53	10.89
24	169.33	120.95	199079.79	743.66	399.98	743.66	399.98	6634.88	50.28	131.97
25	171.26	124.27	200512.85	743.66	431.25	743.66	431.25	2866.11	47.68	60.11
26	171.79	125.02	200908.45	743.66	527.39	743.66	527.39	791.20	46.88	16.88
27	172.29	132.02	204601.69	7360.00	527.39	7360.00	527.39	7386.48	43.44	170.05
28	172.33	132.33	204875.32	7360.00	897.16	7360.00	897.16	547.27	40.13	13.64
29	172.86	132.41	208791.01	7360.00	44110.80	7360.00	44110.80	7831.38	40.22	194.71
30	174.48	132.44	209996.48	743.66	44110.80	743.66	44110.80	2410.93	41.23	58.47
31	177.84	132.50	212347.51	699.09	44110.80	699.09	44110.80	4702.06	43.67	107.67
32	185.93	132.65	219087.96	833.18	44110.80	833.18	44110.80	13480.89	49.21	273.95
33	186.26	132.65	219294.87	628.90	44110.80	628.90	44110.80	413.82	53.45	7.74
34	186.76	132.66	219639.43	685.01	44110.80	685.01	44110.80	689.12	53.86	12.80
35	187.95	132.68	220622.88	831.08	44110.80	831.08	44110.80	1966.90	54.68	35.97
36	189.13	132.71	221602.43	831.08	44102.37	831.08	44102.37	1959.11	55.84	35.08
37	193.28	132.76	224192.76	624.32	44102.37	624.32	44102.37	5180.65	58.44	88.65
38	194.12	132.78	224711.43	616.00	44102.37	616.00	44102.37	1037.34	60.93	17.03
39	195.47	132.80	225604.18	659.83	44102.37	659.83	44102.37	1785.51	62.01	28.80
40	197.24	132.82	226687.13	611.14	44102.37	611.14	44102.37	2165.89	63.54	34.08
41	199.77	132.86	228494.64	716.42	44102.37	716.42	44102.37	3615.03	65.65	55.06
42	201.92	132.89	229941.35	672.58	44102.37	672.58	44102.37	2893.43	67.96	42.58
43	204.51	132.94	231748.54	696.41	44102.37	696.41	44102.37	3614.37	70.29	51.42
44	207.12	132.97	233420.38	640.31	44102.37	640.31	44102.37	3343.68	72.85	45.90
45	209.52	133.00	234603.33	494.24	44102.37	494.24	44102.37	2365.90	75.33	31.41
46	212.52	135.86	236087.28	494.24	518.96	494.24	518.96	2967.90	76.59	38.75
47	212.71	136.04	236179.93	488.89	518.96	488.89	518.96	185.30	76.66	2.42
48	213.09	136.42	236367.20	488.89	487.69	488.89	487.69	374.54	76.67	4.89
49	213.44	136.79	236538.17	488.89	463.32	488.89	463.32	341.93	76.66	4.46
50	213.47	136.83	236553.68	488.89	367.19	488.89	367.19	31.02	76.64	0.40
51	219.42	145.10	239587.77	510.10	367.19	510.10	367.19	6068.20	75.48	80.40
52	221.09	150.06	241410.37	1090.79	367.19	1090.79	367.19	3645.19	72.66	50.16
53	221.58	151.09	241948.55	1090.79	520.99	1090.79	520.99	1076.37	70.76	15.21
54	222.36	151.09	242793.60	1090.79	2279895.43	1090.79	2279895.43	1690.10	70.88	23.85
55	227.23	151.10	248080.66	1085.86	2279895.43	1085.86	2279895.43	10574.11	73.67	143.53
56	227.90	151.10	248788.24	1060.35	2279895.43	1060.35	2279895.43	1415.16	76.47	18.51
57	228.02	151.39	248925.32	1060.35	463.10	1060.35	463.10	274.15	76.72	3.57
58	229.40	151.39	250381.62	1060.35	5046813.19	1060.35	5046813.19	2912.60	77.32	37.67
59	230.77	151.39	251654.29	926.25	5046813.19	926.25	5046813.19	2545.35	78.69	32.35
60	235.81	151.39	252835.16	234.58	5046813.19	234.58	5046813.19	2361.73	81.87	28.85
61	243.37	151.39	253972.13	150.32	5046813.19	150.32	5046813.19	2273.95	88.14	25.80
62	254.28	155.86	255612.84	150.32	367.19	150.32	367.19	3281.42	95.16	34.48
63	297.47	158.66	256642.01	23.83	367.19	23.83	367.19	2058.34	117.46	17.52
		162.90	258196.62						Total area	3089.65

Table F8 Calculation of Target Area at $\Delta t_{min} = 41.017^{o}C$

i	Thi C	Tci C	CumQi kW	SumMCp,h kW/C	SumMCp,c kW/C	Sum(MCp,h/h) m2	Sum(MCp,c/c) m2	Sum(Q/h) m2C	LMTDi C	A m2
0	142.47	30.00	167725.00	77035.62	0.00	77035.62	0.00	0.00	0.00	0.00
1	142.47	39.49	167900.22	77035.62	18.46	77035.62	18.46	350.43	107.65	3.26
2	142.47	40.61	167930.11	77035.62	26.89	77035.62	26.89	59.80	102.42	0.58
3	142.47	40.75	167943.64	77035.62	90.79	77035.62	90.79	27.05	101.79	0.27
4	142.47	41.49	168028.62	77035.62	115.15	77035.62	115.15	169.96	101.35	1.68
5	142.49	49.12	169517.48	77035.62	195.31	77035.62	195.31	2977.71	97.13	30.66
6	142.55	64.44	174092.55	77035.62	298.63	77035.62	298.63	9150.15	85.52	107.00
7	142.60	70.65	177551.86	77035.62	556.24	77035.62	556.24	6918.63	74.99	92.27
8	144.55	73.74	179268.25	876.16	556.24	876.16	556.24	3432.78	71.38	48.09
9	145.01	74.40	179637.88	803.54	556.24	803.54	556.24	739.26	70.71	10.45
10	145.67	75.13	180038.83	607.50	556.24	607.50	556.24	801.90	70.58	11.36
11	145.88	75.33	180151.30	545.96	556.24	545.96	556.24	224.94	70.55	3.19
12	145.89	82.13	183935.73	377353.04	556.24	377353.04	556.24	7568.86	67.10	112.80
13	145.89	84.22	185056.89	377353.04	537.78	377353.04	537.78	2242.32	62.71	35.76
14	147.10	85.44	185714.23	545.96	537.78	545.96	537.78	1314.68	61.67	21.32
15	147.46	85.75	185880.62	463.48	537.78	463.48	537.78	332.78	61.68	5.39
16	150.06	87.86	187017.39	436.55	537.78	436.55	537.78	2273.55	61.95	36.70
17	152.16	89.46	187876.93	408.53	537.78	408.53	537.78	1719.08	62.45	27.53
18	154.96	92.64	189589.73	612.81	537.78	612.81	537.78	3425.59	62.51	54.80
19	160.72	99.69	193378.84	657.38	537.78	657.38	537.78	7578.22	61.67	122.88
20	164.10	103.06	195191.96	536.90	537.78	536.90	537.78	3626.25	61.04	59.41
21	170.30	111.63	199799.71	743.66	537.78	743.66	537.78	9215.49	59.84	153.99
22	170.68	112.65	200085.77	743.66	280.18	743.66	280.18	572.12	58.35	9.81
23	171.79	114.71	200908.45	743.66	399.98	743.66	399.98	1645.36	57.55	28.59
24	172.13	120.95	203403.21	7360.00	399.98	7360.00	399.98	4989.52	54.08	92.27
25	172.32	124.27	204836.26	7360.00	431.25	7360.00	431.25	2866.11	49.60	57.78
26	172.86	131.77	208791.01	7360.00	527.39	7360.00	527.39	7909.50	44.48	177.82
27	173.04	132.02	208925.10	743.66	527.39	743.66	527.39	268.18	41.05	6.53
28	173.41	132.33	209198.74	743.66	897.16	743.66	897.16	547.27	41.05	13.33
29	174.48	132.34	209996.48	743.66	44110.80	743.66	44110.80	1595.49	41.61	38.35
30	177.84	132.40	212347.51	699.09	44110.80	699.09	44110.80	4702.06	43.77	107.43
31	185.93	132.55	219087.96	833.18	44110.80	833.18	44110.80	13480.89	49.31	273.41
32	186.26	132.55	219294.87	628.90	44110.80	628.90	44110.80	413.82	53.54	7.73
33	186.76	132.56	219639.43	685.01	44110.80	685.01	44110.80	689.12	53.95	12.77
34	189.13	132.61	221602.43	831.08	44110.80	831.08	44110.80	3926.01	55.35	70.93
35	193.28	132.67	224192.76	624.32	44110.80	624.32	44110.80	5180.65	58.54	88.50
36	194.12	132.68	224711.43	616.00	44110.80	616.00	44110.80	1037.34	61.02	17.00
37	194.47	132.68	224946.29	659.83	44110.80	659.83	44110.80	469.73	61.61	7.62
38	195.47	132.70	225604.18	659.83	44102.37	659.83	44102.37	1315.78	62.28	21.13
39	197.24	132.72	226687.13	611.14	44102.37	611.14	44102.37	2165.89	63.64	34.03
40	199.77	132.76	228494.64	716.42	44102.37	716.42	44102.37	3615.03	65.75	54.98
41	201.92	132.80	229941.35	672.58	44102.37	672.58	44102.37	2893.43	68.06	42.52
42	204.51	132.84	231748.54	696.41	44102.37	696.41	44102.37	3614.37	70.39	51.35
43	207.12	132.88	233420.38	640.31	44102.37	640.31	44102.37	3343.68	72.95	45.83
44	212.52	132.94	236087.28	494.24	44102.37	494.24	44102.37	5333.80	76.88	69.37
45	213.47	132.95	236553.68	488.89	44102.37	488.89	44102.37	932.80	80.05	11.65
46	218.12	133.00	238926.74	510.10	44102.37	510.10	44102.37	4746.14	82.80	57.32
47	219.42	134.27	239587.77	510.10	518.96	510.10	518.96	1322.06	85.14	15.53
48	220.26	136.04	240503.34	1090.79	518.96	1090.79	518.96	1831.14	84.68	21.62
49	220.43	136.42	240690.61	1090.79	487.69	1090.79	487.69	374.54	84.12	4.45
50	220.59	136.79	240861.58	1090.79	463.32	1090.79	463.32	341.93	83.90	4.08
51	222.36	142.05	242793.60	1090.79	367.19	1090.79	367.19	3864.05	82.04	47.10
52	225.07	150.06	245733.78	1085.86	367.19	1085.86	367.19	5880.36	77.63	75.75
53	225.56	151.09	246271.97	1085.86	520.99	1085.86	520.99	1076.37	74.74	14.40
54	227.23	151.09	248080.66	1085.86	2279895.43	1085.86	2279895.43	3617.38	75.30	48.04
55	229.40	151.09	250381.62	1060.35	2279895.43	1060.35	2279895.43	4601.91	77.21	59.60
56	230.77	151.10	251654.29	926.25	2279895.43	926.25	2279895.43	2545.35	78.99	32.22
57	235.81	151.10	252835.16	234.58	2279895.43	234.58	2279895.43	2361.73	82.17	28.74
58	237.65	151.10	253111.65	150.32	2279895.43	150.32	2279895.43	553.00	85.63	6.46
59	238.56	151.39	253248.73	150.32	463.10	150.32	463.10	274.15	86.86	3.16
60	254.28	151.39	255612.84	150.32	5046813.19	150.32	5046813.19	4728.22	94.81	49.87
61	297.47	151.39	256642.01	23.83	5046813.19	23.83	5046813.19	2058.34	123.22	16.70
		151.39	258295.54						Total area	2765.16

Appendix G Problem Table Algorithm with Multiple Utility Level

Table G1 Problem Table Algorithm with Multiple Utility Level at Δtmin = 5°C

Temperature C		Enthalpy kW	Surplus kW	Cascade kW	
	314.50	105654.00		92332.70	power
314.50	313.00	87486.79	-18167.21	74165.49	
313.00	294.97	71746.65	-15740.13	58425.35	
294.97	292.24	69428.97	-2317.69	56107.67	
292.24	279.12	69741.67	312.70	56420.37	
279.12	271.88	44773.68	-24967.98	31452.38	
271.88	256.78	40561.50	-4212.18	27240.20	
256.78	251.78	40680.67	119.17	27359.37	
251.78	243.35	41948.65	1267.98	28627.35	
243.35	238.50	42455.41	506.76	29134.11	
238.50	238.38	33083.14	-9372.27	19761.84	
238.38	238.31	33073.29	-9.86	19751.99	
238.31	235.28	33389.32	316.03	20068.02	
235.28	233.31	31899.51	-1489.82	18578.21	
233.31	231.97	31002.10	-897.40	17680.80	
231.97	229.73	31262.92	260.82	17941.62	
229.73	228.27	31537.76	274.84	18216.46	
228.27	227.77	31979.74	441.98	18658.44	
227.77	226.90	32677.59	697.84	19356.29	
226.90	226.16	33369.96	692.37	20048.66	
226.16	224.73	34581.57	1211.61	21260.27	
224.73	219.86	38834.09	4252.52	25512.79	
219.86	216.92	41415.45	2581.37	28094.15	
216.92	216.71	41476.76	61.31	28155.46	
216.71	215.21	41129.80	-346.96	27808.50	
215.21	213.41	41593.93	464.13	28272.63	
213.41	212.69	41809.71	215.78	28488.41	
212.69	210.97	41971.22	161.51	28649.92	
210.97	210.02	42040.87	69.65	28719.57	
210.02	208.38	42169.15	128.28	28847.85	
208.38	206.28	30853.74	-11315.41	17532.44	
206.28	204.62	19139.36	-11714.38	5818.06	
204.62	203.69	12679.68	-6459.68	-641.62	
203.69	203.20	10024.76	-2654.92	-3296.54	
203.20	202.27	10105.86	81.09	-3215.44	
202.27	202.01	10179.67	73.81	-3141.63	
202.01	200.35	10755.54	575.87	-2565.76	
200.35	199.42	11019.68	264.14	-2301.62	
199.42	197.27	11576.72	557.04	-1744.58	
197.27	194.74	12340.70	763.98	-980.60	
194.74	193.64	12557.79	217.09	-763.51	
193.64	192.97	12721.56	163.77	-599.74	
192.97	191.76	13074.93	353.37	-246.37	
191.76	191.62	13136.32	61.39	-184.98	
191.62	191.14	13321.33	185.01	13320.90	MP stream
191.14	190.83	13413.29	91.96	13412.86	
190.83	190.78	13417.09	3.80	13416.66	
190.78	186.63	13761.02	343.92	13760.59	
186.63	184.26	14445.16	684.14	14444.73	
184.26	183.76	14517.38	72.22	14516.95	
183.76	183.43	14546.16	28.78	14545.73	
183.43	181.11	15222.44	676.28	15222.01	
181.11	180.67	15253.25	30.81	15252.82	
180.67	179.73	15398.60	145.35	15398.17	
179.73	177.38	15974.04	575.44	15973.62	
177.38	175.34	16922.81	948.77	16922.38	
175.34	171.98	18038.99	1116.18	18038.57	
171.98	170.36	18649.25	610.26	18648.82	
170.36	169.29	26138.56	7489.31	26138.13	
169.29	165.74	27473.14	1334.58	27472.71	
165.74	165.44	9521.64	-17951.50	9521.21	
165.44	165.40	9518.25	-3.39	9517.82	
165.40	161.60	10948.08	1429.83	10947.65	
161.60	158.22	11521.21	573.13	11520.78	
158.22	153.89	12777.73	1256.52	12777.30	
153.89	153.89	7731.57	-5046.16	7731.14	
153.89	153.60	7789.08	57.51	7788.65	
153.60	153.59	951.36	-6837.71	950.94	
153.59	152.56	1092.25	140.88	1091.82	
152.56	152.46	1121.56	29.31	1121.13	
152.46	149.66	1808.06	686.51	1807.64	
149.66	147.56	1895.04	86.98	1894.62	
147.56	144.96	2075.67	180.62	2075.24	
144.96	144.60	2110.23	34.57	2109.80	
144.60	143.39	2325.48	215.25	2325.05	
143.39	143.38	7226.29	4900.82	7225.87	
143.38	143.17	7263.12	36.83	7262.69	
143.17	142.51	7421.73	158.60	7421.30	
142.51	142.05	7622.45	200.72	7622.02	
142.05	140.10	8619.52	997.07	8619.09	
140.10	139.92	22343.17	13723.65	22342.74	
139.92	139.29	22661.28	318.11	22660.85	
139.29	138.92	22813.61	152.34	22813.19	
138.92	138.54	22962.79	149.17	22962.36	
138.54	137.94	23177.82	215.03	23177.39	
137.94	137.41	23321.39	143.57	23320.96	
137.41	137.15	23421.32	99.93	23420.89	
137.15	137.08	23442.11	20.79	23441.68	
137.08	136.35	23605.13	163.02	23604.70	
136.35	135.50	26830.29	3225.16	26829.86	
135.50	135.18	14212.91	-12617.38	14212.48	
135.18	134.83	0.42	-14212.48	0.00	

Temperature C		Enthalpy kW	Surplus kW	Cascade kW	
134.83	134.69	473.41	472.98	472.98	
134.69	134.52	1034.51	561.11	1034.09	
134.52	133.36	5380.68	4346.17	5380.26	
133.36	131.11	13753.17	8372.49	13752.75	
131.11	129.61	19498.81	5745.63	19498.38	
129.61	126.77	20237.62	738.81	20237.20	
126.77	125.85	20584.25	326.63	20583.82	
125.85	123.45	21698.19	1133.94	21697.76	
123.45	123.13	21854.99	156.80	21854.56	
123.13	122.09	22402.47	547.48	22402.05	
122.09	118.45	27361.45	4958.98	27361.03	
118.45	116.39	30007.26	2645.81	30006.84	
116.39	115.15	31636.40	1629.13	31635.97	
115.15	114.13	33101.21	1464.81	33100.78	
114.13	113.50	33842.77	741.56	33842.34	
113.50	112.67	34900.68	1057.91	34900.25	
112.67	109.92	38642.68	3742.01	38642.26	
109.92	109.89	61100.74	22458.05	61100.31	
109.89	109.00	62311.43	1210.69	62311.00	
109.00	108.71	62717.68	406.25	62717.25	
108.71	108.54	68618.30	5900.62	68617.87	
108.54	102.25	77315.38	8697.08	77314.95	
102.25	95.91	80782.94	3467.57	80782.52	
95.91	94.30	81484.66	701.71	81484.23	
94.30	92.85	82053.20	568.54	82052.77	
92.85	87.48	83596.20	1543.01	83595.78	
87.48	84.63	84416.63	820.43	84416.20	
84.63	83.07	84837.94	421.31	84837.52	
83.07	82.60	84974.39	136.44	84973.96	
82.60	82.04	85169.93	195.54	85169.50	
82.04	81.00	85492.14	322.21	85491.72	
81.00	80.50	85653.95	161.81	85653.52	
80.50	80.13	85702.09	48.15	85701.67	
80.13	80.08	100281.29	14579.20	100280.87	
80.08	75.04	100940.58	659.29	100940.15	
75.04	68.94	101876.73	936.15	101876.30	
68.94	63.53	103145.61	1268.89	103145.19	
63.53	54.33	106352.73	3207.11	106352.30	
54.33	53.45	106612.91	260.18	106612.48	
53.45	53.30	106648.82	35.91	106648.39	
53.30	51.62	106873.60	224.78	106873.18	
51.62	43.99	108675.75	1802.15	108675.33	
43.99	43.25	108909.38	233.63	108908.96	
43.25	43.11	108960.18	50.80	108959.76	
43.11	42.29	109291.74	331.56	109291.32	
42.29	41.99	109408.16	116.42	109407.73	
41.99	38.99	110625.86	1217.70	110625.44	
38.99	38.72	110706.08	80.22	110705.66	Air
38.72	35.19	111711.22	1005.14	1005.14	
35.19	35.03	111755.54	44.32	1049.46	
35.03	34.28	111932.70	177.16	1226.61	CW
34.28	32.50	112268.22	335.53	335.53	
32.50	31.08	112562.32	294.10	629.63	
31.08	30.98	112579.46	17.14	646.77	
30.98	30.90	112592.35	12.89	659.66	
30.90	30.28	112689.83	97.48	757.14	
30.28	30.26	112691.81	1.98	759.12	
30.26	29.83	112703.93	12.11	771.23	
29.83	27.15	112715.68	11.75	782.98	
27.15	21.62	112739.59	23.91	806.89	RF

Table G2 Problem Table Algorithm with Multiple Utility Level at $\Delta tmin = 10^{\circ}C$

Temperature C		Enthalpy kW	Surplus kW	Cascade kW	
	317	117127		94104	power
317	315.499	98959.79	-18167.2	75936.79	
315.499	294.735	80836.9	-18122.9	57813.9	
294.735	292.465	80836.9	0	57813.9	
292.465	281.615	81095.5	258.5972	58072.5	
281.615	274.377	56127.52	-24968	33104.52	
274.377	259.284	51915.33	-4212.18	28892.33	
259.284	249.284	52153.67	238.3384	29130.67	
249.284	245.849	52670.03	516.3628	29647.03	
245.849	241	53176.79	506.762	30153.79	
241	240.882	43804.52	-9372.27	20781.52	
240.882	240.806	43794.67	-9.85535	20771.67	
240.806	237.782	44110.7	316.0339	21087.7	
237.782	234.466	41610.58	-2500.12	18587.58	
234.466	232.228	41682.84	72.25815	18659.84	
232.228	230.806	41831.45	148.6112	18808.45	
230.806	230.27	41932.63	101.1767	18909.63	
230.27	228.657	42107.81	175.178	19084.81	
228.657	225.772	42171.58	63.76693	19148.58	
225.772	224.398	43152.31	980.7325	20129.31	
224.398	222.228	44992.2	1839.887	21969.2	
222.228	219.214	47624.58	2632.385	24601.58	
219.214	217.712	48142.4	517.8244	25119.4	
217.712	217.359	48436.62	294.2128	25413.62	
217.359	215.911	49650.61	1213.993	26627.61	
215.911	215.186	50287.39	636.7779	27264.39	
215.186	214.42	50804.37	516.9844	27781.37	
214.42	210.881	51137.85	333.4761	28114.85	
210.881	208.779	39855.79	-11282.1	16832.79	
208.779	208.472	37690.29	-2165.51	14667.29	
208.472	207.518	30940.76	-6749.53	7917.756	
207.518	206.189	21545.22	-9395.54	-1477.78	
206.189	205.695	18818.14	-2727.08	-4204.86	
205.695	204.765	18763.39	-54.7507	-4259.61	
204.765	202.85	19040.16	276.7716	-3982.84	
202.85	202.122	19098.86	58.69658	-3924.14	
202.122	199.511	19690.77	591.9072	-3332.23	
199.511	196.916	20424.64	733.8702	-2598.36	
196.916	196.143	20624.82	200.1821	-2398.18	
196.143	194.765	21044.81	419.9912	-1978.19	
194.765	194.26	21220.86	176.054	-1802.14	
194.26	193.637	21523.55	302.6874	-1499.45	
193.637	193.326	21646.74	123.1901	-1376.26	
193.326	192.242	21836.42	189.6825	-1186.58	
192.242	190.47	21959.95	123.527	-1063.05	
190.47	189.117	22120.15	160.1995	-902.85	
189.117	188.275	22182.93	62.78346	-840.066	
188.275	184.126	22526.86	343.9248	-496.142	
184.126	183.614	22675.16	148.299	-347.843	
183.614	183.165	22705.02	29.86709	-317.976	
183.165	182.228	22848.4	143.3798	-174.596	
182.228	181.764	22961.05	112.643	-61.9528	
181.764	181.261	23009.68	48.63741	-13.3154	
181.261	180.932	23023.04	13.35429	23022.8	MP Stream
180.932	179.878	23281.13	258.0927	23280.89	
179.878	172.842	26559.88	3278.745	26559.64	
172.842	169.479	27676.06	1116.182	27675.82	
169.479	168.242	28141.75	465.6926	28141.51	
168.242	167.941	10190.25	-17951.5	10190.01	
167.941	167.898	10186.86	-3.39182	10186.62	
167.898	167.858	10201.92	15.05878	10201.68	
167.858	166.787	17691.22	7489.308	17690.99	
166.787	159.1	20585.14	2893.92	20584.91	
159.1	156.393	21044.57	459.4223	21044.33	
156.393	156.392	15998.29	-5046.28	15998.05	
156.392	156.096	16020.14	21.84628	16019.9	
156.096	156.093	9182.061	-6838.08	9181.823	
156.093	155.723	9187.949	5.887606	9187.71	
155.723	155.06	9278.372	90.4228	9278.133	
155.06	149.959	10758.62	1480.25	10758.38	
149.959	147.164	11445.13	686.5064	11444.89	
147.164	145.06	11532.11	86.97995	11531.87	
145.06	142.456	11712.73	180.6213	11712.49	
142.456	142.097	11747.3	34.56791	11747.06	
142.097	141.791	11802	54.70529	11801.76	
141.791	141.422	11832.5	30.49429	11832.26	
141.422	141.038	11854.88	22.37794	11854.64	
141.038	140.893	11858.79	3.915451	11858.55	
140.893	140.88	16757.63	4898.843	16757.39	
140.88	140.674	16763.2	5.56264	16762.96	
140.674	140.014	16821.63	58.43469	16821.39	
140.014	139.554	16952.54	130.9084	16952.3	
139.554	138	17507.62	555.085	17507.39	
138	137.683	3804.915	-13702.7	3804.676	
137.683	137.595	0.266226	-3804.65	0	

Temperature C		Enthalpy kW	Surplus kW	Cascade kW	
137.595	137.416	5893.809	5893.543	5893.543	
137.416	137.326	2002.691	-3891.12	2002.425	
137.326	137.021	1996.286	-6.4056	1996.02	
137.021	135.436	2549.084	552.7981	2548.818	
135.436	134.91	2688.219	139.1347	2687.952	
134.91	134.651	2785.963	97.74393	2785.696	
134.651	134.583	2806.184	20.22131	2805.918	
134.583	133.853	2963.051	156.8669	2962.785	
133.853	132.187	9248.084	6285.033	9247.818	
132.187	130.862	14216.74	4968.656	14216.47	
130.862	129.268	20153.46	5936.722	20153.2	
129.268	128.614	22652.1	2498.641	22651.84	
128.614	127.109	28542.42	5890.317	28542.15	
127.109	125.945	28957.02	414.6042	28956.76	
125.945	123.351	29962.1	1005.076	29961.83	
123.351	120.633	31328.09	1365.986	31327.82	
120.633	119.591	31875.57	547.4838	31875.3	
119.591	117.651	34514.19	2638.622	34513.93	
117.651	116.63	36025.19	1510.997	36024.92	
116.63	115.945	36862.47	837.2856	36862.21	
115.945	113.89	39225.11	2362.635	39224.84	
113.89	111	42626.87	3401.758	42626.6	
111	110.174	43684.77	1057.907	43684.51	
110.174	107.417	47426.78	3742.006	47426.51	
107.417	107.393	69884.84	22458.05	69884.57	
107.393	106.501	71095.52	1210.689	71095.26	
106.501	106.207	71501.78	406.2507	71501.51	
106.207	106.042	77402.4	5900.62	77402.13	
106.042	99.748	86099.48	8697.082	86099.21	
99.748	93.41	89567.04	3467.566	89566.78	
93.41	91.801	90268.75	701.7114	90268.49	
91.801	90.348	90837.29	568.5398	90837.03	
90.348	87.131	91762.52	925.229	91762.26	
87.131	84.983	92340.66	578.1317	92340.39	
84.983	80.566	93529.75	1189.099	93529.49	
80.566	80.1	93666.2	136.4439	93665.93	
80.1	79.536	93861.74	195.5417	93861.47	
79.536	78.495	94183.95	322.2124	94183.69	
78.495	78	94345.76	161.807	94345.49	
78	77.632	94393.91	48.14793	94393.64	
77.632	77.58	108973.1	14579.2	108972.8	
77.58	72.541	109632.4	659.2865	109632.1	
72.541	69.435	109991.1	358.7073	109990.8	
69.435	61.034	113125.4	3134.346	113125.2	
61.034	54.115	115537.1	2411.697	115536.9	
54.115	51.833	116568.3	1031.201	116568.1	
51.833	50.95	116919.8	351.4143	116919.5	
50.95	50.804	116970.8	50.9956	116970.5	
50.804	46.492	117990.2	1019.399	117989.9	
46.492	45.754	118223.8	233.6276	118223.5	
45.754	45.6054	118274.4	50.66264	118274.2	
45.6054	44.493	118724.8	450.3374	118724.5	
44.493	39.786	120670	1945.229	120669.7	Air
39.786	36.492	122006.6	1336.591	1336.591	CW
36.492	36.216	122086.8	80.22131	80.22131	
36.216	35	122433.8	346.9344	427.1557	
35	32.6934	123134.4	700.6649	1127.821	
32.6934	32.533	123181.8	47.38801	1175.209	
32.533	31.784	123372.8	190.9816	1366.19	
31.784	28.576	124035.3	662.5564	2028.747	
28.576	28.48	124052.5	17.13694	2045.884	
28.48	28.4	124065.4	12.89192	2058.776	
28.4	27.776	124162.9	97.48155	2156.257	
27.776	27.761	124164.8	1.978039	2158.235	
27.761	27.328	124176.9	12.11358	2170.349	
27.328	24.649	124188.7	11.75417	2182.103	
24.649	19.124	124212.6	23.90552	2206.008	RF

Table G3 Problem Table Algorithm with Multiple Utility Level at Δtmin = 20°C

Temperature C		Enthalpy kW	Surplus kW	Cascade kW	
	322.00	140026.00		100417.00	power
322.00	320.50	121858.79	-18167.21	82249.79	
320.50	299.74	103735.90	-18122.89	64126.90	
299.74	287.47	103735.90	0.00	64126.90	
287.47	286.62	103756.16	20.26	64147.16	
286.62	279.38	78788.18	-24967.98	39179.18	
279.38	264.28	74575.99	-4212.18	34966.99	
264.28	250.85	74890.20	320.21	35287.20	
250.85	246.00	74789.61	-106.59	35180.61	
246.00	245.88	65402.42	-9387.20	25793.42	
245.88	245.81	65382.95	-19.47	25773.95	
245.81	244.28	65349.49	-33.46	25740.49	
244.28	242.78	65506.46	156.97	25897.46	
242.78	239.47	63006.35	-2500.12	23397.35	
239.47	237.23	63078.60	72.26	23469.60	
237.23	235.27	63283.23	204.63	23674.23	
235.27	233.66	63322.51	39.28	23713.51	
233.66	225.81	62834.56	-487.95	23225.56	
225.81	224.21	62869.75	35.19	23260.75	
224.21	222.71	62108.95	-760.80	22499.95	
222.71	220.91	62076.85	-32.09	22467.85	
220.91	220.77	62079.93	3.07	22470.93	
220.77	220.19	62498.20	418.27	22889.20	
220.19	219.40	62900.38	402.18	23291.38	
219.40	217.23	64298.89	1398.51	24689.89	
217.23	215.88	65201.36	902.47	25592.36	
215.88	213.78	55129.54	-10071.82	15520.54	
213.78	212.36	45930.78	-9198.77	6321.78	
212.36	211.19	38357.27	-7573.50	-1251.73	
211.19	210.70	35924.90	-2432.38	-3684.10	
210.70	209.77	36424.94	500.04	-3184.06	
209.77	209.42	36680.61	255.67	-2928.39	
209.42	207.85	36932.44	251.82	-2676.56	
207.85	203.47	37354.89	422.45	-2254.11	
203.47	202.52	37426.71	71.82	-2182.29	
202.52	201.14	37537.57	110.86	-2071.43	
201.14	199.26	37775.66	238.09	-1833.34	
199.26	198.64	37939.93	164.27	-1669.07	
198.64	198.33	37994.02	54.09	-1614.98	
198.33	197.12	37937.20	-56.82	-1671.80	
197.12	194.51	38195.36	258.16	-1413.64	
194.51	191.92	38597.53	402.17	-1011.47	
191.92	189.77	38879.62	282.09	-729.38	
189.77	188.61	39081.03	201.41	-527.97	
188.61	188.17	39059.41	-21.62	-549.59	
188.17	187.24	39094.82	35.40	-514.18	
187.24	187.23	39093.88	-0.94	-515.12	
187.23	185.47	39134.02	40.13	-474.98	
185.47	184.88	39176.36	42.34	-432.64	
184.88	184.12	39399.06	222.70	-209.94	
184.12	183.28	39608.56	209.50	39608.00	MP Stream
183.28	179.13	40675.42	1066.86	40674.86	
179.13	176.76	41771.13	1095.71	41770.57	
176.76	176.26	41931.00	159.86	41930.44	
176.26	175.93	42017.10	86.10	42016.54	
175.93	173.24	43270.63	1253.53	43270.07	
173.24	172.94	25346.08	-17924.55	25345.52	
172.94	172.90	25346.53	0.46	25345.98	
172.90	167.84	27702.61	2356.07	27702.05	
167.84	164.48	28818.79	1116.18	28818.23	
164.48	162.86	29429.05	610.26	29428.49	
162.86	161.79	36918.35	7489.31	36917.80	
161.79	161.39	37066.68	148.33	37066.12	
161.39	161.39	32020.61	-5046.07	32020.06	
161.39	161.10	32103.66	83.05	32103.10	
161.10	161.09	25266.20	-6837.46	25265.64	
161.09	160.06	25496.22	230.01	25495.66	
160.06	154.10	27739.97	2243.76	27739.42	
154.10	150.72	28313.11	573.13	28312.55	
150.72	146.79	29454.13	1141.02	29453.57	
146.79	146.42	29525.73	71.61	29525.17	
146.42	146.04	29590.89	65.16	29590.33	
146.04	144.96	29740.24	149.35	29739.69	
144.96	143.00	29924.09	183.85	29923.53	
143.00	142.68	16137.90	-13786.19	16137.34	
142.68	142.33	609.12	-15528.78	608.56	
142.33	142.16	563.05	-46.07	562.49	
142.16	142.02	493.18	-69.87	492.62	
142.02	140.06	260.09	-233.09	259.53	
140.06	137.46	23.55	-236.54	22.99	
137.46	137.10	0.60	-22.94	0.00	

Temperature C		Enthalpy kW	Surplus kW	Cascade kW	
137.10	135.89	22.96	22.36	22.36	
135.89	135.88	4921.70	4898.73	4921.10	
135.88	135.67	4925.52	3.83	4924.92	
135.67	135.01	4978.40	52.87	4977.79	
135.01	134.55	5105.43	127.03	5104.83	
134.55	134.27	5205.17	99.75	5204.57	
134.27	132.60	5949.50	744.32	5948.90	
132.60	132.42	19661.68	13712.18	19661.08	
132.42	130.95	20316.13	654.45	20315.53	
130.95	130.44	20558.51	242.37	20557.91	
130.44	129.91	20764.66	206.15	20764.06	
129.91	129.65	20895.40	130.74	20894.80	
129.65	129.58	20924.29	28.89	20923.68	
129.58	128.85	21174.16	249.87	21173.56	
128.85	127.19	27671.46	6497.29	27670.85	
127.19	125.86	32808.93	5137.47	32808.33	
125.86	123.61	41467.83	8658.90	41467.23	
123.61	122.65	45266.97	3799.14	45266.36	
122.65	122.11	47470.15	2203.18	47469.55	
122.11	121.63	47713.13	242.98	47712.53	
121.63	118.35	48531.77	818.64	48531.17	
118.35	115.63	49523.22	991.45	49522.61	
115.63	114.59	49927.11	403.90	49926.51	
114.59	110.95	54383.67	4456.56	54383.07	
110.95	108.89	56746.31	2362.63	56745.71	
108.89	106.00	60148.06	3401.76	60147.46	
106.00	105.17	61205.97	1057.91	61205.37	
105.17	102.42	64947.98	3742.01	64947.38	
102.42	102.39	87406.03	22458.05	87405.43	
102.39	101.50	88616.72	1210.69	88616.12	
101.50	101.21	89022.97	406.25	89022.37	
101.21	101.04	94923.59	5900.62	94922.99	
101.04	94.75	103620.68	8697.08	103620.07	
94.75	92.13	105052.46	1431.78	105051.85	
92.13	88.41	107019.56	1967.11	107018.96	
88.41	86.80	107691.57	672.01	107690.97	
86.80	85.35	108233.30	541.72	108232.69	
85.35	79.98	109677.28	1443.98	109676.68	
79.98	75.57	110866.38	1189.10	110865.78	
75.57	75.10	111002.82	136.44	111002.22	
75.10	74.54	111198.36	195.54	111197.76	
74.54	74.44	111229.63	31.26	111229.02	
74.44	73.50	111762.72	533.10	111762.12	
73.50	73.00	112052.04	289.32	112051.44	
73.00	72.63	112194.99	142.95	112194.39	
72.63	72.58	126787.58	14592.59	126786.98	
72.58	67.54	128744.93	1957.35	128744.33	
67.54	59.12	131888.61	3143.67	131888.01	
59.12	56.03	133356.44	1467.84	133355.84	
56.03	51.49	135408.91	2052.46	135408.30	
51.49	50.75	135801.55	392.65	135800.95	
50.75	50.61	135884.46	82.90	135883.86	
50.61	49.49	136574.24	689.78	136573.64	
49.49	46.83	138246.69	1672.44	138246.08	
46.83	45.95	138754.26	507.58	138753.66	Air
45.95	45.80	138831.08	76.82	76.82	
45.80	40.00	141229.66	2398.58	2475.40	CW
40.00	34.79	143480.65	2250.99	2250.99	
34.79	31.49	144878.04	1397.39	3648.38	
31.49	31.22	144963.35	85.32	3733.70	
31.22	27.69	146033.52	1070.16	4803.86	
27.69	27.53	146080.79	47.27	4851.13	
27.53	26.78	146271.77	190.98	5042.11	
26.78	23.58	146934.32	662.56	5704.67	
23.58	23.48	146951.46	17.14	5721.81	
23.48	23.40	146964.35	12.89	5734.70	
23.40	22.78	147061.83	97.48	5832.18	
22.78	22.76	147063.81	1.98	5834.16	
22.76	22.33	147075.93	12.11	5846.27	
22.33	19.65	147087.68	11.75	5858.02	
19.65	14.12	147111.59	23.91	5881.93	RF

Table G4 Problem Table Algorithm with Multiple Utility Level at Δtmin = 30°C

Temperature		Enthalpy	Surplus	Cascade	
C		kW	kW	kW	
	327.00	145791.00		104089.00	power
327.00	325.50	127623.79	-18167.21	85921.79	
325.50	304.74	109500.90	-18122.89	67798.90	
304.74	291.62	109500.90	0.00	67798.90	
291.62	284.38	84360.41	-25140.49	42658.41	
284.38	282.47	83781.23	-579.18	42079.23	
282.47	269.28	80102.65	-3678.58	38400.65	
269.28	255.85	80422.86	320.21	38720.86	
255.85	251.00	80316.27	-106.59	38614.27	
251.00	250.88	70929.08	-9387.20	29227.08	
250.88	250.81	70909.61	-19.47	29207.61	
250.81	247.78	70843.14	-66.47	29141.14	
247.78	244.47	67923.58	-2919.56	26221.58	
244.47	242.23	67712.75	-210.83	26010.75	
242.23	240.27	67669.71	-43.04	25967.71	
240.27	239.28	67569.00	-100.71	25867.00	
239.28	238.66	67584.27	15.27	25882.27	
238.66	229.21	66997.38	-586.89	25295.38	
229.21	227.71	66110.02	-887.35	24408.02	
227.71	225.91	65926.19	-183.83	24224.19	
225.91	225.19	65881.13	-45.06	24179.13	
225.19	220.88	64737.93	-1143.20	23035.93	
220.88	220.81	64308.40	-429.53	22606.40	
220.81	218.78	52870.40	-11438.00	11168.40	
218.78	216.19	33887.55	-18982.86	-7814.45	
216.19	215.77	31477.26	-2410.28	-10224.74	
215.77	215.70	31085.46	-391.81	-10616.54	
215.70	214.77	31432.48	347.03	-10269.52	
214.77	214.40	31644.08	211.59	-10057.92	
214.40	212.85	32744.15	1100.07	-8957.85	
212.85	212.23	33146.42	402.27	-8555.58	
212.23	207.36	36419.62	3273.19	-5282.38	
207.36	206.14	37243.07	823.45	-4458.93	
206.14	204.42	38488.79	1245.72	-3213.21	
204.42	204.26	38511.56	22.77	-3190.44	
204.26	203.64	38685.71	174.16	-3016.29	
203.64	203.33	38744.74	59.03	-2957.26	
203.33	198.47	38592.68	-152.06	-3109.32	
198.47	197.52	38542.55	-50.13	-3159.45	
197.52	193.61	38358.30	-184.25	-3343.70	
193.61	193.17	38236.92	-121.37	-3465.08	
193.17	192.23	38064.68	-172.24	-3637.32	
192.23	192.12	38054.71	-9.97	-3647.29	
192.12	189.88	38171.38	116.67	-3530.62	
189.88	189.51	38271.62	100.23	-3430.38	
189.51	186.92	39125.95	854.34	-2576.05	
186.92	184.77	39782.85	656.89	-1919.15	
184.77	182.24	40663.95	881.10	-1038.05	
182.24	180.47	41096.24	432.29	-605.76	
180.47	179.12	41492.19	395.95	-209.81	
179.12	178.28	41701.69	209.50	41700.70	MP stream
178.28	178.24	41710.17	8.49	41709.19	
178.24	177.94	23722.75	-17987.42	23721.77	
177.94	177.90	23714.23	-8.52	23713.24	
177.90	174.13	24684.16	969.92	24683.17	
174.13	171.76	25779.87	1095.71	25778.88	
171.76	171.26	25939.73	159.86	25938.74	
171.26	170.93	26025.83	86.10	26024.85	
170.93	166.39	28140.99	2115.15	28140.00	
166.39	166.39	23095.01	-5045.98	23094.02	
166.39	166.10	23204.55	109.54	23203.56	
166.10	166.09	16367.37	-6837.19	16366.38	
166.09	165.06	16689.86	322.49	16688.87	
165.06	162.84	17723.44	1033.58	17722.45	
162.84	159.48	18839.62	1116.18	18838.63	
159.48	157.86	19449.88	610.26	19448.89	
157.86	156.79	26939.18	7489.31	26938.20	
156.79	151.79	28820.02	1880.84	28819.04	
151.79	151.42	28923.47	103.44	28922.48	
151.42	151.04	29021.76	98.29	29020.77	
151.04	149.10	29457.22	435.46	29456.24	
149.10	148.00	29476.96	19.74	29475.97	
148.00	147.68	15666.71	-13810.25	15665.72	
147.68	147.33	110.83	-15555.88	109.84	
147.33	147.02	0.95	-109.88	0.00	

Temperature		Enthalpy	Surplus	Cascade	
C		kW	kW	kW	
147.02	145.72	13.30	12.35	12.35	
145.72	139.96	762.55	749.24	761.59	
139.96	139.27	821.57	59.02	820.62	
139.27	137.16	1203.56	381.99	1202.61	
137.16	135.95	1175.85	-27.70	1174.90	
135.95	135.06	1183.42	7.56	1182.47	
135.06	132.46	1278.64	95.23	1277.69	
132.46	132.10	1301.44	22.80	1300.49	
132.10	130.89	1477.20	175.76	1476.25	
130.89	130.88	6377.59	4900.39	6376.64	
130.88	130.67	6407.66	30.07	6406.71	
130.67	130.01	6544.63	136.96	6543.67	
130.01	129.55	6730.26	185.64	6729.31	
129.55	127.65	7636.43	906.16	7635.48	
127.65	127.60	7669.80	33.37	7668.85	
127.60	127.42	21409.03	13739.22	21408.08	
127.42	126.63	21877.47	468.44	21876.52	
126.63	125.44	22281.49	404.02	22280.54	
125.44	124.91	22415.16	133.67	22414.21	
124.91	124.65	22510.21	95.05	22509.26	
124.65	124.58	22529.72	19.51	22528.77	
124.58	123.85	22679.01	149.28	22678.06	
123.85	122.19	28946.73	6267.72	28945.78	
122.19	120.86	33901.61	4954.89	33900.66	
120.86	118.61	42250.74	8349.13	42249.79	
118.61	117.11	47980.74	5729.99	47979.79	
117.11	113.35	48918.97	938.23	48918.02	
113.35	110.63	49910.41	991.45	49909.46	
110.63	109.59	50314.31	403.90	50313.36	
109.59	105.95	54770.87	4456.56	54769.92	
105.95	103.89	57133.50	2362.63	57132.55	
103.89	101.00	60535.26	3401.76	60534.31	
101.00	100.17	61593.17	1057.91	61592.22	
100.17	97.42	65335.18	3742.01	65334.23	
97.42	97.39	87793.23	22458.05	87792.28	
97.39	97.13	88148.84	355.61	88147.89	
97.13	96.50	88992.29	843.45	88991.34	
96.50	96.21	89393.12	400.82	89392.17	
96.21	96.04	95290.69	5897.57	95289.74	
96.04	89.75	103871.60	8580.91	103870.65	
89.75	83.41	107222.19	3350.58	107221.24	
83.41	81.80	107894.20	672.01	107893.25	
81.80	80.35	108435.92	541.72	108434.97	
80.35	79.44	108681.65	245.73	108680.70	
79.44	74.98	111026.75	2345.10	111025.80	
74.98	70.57	113353.69	2326.93	113352.74	
70.57	70.10	113610.18	256.49	113609.23	
70.10	69.54	113951.01	340.83	113950.06	
69.54	68.50	114541.38	590.38	114540.43	
68.50	68.00	114830.70	289.32	114829.75	
68.00	67.63	114973.65	142.95	114972.70	
67.63	67.58	129566.24	14592.59	129565.29	
67.58	64.12	130912.19	1345.95	130911.24	
64.12	62.54	131686.23	774.04	131685.28	
62.54	56.49	134568.06	2881.84	134567.11	
56.49	55.75	134978.81	410.75	134977.86	
55.75	55.61	135065.37	86.56	135064.42	
55.61	54.49	135782.44	717.06	135781.49	
54.49	51.03	138042.09	2259.66	138041.14	Air
51.03	45.00	141835.90	3793.81	3793.81	CW
45.00	41.83	143885.57	2049.67	2049.67	
41.83	40.95	144409.44	523.87	2573.54	
40.95	40.80	144488.95	79.51	2653.05	
40.80	29.79	149245.65	4756.70	7409.75	
29.79	26.49	150643.04	1397.39	8807.14	
26.49	26.22	150728.35	85.32	8892.45	
26.22	22.69	151798.52	1070.16	9962.62	
22.69	22.53	151845.79	47.27	10009.89	
22.53	21.78	152036.77	190.98	10200.87	
21.78	18.58	152699.32	662.56	10863.43	
18.58	18.48	152716.46	17.14	10880.56	
18.48	18.40	152729.35	12.89	10893.45	
18.40	17.78	152826.83	97.48	10990.94	
17.78	17.76	152828.81	1.98	10992.91	
17.76	17.33	152840.93	12.11	11005.03	
17.33	14.65	152852.68	11.75	11016.78	
14.65	9.12	152876.59	23.91	11040.69	RF

Table G5 Problem Table Algorithm with Multiple Utility Level at Δtmin = 40°C

Temperature C		Enthalpy kW	Surplus kW	Cascade kW	
	332.00	156316.00		125846.00	power
332.00	330.50	138148.79	-18167.21	107678.79	
330.50	309.74	120025.90	-18122.89	89555.90	
309.74	296.62	120025.90	0.00	89555.90	
296.62	289.38	94885.41	-25140.49	64415.41	
289.38	277.47	91277.08	-3608.33	60807.08	
277.47	274.28	90389.32	-887.76	59919.32	
274.28	260.85	90709.52	320.21	60239.52	
260.85	256.00	90602.93	-106.59	60132.93	
256.00	255.88	81215.74	-9387.20	50745.74	
255.88	255.81	81196.27	-19.47	50726.27	
255.81	252.78	81129.80	-66.47	50659.80	
252.78	249.47	78210.24	-2919.56	47740.24	
249.47	247.23	77999.41	-210.83	47529.41	
247.23	245.27	77956.37	-43.04	47486.37	
245.27	243.66	77791.62	-164.75	47321.62	
243.66	234.28	76023.49	-1768.13	45553.49	
234.28	234.21	76019.14	-4.35	45549.14	
234.21	232.71	75131.78	-887.35	44661.78	
232.71	230.91	74947.95	-183.83	44477.95	
230.91	230.19	74902.89	-45.06	44432.89	
230.19	225.88	73759.69	-1143.20	43289.69	
225.88	223.78	61721.38	-12038.31	31251.38	
223.78	221.19	42520.31	-19201.08	12050.31	
221.19	220.70	39623.34	-2896.97	9153.34	
220.70	219.77	39248.75	-374.59	8778.75	
219.77	217.85	38866.93	-381.82	8396.93	
217.85	215.81	38328.77	-538.15	7858.77	
215.81	211.14	37493.95	-834.82	7023.95	
211.14	210.77	37444.53	-49.42	6974.53	
210.77	209.40	38211.85	767.32	7741.85	
209.40	209.26	38307.43	95.57	7837.43	
209.26	208.64	38824.38	516.96	8354.38	
208.64	208.33	39054.54	230.15	8584.54	
208.33	207.23	39624.31	569.77	9154.31	
207.23	202.36	42275.14	2650.83	11805.14	
202.36	199.42	43889.70	1614.56	13419.70	
199.42	198.61	43864.45	-25.25	13394.45	
198.61	198.17	43750.20	-114.25	13280.20	
198.17	197.23	43592.83	-157.37	13122.83	
197.23	194.88	43409.03	-183.79	12939.03	
194.88	193.47	43609.98	200.94	13139.98	
193.47	192.52	43726.08	116.10	13256.08	
192.52	187.12	44411.63	685.56	13941.63	
187.12	184.51	45124.75	713.11	14654.75	
184.51	183.24	45542.53	417.78	15072.53	
183.24	182.94	27576.81	-17965.72	-2893.19	
182.94	182.90	27571.39	-5.42	-2898.61	
182.90	181.92	27894.69	323.30	-2575.31	
181.92	179.77	28551.58	656.89	-1918.42	
179.77	177.24	29432.68	881.10	-1037.32	
177.24	175.47	29864.97	432.29	-605.03	
175.47	174.12	30260.92	395.95	-209.08	
174.12	173.28	30470.42	209.50	30470.60	MP Stream
173.28	171.39	30954.35	483.93	30954.53	
171.39	171.39	25908.16	-5046.19	25908.34	
171.39	171.10	25955.89	47.72	25956.07	
171.10	171.09	19118.07	-6837.81	19118.25	
171.09	170.06	19224.82	106.74	19225.00	
170.06	169.13	19464.98	240.17	19465.16	
169.13	166.76	20560.69	1095.71	20560.87	
166.76	166.26	20720.56	159.86	20720.74	
166.26	165.93	20806.66	86.10	20806.84	
165.93	157.84	24576.57	3769.90	24576.75	
157.84	156.79	24925.39	348.83	24925.58	
156.79	156.42	25012.39	87.00	25012.57	
156.42	156.04	25093.57	81.18	25093.75	
156.04	154.48	25374.39	280.82	25374.57	
154.48	153.00	25706.72	332.33	25706.90	
153.00	152.86	19549.78	-6156.94	19549.96	
152.86	152.68	13119.87	-6429.91	13120.05	
152.68	152.33	-0.17	-13120.03	0.00	

Temperature C		Enthalpy kW	Surplus kW	Cascade kW	
152.33	152.02	1971.00	1971.17	1971.17	
152.02	151.79	3569.83	1598.83	3570.00	
151.79	144.27	5195.95	1626.12	5196.12	
144.27	144.10	5248.43	52.48	5248.60	
144.10	140.95	5581.76	333.33	5581.93	
140.95	140.72	5612.16	30.40	5612.33	
140.72	134.96	7095.78	1483.62	7095.95	
134.96	132.65	7586.98	491.20	7587.15	
132.65	132.16	7748.97	161.99	7749.14	
132.16	131.63	7817.51	68.54	7817.68	
131.63	130.06	7614.59	-202.93	7614.75	
130.06	127.46	7350.98	-263.60	7351.15	
127.46	127.10	7324.31	-26.68	7324.48	
127.10	125.89	7334.16	9.85	7334.33	
125.89	125.88	12232.76	4898.60	12232.93	
125.88	125.67	12234.44	1.69	12234.61	
125.67	125.01	12280.46	46.01	12280.62	
125.01	124.55	12402.71	122.25	12402.88	
124.55	122.60	13065.59	662.88	13065.76	
122.60	122.42	26758.70	13693.11	26758.87	
122.42	120.44	27428.69	669.99	27428.86	
120.44	119.91	27562.36	133.67	27562.52	
119.91	119.65	27657.41	95.05	27657.58	
119.65	119.58	27676.92	19.51	27677.09	
119.58	118.85	27826.20	149.28	27826.37	
118.85	117.19	34093.92	6267.72	34094.09	
117.19	115.86	39048.81	4954.89	39048.98	
115.86	113.61	47397.94	8349.13	47398.11	
113.61	112.11	53127.93	5729.99	53128.10	
112.11	108.35	54066.17	938.23	54066.33	
108.35	105.63	55057.61	991.45	55057.78	
105.63	104.59	55461.51	403.90	55461.68	
104.59	102.13	58468.40	3006.89	58468.57	
102.13	100.95	59896.18	1427.77	59896.35	
100.95	98.89	62220.88	2324.70	62221.05	
98.89	96.00	65569.30	3348.42	65569.47	
96.00	95.17	66611.96	1042.66	66612.13	
95.17	92.42	70303.08	3691.12	70303.25	
92.42	92.39	92760.69	22457.61	92760.86	
92.39	91.50	93954.92	1194.23	93955.08	
91.50	91.21	94355.74	400.82	94355.91	
91.21	91.04	100253.32	5897.57	100253.48	
91.04	84.75	108834.23	8580.91	108834.40	
84.75	84.44	108999.69	165.47	108999.86	
84.44	78.41	113736.87	4737.18	113737.04	
78.41	76.80	114823.37	1086.50	114823.54	
76.80	75.35	115739.39	916.02	115739.56	
75.35	69.98	118565.41	2826.03	118565.58	
69.98	69.12	119022.69	457.27	119022.86	
69.12	65.57	121259.04	2236.35	121259.21	
65.57	65.10	121563.68	304.64	121563.85	
65.10	64.54	121962.78	399.10	121962.95	
64.54	63.50	122660.72	697.94	122660.89	
63.50	63.00	123001.19	340.47	123001.35	
63.00	62.63	123182.16	180.97	123182.32	
62.63	62.58	137780.12	14597.97	137780.29	
62.58	61.49	138315.16	535.04	138315.33	
61.49	60.75	138737.24	422.08	138737.41	
60.75	60.61	138826.09	88.85	138826.25	
60.61	59.49	139560.22	734.13	139560.38	
59.49	57.54	140865.36	1305.14	140865.52	Air
57.54	50.00	145791.66	4926.30	4926.30	CW
50.00	46.03	148455.72	2664.07	2664.07	
46.03	36.83	154410.57	5954.85	8618.91	
36.83	35.95	154934.44	523.87	9142.78	
35.95	35.80	155013.95	79.51	9222.30	
35.80	24.79	159770.65	4756.70	13978.99	
24.79	21.49	161168.04	1397.39	15376.38	
21.49	21.22	161253.35	85.32	15461.70	
21.22	17.69	162323.52	1070.16	16531.86	
17.69	17.53	162370.79	47.27	16579.13	
17.53	16.78	162561.77	190.98	16770.11	
16.78	13.58	163224.32	662.56	17432.67	
13.58	13.48	163241.46	17.14	17449.81	
13.48	13.40	163254.35	12.89	17462.70	
13.40	12.78	163351.83	97.48	17560.18	
12.78	12.76	163353.81	1.98	17562.16	
12.76	12.33	163365.93	12.11	17574.27	
12.33	9.65	163377.68	11.75	17586.03	
9.65	4.12	163401.59	23.91	17609.93	RF

Appendix H Retrofit Network Cost Report

H-1 Retrofit Network Cost Report for Design Option A

Table H1 Cost of Existing Heat Exchanger for Design Option A

HEX no.	HEX name	U KW/M^2°C	Old Area M^2	New Area M^2	Extra Area M^2	Investment $
4	430-E3	0.3813	48.00	-	-	-
1	430-E1	0.4944	36.30	-	-	-
9	540-E1	0.236	1874.70	-	-	-
12	431-E2	0.3872	427.20	-	-	-
20	380-E4	0.3833	245.80	-	-	-
26	432-E8	0.4611	283.00	-	-	-
32	432-E1	0.405	94.00	-	-	-
34	500-E6	0.3951	487.70	-	-	-
36	500-E9	0.3896	238.20	-	-	-
38	500-E12	0.3168	81.90	-	-	-
42	500-E15	0.7234	103.00	-	-	-
43	500-E16	0.3804	741.00	-	-	-
45	320-E1	0.3605	233.60	-	-	-
46	320-E6	0.3836	1498.80	-	-	-
47	320-E7	0.4154	602.40	-	-	-
48	320-E5	0.3885	98.20	-	-	-
49	320-E8	0.3279	349.10	-	-	-
52	320-E17	0.3434	54.00	-	-	-
54	320-E16	0.4469	108.00	-	-	-
56	390-E3	0.3603	72.00	-	-	-

Table H2 Cost of New Heat Exchanger for Design Option A

HEX	Area	Investment
	m2	$
61	85.62	212681.00
62	753.52	770937.90
63	17.45	83599.84
Total		1068219.00

Table H3 Utility savings for design option A

HEX no.	HEX name	Old Q	New Q	Saved Q	Utility Type	annual cost	Savings
		kW	kW	kW		$/kWyr	$/yr
2	430-EA9	1365.60	-	-	air	0.00	-
3	430-E10	580.00	-	-	cw	0.00	-
5	430-EA3	19996.80	-	-	air	0.00	-
6	430-E2	956.30	0.00	956.30	mp	216.26	206809.00
7	430-H1	30443.00	-	-	heater	440.35	-
8	540-E2	1255.80	-	-	cw	0.00	-
10	540-EA1	8035.10	-	-	air	0.00	-
11	540-E4	628.80	-	-	cw	0.00	-
13	431-EA2	16096.20	-	-	air	0.00	-
14	431-EA1	670.80	-	-	air	0.00	-
15	431-E5	197.50	-	-	cw	0.00	-
16	431-EA3	24566.70	-	-	air	0.00	-
17	431-E3	3254.50	3006.90	247.60	hp	222.64	55126.10
18	380-EA1	3.15	-	-	air	0.00	-
19	380-E1	0.514	-	-	cw	0.00	-
21	380-E3	4705.20	-	-	air	0.00	-
22	380-E5	317.30	-	-	cw	0.00	-
23	380-H2	29712.40	-	-	heater	440.35	-
24	432-EA3	1278.90	-	-	air	0.00	-
25	432-E4	16.90	-	-	cw	0.00	-
27	432-EA5	5175.00	175.00	5000.00	air	0.00	0.00
28	432-EA14	7956.10	-	-	air	0.00	-
29	432-EA6	367.40	-	-	air	0.00	-
30	432-E7	121.80	-	-	cw	0.00	-
31	432-EA10	931.30	688.03	243.27	air	0.00	0.00
33	432-H1	29712.40	-	-	heater	440.35	-
35	500-EA8	33486.20	-	-	air	0.00	-
37	500-EA11	15346.90	14143.00	1203.90	air	0.00	0.00
39	500-EA13	2188.50	-	-	air	0.00	-
40	500-E14	603.70	-	-	cw	0.00.	-
41	500-EA17	6788.00	-	-	air	0.00	-
44	320-EA1	9998.20	-	-	air	0.00	-
50	320-EA2	3353.00	-	-	air	0.00	-
51	320-E9	218.70	-	-	cw	0.00	-
53	320-E18	130.80	-	-	cw	0.00	-
55	320-H2	9402.40	-	-	heater	440.35	-
57	390-EA2	1344.30	-	-	air	0.00	-
58	390-H2	9402.40	-	-	heater	440.35	-
59	431-E4	29488.00	24488.00	5000.00	mp	216.26	1081300.00
60	431-E6	18084.30	17841.00	243.26	mp	216.26	52608.50
Total				12894.00	Total		1395844.00

H-2 Retrofit Network Cost Report for Design Option B

Table H4 Cost of Existing Heat Exchanger for Design Option B

HEX no.	HEX name	U KW/M^2°C	Old Area M^2	New Area M^2	Extra Area M^2	Investment $
4	430-E3	0.3813	48.00	-	-	-
1	430-E1	0.4944	36.30	-	-	-
9	540-E1	0.236	1874.70	-	-	-
12	431-E2	0.3872	427.20	-	-	-
20	380-E4	0.3833	245.80	-	-	-
26	432-E8	0.4611	283.00	-	-	-
32	432-E1	0.405	94.00	-	-	-
34	500-E6	0.3951	487.70	-	-	-
36	500-E9	0.3896	238.20	-	-	-
38	500-E12	0.3168	81.90	-	-	-
42	500-E15	0.7234	103.00	-	-	-
43	500-E16	0.3804	741.00	-	-	-
45	320-E1	0.3605	233.60	-	-	-
46	320-E6	0.3836	1498.80	-	-	-
47	320-E7	0.4154	602.40	-	-	-
48	320-E5	0.3885	98.20	-	-	-
49	320-E8	0.3279	349.10	-	-	-
52	320-E17	0.3434	54.00	-	-	-
54	320-E16	0.4469	108.00	-	-	-
56	390-E3	0.3603	72.00	-	-	-

Table H5 Cost of New Heat Exchanger for Design Option B

HEX	Area	Investment
	m2	$
61	101.25	235895.00
62	2129.02	1422848.00
63	23.95	100761.90
Total		1759505.00

Table H6 Utility Savings for Design Option B

HEX no.	HEX name	Old Q	New Q	Saved Q	Utility Type	annual cost	Savings
		kW	kW	kW		$/kWyr	$/yr
2	430-EA9	1365.60	-	-	air	0.00	-
3	430-E10	580.00	-	-	cw	0.00	-
5	430-EA3	19996.80	-	-	air	0.00	-
6	430-E2	956.30	0.00	956.30	mp	216.26	206809.00
7	430-H1	30443.00	-	-	heater	440.35	-
8	540-E2	1255.80	-	-	cw	0.00	-
10	540-EA1	8035.10	-	-	air	0.00	-
11	540-E4	628.80	-	-	cw	0.00	-
13	431-EA2	16096.20	-	-	air	0.00	-
14	431-EA1	670.80	-	-	air	0.00	-
15	431-E5	197.50	-	-	cw	0.00	-
16	431-EA3	24566.70	-	-	air	0.00	-
17	431-E3	3254.50	2532.80	721.70	hp	222.64	160680.00
18	380-EA1	3.15	-	-	air	0.00	-
19	380-E1	0.514	-	-	cw	0.00	-
21	380-E3	4705.20	-	-	air	0.00	-
22	380-E5	317.30	-	-	cw	0.00	-
23	380-H2	29712.40	-	-	heater	440.35	-
24	432-EA3	1278.90	-	-	air	0.00	-
25	432-E4	16.90	-	-	cw	0.00	-
27	432-EA5	5175.00	4218.70	956.30	air	0.00	0.00
28	432-EA14	7956.10	7234.40	721.70	air	0.00	0.00
29	432-EA6	367.40	-	-	air	0.00	-
30	432-E7	121.80	-	-	cw	0.00	-
31	432-EA10	931.30	-	-	air	0.00	-
33	432-H1	29712.40	-	-	heater	440.35	-
35	500-EA8	33486.20	-	-	air	0.00	-
37	500-EA11	15346.90	3510.19	11837.00	air	0.00	0.00
39	500-EA13	2188.50	-	-	air	0.00	-
40	500-E14	603.70	-	-	cw	0.00	-
41	500-EA17	6788.00	-	-	air	0.00	-
44	320-EA1	9998.20	-	-	air	0.00	-
50	320-EA2	3353.00	-	-	air	0.00	-
51	320-E9	218.70	-	-	cw	0.00	-
53	320-E18	130.80	-	-	cw	0.00	-
55	320-H2	9402.40	-	-	heater	440.35	-
57	390-EA2	1344.30	-	-	air	0.00	-
58	390-H2	9402.40	-	-	heater	440.35	-
59	431-E4	29488.00	17651.30	11837.00	mp	216.26	2559807.00
60	431-E6	18084.30	-	-	mp	216.26	-
Total				27029.00	Total		2927296.00

H-3 Retrofit Network Cost Report for Design Option C

Table H7 Cost of Existing Heat Exchanger for Design Option C

HEX no.	HEX name	U KW/M^2°C	Old Area M^2	New Area M^2	Extra Area M^2	Investment $
4	430-E3	0.3813	48.00	-	-	-
1	430-E1	0.4944	36.30	-	-	-
9	540-E1	0.236	1874.70	-	-	-
12	431-E2	0.3872	427.20	-	-	-
20	380-E4	0.3833	245.80	-	-	-
26	432-E8	0.4611	283.00	-	-	-
32	432-E1	0.405	94.00	-	-	-
34	500-E6	0.3951	487.70	-	-	-
36	500-E9	0.3896	238.20	-	-	-
38	500-E12	0.3168	81.90	-	-	-
42	500-E15	0.7234	103.00	-	-	-
43	500-E16	0.3804	741.00	-	-	-
45	320-E1	0.3605	233.60	-	-	-
46	320-E6	0.3836	1498.80	-	-	-
47	320-E7	0.4154	602.40	-	-	-
48	320-E5	0.3885	98.20	-	-	-
49	320-E8	0.3279	349.10	-	-	-
52	320-E17	0.3434	54.00	-	-	-
54	320-E16	0.4469	108.00	-	-	-
56	390-E3	0.3603	72.00	-	-	-

Table H8 Cost of New Heat Exchanger for Design Option C

HEX	Area	Investment
	m2	$
61	46.51	148691.30
62	101.25	235895.00
63	2129.02	1422848.00
64	17.63	84118.38
Total		1891553.00

Table H9 Utility Savings for Design Option C

HEX no.	HEX name	Old Q	New Q	Saved Q	Utility Type	annual cost	Savings
		kW	kW	kW		$/kWyr	$/yr
2	430-EA9	1365.60	-	-	air	0.00	-
3	430-E10	580.00	-	-	cw	0.00	-
5	430-EA3	19996.80	-	-	air	0.00	-
6	430-E2	956.30	0.00	956.30	mp	216.26	206809.00
7	430-H1	30443.00	-	-	heater	440.35	-
8	540-E2	1255.80	-	-	cw	0.00	-
10	540-EA1	8035.10	-	-	air	0.00	-
11	540-E4	628.80	-	-	cw	0.00	-
13	431-EA2	16096.20	-	-	air	0.00	-
14	431-EA1	670.80	-	-	air	0.00	-
15	431-E5	197.50	-	-	cw	0.00	-
16	431-EA3	24566.70	-	-	air	0.00	-
17	431-E3	3254.50	2532.80	721.70	hp	222.64	160680.00
18	380-EA1	3.15	-	-	air	0.00	-
19	380-E1	0.514	-	-	cw	0.00	-
21	380-E3	4705.20	-	-	air	0.00	-
22	380-E5	317.30	-	-	cw	0.00	-
23	380-H2	29712.40	-	-	heater	440.35	-
24	432-EA3	1278.90	-	-	air	0.00	-
25	432-E4	16.90	-	-	cw	0.00	-
27	432-EA5	5175.00	3971.10	1203.90	air	0.00	0.00
28	432-EA14	7956.10	7234.40	721.70	air	0.00	0.00
29	432-EA6	367.40	-	-	air	0.00	-
30	432-E7	121.80	-	-	cw	0.00	-
31	432-EA10	931.30	-	-	air	0.00	-
33	432-H1	29712.40	-	-	heater	440.35	-
35	500-EA8	33486.20	-	-	air	0.00	-
37	500-EA11	15346.90	3510.19	11837.00	air	0.00	0.00
39	500-EA13	2188.50	-	-	air	0.00	-
40	500-E14	603.70	-	-	cw	0.00	-
41	500-EA17	6788.00	-	-	air	0.00	-
44	320-EA1	9998.20	-	-	air	0.00	-
50	320-EA2	3353.00	-	-	air	0.00	-
51	320-E9	218.70	-	-	cw	0.00	-
53	320-E18	130.80	-	-	cw	0.00	-
55	320-H2	9402.40	-	-	heater	440.35	-
57	390-EA2	1344.30	-	-	air	0.00	-
58	390-H2	9402.40	-	-	heater	440.35	-
59	431-E4	29488.00	17651.30	11837.00	mp	216.26	2559807.00
60	431-E6	18084.30	17593.70	490.62	mp	216.26	106101.00
Total				27768.00	Total		3033397.00

H-4 Retrofit Network Cost Report for Design Option D

Table H10 Cost of Existing Heat Exchanger for Design Option D

HEX no.	HEX name	U KW/M^2°C	Old Area M^2	New Area M^2	Extra Area M^2	Investment $
4	430-E3	0.3813	48.00	-	-	-
1	430-E1	0.4944	36.30	-	-	-
9	540-E1	0.236	1874.70	-	-	-
12	431-E2	0.3872	427.20	-	-	-
20	380-E4	0.3833	245.80	-	-	-
26	432-E8	0.4611	283.00	-	-	-
32	432-E1	0.405	94.00	-	-	-
34	500-E6	0.3951	487.70	-	-	-
36	500-E9	0.3896	238.20	-	-	-
38	500-E12	0.3168	81.90	-	-	-
42	500-E15	0.7234	103.00	-	-	-
43	500-E16	0.3804	741.00	-	-	-
45	320-E1	0.3605	233.60	-	-	-
46	320-E6	0.3836	1498.80	-	-	-
47	320-E7	0.4154	602.40	-	-	-
48	320-E5	0.3885	98.20	-	-	-
49	320-E8	0.3279	349.10	-	-	-
52	320-E17	0.3434	54.00	-	-	-
54	320-E16	0.4469	108.0	-	-	-
56	390-E3	0.3603	72.00	-	-	-

Table H11 Cost of New Heat Exchanger for Design Option D

HEX	Area	Investment
	m2	$
61	817.70	809030.40
62	1237.71	1033186.00
Total		1842216.00

Table H12 Utility Savings for Design Option D

HEX no.	HEX name	Old Q	New Q	Saved Q	Utility Type	annual cost	Savings
		kW	kW	kW		$/kWyr	$/yr
2	430-EA9	1365.60	-	-	air	0.00	-
3	430-E10	580.00	-	-	cw	0.00	-
5	430-EA3	19996.80	-	-	air	0.00	-
6	430-E2	956.30	-	-	mp	216.26	-
7	430-H1	30443.00	-	-	heater	440.35	-
8	540-E2	1255.80	-	-	cw	0.00	-
10	540-EA1	8035.10	-	-	air	0.00	-
11	540-E4	628.80	-	-	cw	0.00	-
13	431-EA2	16096.20	-	-	air	0.00	-
14	431-EA1	670.80	-	-	air	0.00	-
15	431-E5	197.50	-	-	cw	0.00	-
16	431-EA3	24566.70	-	-	air	0.00	-
17	431-E3	3254.50	-	-	hp	222.64	-
18	380-EA1	3.15	-	-	air	0.00	-
19	380-E1	0.514	-	-	cw	0.00	-
21	380-E3	4705.20	-	-	air	0.00	-
22	380-E5	317.30	-	-	cw	0.00	-
23	380-H2	29712.40	-	-	heater	440.35	-
24	432-EA3	1278.90	-	-	air	0.00	-
25	432-E4	16.90	-	-	cw	0.00	-
27	432-EA5	5175.00	130.16	5044.80	air	0.00	0.00
28	432-EA14	7956.10	-	-	air	0.00	-
29	432-EA6	367.40	-	-	air	0.00	-
30	432-E7	121.80	-	-	cw	0.00	-
31	432-EA10	931.30	-	-	air	0.00	-
33	432-H1	29712.40	-	-	heater	440.35	-
35	500-EA8	33486.20	-	-	air	0.00	-
37	500-EA11	15346.90	8547.89	6799.00	air	0.00	0.00
39	500-EA13	2188.50	-	-	air	0.00	-
40	500-E14	603.70	-	-	cw	0.00	-
41	500-EA17	6788.00	-	-	air	0.00	-
44	320-EA1	9998.20	-	-	air	0.00	-
50	320-EA2	3353.00	-	-	air	0.00	-
51	320-E9	218.70	-	-	cw	0.00	-
53	320-E18	130.80	-	-	cw	0.00	-
55	320-H2	9402.40	-	-	heater	440.35	-
57	390-EA2	1344.30	-	-	air	0.00	-
58	390-H2	9402.40	-	-	heater	440.35	-
59	431-E4	29488.00	17644.20	11844.00	mp	216.26	2561350.00
60	431-E6	18084.30	-	-	mp	216.26	-
Total				23688.00	Total		2561350.00

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