

ภาคผนวก ง

สำเนาเอกสารเกี่ยวกับการจัดการด้านเสียง

ภาคผนวก ง-1

แผนการซ่อมบำรุงเครื่องจักรประจำปี พ.ศ. 2567-2568

หน่วยผลิตที่ 1



2025 unit 1 Draft Outage Schedule

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	Task Name	% Complete	Duration	Start	Finish	RO	Dec 1, 2025 Jan 1, 2026 Feb 1, 2026 Mar 1, 2026
0	Major Outage	0%	38.33 days	01 Jan 00:00	08 Feb 08:00	BLCP	
1	Outage Unit 1 Execution Plan	0%	38.33 days	01 Jan 00:00	08 Feb 08:00	BLCP	
2	Unit Shut down	0%	8.25 days	01 Jan 00:00	09 Jan 06:00	OPS	
3	Shutdown @ 2:00	0%	0 hrs	01 Jan 00:00	01 Jan 00:00	OPS	Wed 01
4	Turbine MOST remote test	0%	15 mins	01 Jan 00:00	01 Jan 00:15	OPS	Wed 01
5	Gen breaker open	0%	1 hr	01 Jan 00:00	01 Jan 01:00	OPS	Wed 01
6	Turbine MOST Physical test	0%	1 hr	01 Jan 01:00	01 Jan 02:00	OPS	Wed 01
7	MFT finish	0%	0 hrs	01 Jan 02:00	01 Jan 02:00	OPS	Wed 01
8	Turning gear on.	0%	1 hr	01 Jan 02:00	01 Jan 03:00	OPS	Wed 01
9	Air Force cool down Boiler Isolate Draft system by by pass HP#8	0%	12 hrs	01 Jan 02:00	01 Jan 14:00	OPS	Wed 01
10	Boiler Team Install Spool HP#8	0%	2 hrs	01 Jan 03:30	01 Jan 05:30	BL	Wed 01
11	Remove insulation and open all man-hole for boiler	0%	12 hrs	01 Jan 00:00	01 Jan 12:00	ES/BL	Wed 01
12	Penthouse vacuum cleaning ash	0%	8 days	01 Jan 06:00	09 Jan 06:00	BL	Thu 09
13	Fire fighting transformer system test	0%	1 hr	01 Jan 04:00	01 Jan 05:00	OPS/Safety/HV	Wed 01
14	Maintenance window	0%	37.67 days	01 Jan 06:00	07 Feb 22:00	ENG	
15	Water and steam system inspection	0%	2.42 days	01 Jan 06:00	03 Jan 16:00	LAB	
16	As found internal inspection by Chemist	0%	0.33 days	03 Jan 08:00	03 Jan 16:00	LAB	
17	Storage Tank / Deaerator	0%	4 hrs	03 Jan 08:00	03 Jan 12:00	LAB	Fri 03
18	Hot well condenser A/B	0%	4 hrs	03 Jan 08:00	03 Jan 12:00	LAB	Fri 03
19	Steam drum	0%	4 hrs	03 Jan 08:00	03 Jan 12:00	LAB	Fri 03
20	Blow down Tank	0%	4 hrs	03 Jan 12:00	03 Jan 16:00	LAB	Fri 03
21	Final internal inspection condition before closed manhole by Chemist	0%	1.13 days	01 Jan 06:00	02 Jan 09:00	LAB	
22	Steam drum	0%	2 hrs	01 Jan 06:00	01 Jan 08:00	LAB	
23	Blow down Tank	0%	2 hrs	01 Jan 08:00	01 Jan 10:00	LAB	
24	Storage Tank / Deaerator	0%	3 hrs	02 Jan 06:00	02 Jan 09:00	LAB	Thu 02
25	Hot well condenser A/B	0%	3 hrs	01 Jan 06:00	01 Jan 09:00	LAB	Wed 01
26	Boiler Maintenance	0%	37.42 days	01 Jan 06:00	07 Feb 16:00	BL	
27	As Found IGV of Main Fan and Burner Tilting	0%	1 day	01 Jan 06:00	02 Jan 06:00	BL	Thu 02
28	Boiler pressure part	0%	37.42 days	01 Jan 06:00	07 Feb 16:00	BL	
29	Furnace	0%	37.42 days	01 Jan 06:00	07 Feb 16:00	BL	
30	Clean Boiler Nose and Slope Tube by water	0%	6 hrs	01 Jan 14:00	01 Jan 20:00	BL	Wed 01
31	Internal install IU scaffolding	0%	5 days	01 Jan 22:00	06 Jan 22:00	ES	
32	Erection floor	0%	3 hrs	01 Jan 22:00	02 Jan 01:00	ES	Thu 02
33	Base truss	0%	6 hrs	02 Jan 01:00	02 Jan 07:00	ES	Thu 02
34	Installation Winch and Base Tower	0%	10 hrs	02 Jan 07:00	02 Jan 17:00	ES	Thu 02
35	Wing Truss	0%	6 hrs	02 Jan 17:00	02 Jan 23:00	ES	Thu 02
36	Water wall	0%	1.63 days	02 Jan 23:00	04 Jan 14:00	ES	
37	Erect scaffolding at Level 1 (with spandek)	0%	3 hrs	02 Jan 23:00	03 Jan 02:00	ES	Fri 03
38	Erect scaffolding at Level 2 (with spandek)	0%	3 hrs	03 Jan 02:00	03 Jan 05:00	ES	Fri 03
39	Erect scaffolding at Level 3 (with spandek)	0%	3 hrs	03 Jan 05:00	03 Jan 08:00	ES	Fri 03
<div><div><div>Task</div><div>Critical Task</div><div>Milestone</div><div>Summary</div><div>Rollup Task</div><div>Rollup Critical Task</div><div>Rollup Up Milestone</div></div><div><div>Rollup Up Progress</div><div>External Tasks</div><div>Project Summary</div><div>Group By Summary</div><div>Inactive Task</div><div>Inactive Milestone</div></div><div><div>Inactive Summary</div><div>Manual Task</div><div>Duration-only</div><div>Manual Summary Rollup</div><div>Manual Summary</div><div>Star-only</div></div><div><div>Finish-only</div><div>External Milestone</div><div>Critical</div><div>Critical Split</div><div>Baseline</div><div>Baseline Milestone</div></div><div><div>Baseline Summary</div><div>Progress</div><div>Deadline</div></div></div>							
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	Task Name	% Complete	Duration	Start	Finish	RO	Dec 1, 2025 Jan 1, 2026 Feb 1, 2026 Mar 1, 2026
40	Erect scaffolding at Level 4 (with spandek)	0%	3 hrs	03 Jan 08:00	03 Jan 11:00	ES	
41	Erect scaffolding at Level 5 (with spandek)	0%	2 hrs	03 Jan 11:00	03 Jan 13:00	ES	
42	Erect scaffolding at Level 6 (with spandek)	0%	2 hrs	03 Jan 13:00	03 Jan 15:00	ES	
43	Erect scaffolding at Level 7 (with spandek)	0%	4 hrs	03 Jan 15:00	03 Jan 19:00	ES	
44	Erect scaffolding at Level 8 (with spandek)	0%	3 hrs	03 Jan 19:00	03 Jan 22:00	ES	
45	Erect scaffolding at Level 9 (with spandek at level 9.5)	0%	3 hrs	03 Jan 22:00	04 Jan 01:00	ES	
46	Erect scaffolding at Level 10 (with spandek at level 10.5)	0%	3 hrs	04 Jan 01:00	04 Jan 04:00	ES	
47	Erect scaffolding at Level 11 (with spandek)	0%	3 hrs	04 Jan 04:00	04 Jan 07:00	ES	
48	Erect scaffolding at Level 12	0%	2.5 hrs	04 Jan 07:00	04 Jan 09:30	ES	
49	Erect scaffolding at Level 13	0%	2.5 hrs	04 Jan 09:30	04 Jan 12:00	ES	
50	Erect scaffolding at Level 14	0%	2 hrs	04 Jan 12:00	04 Jan 14:00	ES	
51	Erect scaffolding at dance floor	0%	10 hrs	04 Jan 14:00	05 Jan 00:00	ES	
52	SH	0%	1.71 days	05 Jan 00:00	06 Jan 17:00	ES	
53	Erect scaffolding at Level 1	0%	4 hrs	05 Jan 00:00	05 Jan 04:00	ES	
54	Erect scaffolding at Level 2 (with spandek)	0%	4 hrs	05 Jan 04:00	05 Jan 08:00	ES	
55	Erect scaffolding at Level 3	0%	4 hrs	05 Jan 08:00	05 Jan 12:00	ES	
56	Erect scaffolding at Level 4 (with spandek)	0%	4 hrs	05 Jan 12:00	05 Jan 16:00	ES	
57	Erect scaffolding at Level 5	0%	4 hrs	05 Jan 16:00	05 Jan 20:00	ES	
58	Erect scaffolding at Level 6 (with spandek)	0%	7 hrs	05 Jan 20:00	06 Jan 03:00	ES	
59	Erect scaffolding at Level 7	0%	7 hrs	06 Jan 03:00	06 Jan 10:00	ES	
60	Erect scaffolding at Level 8 (with spandek)	0%	7 hrs	06 Jan 10:00	06 Jan 17:00	ES	
61	Hopper level - 2.5	0%	2 hrs	06 Jan 17:00	06 Jan 19:00	ES	
62	Hopper level - 1.5	0%	2 hrs	06 Jan 19:00	06 Jan 21:00	ES	
63	Ordinary civil engineer inspection for structure	0%	1 hr	06 Jan 21:00	06 Jan 22:00	ES	
64	Install BS scaffolding at 2ry, 3ry RH	0%	2.25 days	05 Jan 00:00	07 Jan 06:00	BL	
65	Tube sand blasting (WWT + 1ry RH + 2ry SH+3ry SH)=322.8 m2	0%	3 days	06 Jan 22:00	09 Jan 22:00	BL	
66	Tube sand blasting (3ry SH = 10 m2) Set-up testing until complete (Blaster 1 team)	0%	2.25 days	06 Jan 22:00	09 Jan 04:00	BL	
67	Tube sand blasting (2ry SH = 193.8 m2) Set-up testing until complete (Blaster 4 team)	0%	2.25 days	06 Jan 22:00	09 Jan 04:00	BL	
68	Tube sand blasting for 2ry SH Girdling Tube of Dissimilar Metal Weld (2ry SH = 1.4 m2)	0%	2.25 days	06 Jan 22:00	09 Jan 04:00	BL	
69	Set-up testing until complete (Blaster 4 team)	0%	2.25 days	06 Jan 22:00	09 Jan 04:00	BL	
70	Tube sand blasting (1ry RH = 74 m2) Set-up testing until complete (Blaster 2 team)	0%	2.25 days	06 Jan 22:00	09 Jan 04:00	BL	
71	Tube sand blasting (Water Wall = 45 m2) Set-up testing until complete (Blaster 2 team)	0%	18 hrs	09 Jan 04:00	09 Jan 22:00	BL	
72	Cleaning sandblast from IU spandek	0%	33.67 days	01 Jan 06:00	03 Feb 22:00	BL	
73	Boiler Furnace Inspection and Replacement	0%	30.67 days	01 Jan 06:00	31 Jan 22:00	BL	
74	Water Wall	0%	2 days	10 Jan 08:00	12 Jan 08:00	MHI	
75	Visual Inspection for Circumferential Cracking and Sulfide Corrosion on Furnace Wall	0%	2 days	12 Jan 08:00	14 Jan 08:00	MHI	
76	TA Pencil UT inspection	0%	12 days	01 Jan 06:00	13 Jan 06:00	ESCO	
77	Site Work prepare field transportation tube preparing (Fit-up)	0%	22 days	09 Jan 22:00	31 Jan 22:00	ESCO	
78	WW tube replacement (41 m2) and as found inspection (WW-M-01)	0%					

Task

Critical Task

Milestone

Summary

Rollup Task

Rollup Critical Task

Rollup Up Critical Task

Rollup Up Milestone

Roll Up Progress

External Tasks

Project Summary

Group By Summary

Rollup Up Critical Task

Rollup Up Milestone

Inactive Milestone

Manual Task

Duration-only

Manual Summary Rollup

Manual Summary

Star-only

Finish-only

External Milestone

Critical

Critical Split

Baseline

Baseline Milestone

Baseline Summary

Progress

Deadline

Baseline

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	Task Name	% Complete	Duration	Start	Finish	RO	Dec 1, 2025 Jan 1, 2026 Feb 1, 2026 Mar 1, 2026
79	Wall Deslager Port (3 Set including F-B-04, R-A-07 and waiting visual inspection) (WW-M-01)	0%	22 days	01 Jan 06:00	23 Jan 06:00	ESCO	
80	Welding water wall Tube membrane (Fin)	0%	15.5 days	01 Jan 06:00	16 Jan 18:00	ESCO	16 Jan Thu 16
81	PT Fin	0%	14 days	02 Jan 16:00	17 Jan 06:00	ESCO	17 Jan Fri 17
82	Wall Deslager straight tube replacement (24 tubes (48 J) and waiting UT inspection) (WW-R-01)	0%	5 days	01 Jan 06:00	06 Jan 06:00	ESCO	06 Jan Mon 06
83	Boiler slope tube, seal plate and refractory replacement for all 4 corner (WW-M-02)	0%	15 days	01 Jan 06:00	16 Jan 06:00	ESCO	16 Jan Thu 16
84	WWT near burner corner #B (Remove coal burner nozzle 2 set and oil burner nozzle 1 set) (WW-R-02)	0%	5 days	01 Jan 06:00	06 Jan 06:00	ESCO	06 Jan Mon 06
85	Estimate repairing tube that thickness reduction from TA inspection (Max.)	0%	2 days	04 Jan 06:00	06 Jan 06:00	ESCO	06 Jan Mon 06
86	Additional replacement after as found	0%	15 days	12 Jan 08:00	27 Jan 08:00	ESCO	27 Jan Mon 27
87	2rySH	0%	18 days	09 Jan 22:00	27 Jan 22:00	BL	27 Jan Mon 27
88	Visual Inspection by TA	0%	2 days	12 Jan 08:00	14 Jan 08:00	MHI	14 Jan Thu 14
89	NDT inspection by R&D TA (Hardness Test, inner Oxide scale, Replica)	0%	2 days	14 Jan 08:00	16 Jan 08:00	MHI	16 Jan Thu 16
90	Inspection of 2ry SH Girdling Tube of Dissimilar Metal Weld (DW-J-01), PT+ Angle-beam UT amount 24 J by BLCP	0%	18 days	09 Jan 22:00	27 Jan 22:00	ESCO	27 Jan Mon 27
91	Modification and replacement of wrapper tubes and pads 30J/Row (2SH-M-02) (Cut 1d+ Beveling 2d+Fit-up&weld 3d+Repair 2d=total 8 days/team, Expected max 3 team and plan to replace max 6 rows)	0%	18 days	09 Jan 22:00	27 Jan 22:00	ESCO	27 Jan Mon 27
92	Modification and replacement of girdling tubes of 2ry and 3ry SH (for each including 6 panels, total 12 J) (2SH-M-03)	0%	18 days	09 Jan 22:00	27 Jan 22:00	ESCO	27 Jan Mon 27
93	Replacement of 2ry and 3ry SH near girdling tube (Total 120 J) (2SH-M-03)	0%	18 days	09 Jan 22:00	27 Jan 22:00	ESCO	27 Jan Mon 27
94	Replace 2ry SH tube for panel #5-Row 3 (2SH-R-01)	0%	7 days	20 Jan 22:00	27 Jan 22:00	ESCO	27 Jan Mon 27
95	3rySH	0%	26 days	07 Jan 08:00	02 Feb 08:00	BL	02 Feb Tue 02
96	Visual Inspection by TA	0%	1 day	07 Jan 08:00	08 Jan 08:00	MHI	08 Jan Wed 08
97	Inspection of 3ry SH Tube of Dissimilar Metal Weld (DW-J-01), PT+ Angle-beam UT amount 216 J by BLCP	0%	6 days	07 Jan 08:00	13 Jan 08:00	BL	13 Jan Mon 13
98	Inspect welded joints of similar parts by 3 methods and RT, total 108 J by TISTR (3SH-J-03)	0%	6 days	07 Jan 08:00	13 Jan 08:00	TISTR	13 Jan Mon 13
99	Inspect welded joints (PMI test) of cooled-spacer tube by BLCP Inspector (3SH-J-04)	0%	2 days	07 Jan 08:00	09 Jan 08:00	BL	09 Jan Thu 09
100	Modification and replacement of 3ry SH tubes (Bend Tubes) (3SH-M-01)+25 J/Panel, total 150 J of estimating (Cut 2d+ Beveling 2d+Fit-up&weld 3d+Repair 2d=total 10 days/team/Row, Expected max 3 team and plan to replace max 6 rows)	0%	22 days	07 Jan 08:00	29 Jan 08:00	ESCO	29 Jan Wed 29
101	Replacement of 3ry SH Tube (3SH-M-02)+Estimate 70 joints	0%	1 day	29 Jan 08:00	30 Jan 08:00	ESCO	30 Jan Thu 30
102	Replacement of cooled-spacer tube for 3ry SH (3SH-M-03)-No significant and not be replaced because alloy material	0%	22 days	07 Jan 08:00	29 Jan 08:00	ESCO	29 Jan Wed 29
103	Replacement of 3ry SH tube (3SH-R-01)+Backlog 8 J (Verify to do the welding defect 79 J from possible 3 of investigation)	0%	22 days	07 Jan 08:00	29 Jan 08:00	ESCO	29 Jan Wed 29
104	RT Test	0%	24 days	09 Jan 08:00	02 Feb 08:00	BL	02 Feb Sun 02
105	1ryRH	0%	33.67 days	01 Jan 06:00	03 Feb 22:00	BL	03 Feb Tue 03
106	Visual Inspection by TA	0%	2 days	10 Jan 08:00	12 Jan 08:00	MHI	12 Jan Sun 12
<div><div>Task</div><div>Critical Task</div><div>Milestone</div><div>Summary</div><div>Rollup Task</div><div>Rollup Critical Task</div><div>Rollup Up Critical Task</div><div>Rollup Up Milestone</div><div>Rollup Up Progress</div><div>Soft</div><div>External Tasks</div><div>Project Summary</div><div>Group By Summary</div><div>Inactive Task</div><div>Inactive Milestone</div><div>Inactive Summary</div><div>Manual Task</div><div>Duration-only</div><div>Manual Summary Rollup</div><div>Manual Summary</div><div>Star-only</div><div>Baseline Milestone</div><div>Finish-only</div><div>External Milestone</div><div>Critical</div><div>Critical Split</div><div>Baseline</div><div>Progress</div><div>Deadline</div><div>Baseline Summary</div></div>							

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	Task Name	% Complete	Duration	Start	Finish	RO	Dec 1, 2025 Jan 1, 2026 Feb 1, 2026 Mar 1, 2026
106	NDT inspection by R&D TA (Hardness Test, inner Oxide scale, Replica)	0%	2 days	10 Jan 08:00	12 Jan 08:00	MHI	
107	Installation scaffolding Remove Insulation from external	0%	3 days	01 Jan 06:00	04 Jan 06:00	ES	
108	Remove skin casing Inlet Header	0%	2 days	04 Jan 06:00	06 Jan 06:00	BL	
109	Remove refractory	0%	2 days	06 Jan 06:00	08 Jan 06:00	ES	
110	Install lifting equipment then Transfer cutting tube to ground floor	0%	3 days	08 Jan 22:00	11 Jan 22:00	BL	
111	Transfer tube inside boiler	0%	3 days	09 Jan 22:00	12 Jan 22:00	BL	
112	Tube replacement	0%	21 days	12 Jan 22:00	02 Feb 22:00	BL	
113	Right side cut & weld 17 tubes	0%	21 days	12 Jan 22:00	02 Feb 22:00	BL	
114	Front side cut & weld 20 tubes	0%	21 days	12 Jan 22:00	02 Feb 22:00	BL	
115	Left side cut & weld 17 tubes	0%	21 days	12 Jan 22:00	02 Feb 22:00	BL	
116	RT Test	0%	21 days	13 Jan 22:00	03 Feb 22:00	BL	
117	Right side cut & weld 17 tubes	0%	21 days	13 Jan 22:00	03 Feb 22:00	BL	
118	Front side cut & weld 20 tubes	0%	21 days	13 Jan 22:00	03 Feb 22:00	BL	
119	Left side cut & weld 17 tubes	0%	21 days	13 Jan 22:00	03 Feb 22:00	BL	
120	2ryRH & 3ryRH	0%	24 days	07 Jan 08:00	31 Jan 08:00	BL	
121	Installation scaffolding internal	0%	2 days	07 Jan 08:00	09 Jan 08:00	ESCO	
122	Vacuum clean dust	0%	1 day	07 Jan 08:00	08 Jan 08:00	ESCO	
123	Remove insulation in penthouse	0%	2 days	07 Jan 08:00	09 Jan 08:00	ESCO	
124	Penthouse (2ry RH, 3ry RH and 3ry SH)	0%	19 days	12 Jan 08:00	31 Jan 08:00	BL	
125	Visual Inspection by TA	0%	1 day	12 Jan 08:00	13 Jan 10:00	MHI	
126	Penthouse Inspection of 3ry SH Tube of Dissimilar Metal Weld (DWJ-01), PT+ Angle-beam PAUT amount 36 J by BLCP with power tool grinding	0%	5 days	13 Jan 10:00	18 Jan 10:00	MHI	
127	Replacement of 2ry RH tube, amount 2 J (2RH-01) +FWHT	0%	5 days	18 Jan 10:00	23 Jan 10:00	ESCO	
128	Inspection in PAUT of 3ry RH outlet HDR and nozzle tube by MH (3RH-04)	0%	9 days	12 Jan 08:00	21 Jan 08:00	ESCO	
129	Penthouse Inspection of 3ry RH Tube of Dissimilar Metal Weld (DWJ-01), PT+ Angle-beam PAUT amount 360 J by BLCP with power tool grinding, Inspector 2 team	0%	10 days	21 Jan 08:00	31 Jan 08:00	ESCO	
130	Remove IU scaffolding	0%	2.33 days	04 Feb 16:00	07 Feb 00:00	ES	
131	SH	0%	1 day	04 Feb 16:00	05 Feb 16:00	ES	
132	Removal Level 6 and Mobilize from Boiler	0%	6 hrs	04 Feb 16:00	04 Feb 22:00	ES	
133	Removal Level 4 and Mobilize from Boiler	0%	6 hrs	04 Feb 22:00	05 Feb 04:00	ES	
134	Removal Level 3 and Mobilize from Boiler	0%	6 hrs	05 Feb 04:00	05 Feb 10:00	ES	
135	Removal Level 2 and Mobilize from Boiler	0%	6 hrs	05 Feb 10:00	05 Feb 16:00	ES	
136	Dance floor	0%	6 hrs	05 Feb 16:00	05 Feb 22:00	ES	
137	Water wall	0%	0.79 days	05 Feb 22:00	06 Feb 17:00	ES	
138	Removal Level 14 and Mobilize from Boiler (without spandeck)	0%	1 hr	05 Feb 22:00	05 Feb 23:00	ES	
139	Removal Level 13 and Mobilize from Boiler (without spandeck)	0%	1 hr	05 Feb 23:00	06 Feb 00:00	ES	
140	Removal Level 12 and Mobilize from Boiler (without spandeck)	0%	1 hr	06 Feb 00:00	06 Feb 01:00	ES	
141	Removal Level 11.5 and Mobilize from Boiler (with spandeck)	0%	1 hr	06 Feb 01:00	06 Feb 02:00	ES	
142	Removal Level 10.5 and Mobilize from Boiler (with spandeck)	0%	2.5 hrs	06 Feb 02:00	06 Feb 24:00	ES	
<div><div><div><div>Task</div><div>Roll Up Progress</div><div>External Task</div><div>Summary</div><div>Roll Up Task</div><div>Roll Up Critical Task</div><div>Roll Up Milestone</div></div><div><div>Inactive Milestone</div><div>Inactive Summary</div><div>Manual Task</div><div>Duration-only</div><div>Manual Summary Roll Up</div><div>Inactive Task</div><div>Inactive Milestone</div></div><div><div>Finish-only</div><div>External Milestone</div><div>Critical</div><div>Critical Milestone</div><div>Baseline</div><div>Baseline Milestone</div></div><div><div>Baseline Summary</div><div>Progress</div><div>Deadline</div></div></div></div> <div>Project: Major Outage Date: 29 Apr 13:55</div> <div>Page 4</div>							



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ID	Task Name	% Complete	Duration	Start	Finish	RO	Dependencies
143	Removal Level 9.5 and Mobilize from Boiler (with spandek)	0%	3.5 hrs	06 Feb 04:30	06 Feb 08:00	ES	
144	Removal Level 8 and Mobilize from Boiler (with spandek)	0%	1.5 hrs	06 Feb 08:00	06 Feb 09:30	ES	
145	Removal Level 7 and Mobilize from Boiler (with spandek)	0%	1.5 hrs	06 Feb 09:30	06 Feb 11:00	ES	
146	Removal Level 6 and Mobilize from Boiler (with spandek)	0%	1 hr	06 Feb 11:00	06 Feb 12:00	ES	
147	Removal Level 5 and Mobilize from Boiler (without spandek)	0%	1 hr	06 Feb 12:00	06 Feb 13:00	ES	
148	Removal Level 4 and Mobilize from Boiler (with spandek)	0%	1 hr	06 Feb 13:00	06 Feb 14:00	ES	
149	Removal Level 3 and Mobilize from Boiler (without spandek)	0%	1 hr	06 Feb 14:00	06 Feb 15:00	ES	
150	Removal Level 2 and Mobilize from Boiler (with spandek)	0%	1 hr	06 Feb 15:00	06 Feb 16:00	ES	
151	Removal Level 1 and Mobilize from Boiler (with spandek)	0%	1 hr	06 Feb 16:00	06 Feb 17:00	ES	
152	Wing Truss	0%	2 hrs	06 Feb 17:00	06 Feb 19:00	ES	
153	Base truss	0%	2 hrs	06 Feb 19:00	06 Feb 21:00	ES	
154	Erection floor	0%	1 hr	06 Feb 21:00	06 Feb 22:00	ES	
155	Hopper level - 1.5	0%	1 hr	06 Feb 22:00	06 Feb 23:00	ES	
156	Hopper level - 2.5	0%	1 hr	06 Feb 23:00	07 Feb 00:00	ES	
157	1ryRH outside after hydro-test	0%	3 days	04 Feb 16:00	07 Feb 16:00	BL/ES	
158	Welding skabok seal then install refractory	0%	1 day	04 Feb 16:00	05 Feb 16:00	BL	
159	Welding Close Skin casing	0%	1 day	05 Feb 16:00	06 Feb 16:00	BL	
160	Installation & remove scaffolding (outside)	0%	1 day	06 Feb 16:00	07 Feb 16:00	ES	
161	Back part	0%	36.75 days	01 Jan 06:00	07 Feb 00:00	BL	
162	As found inspection	0%	2 hrs	01 Jan 14:00	01 Jan 16:00	BL	
163	Install scaffolding Economizer Lower	0%	24 hrs	01 Jan 16:00	02 Jan 16:00	BL	
164	Install scaffolding 1rySH	0%	2 days	02 Jan 16:00	04 Jan 16:00	BL	
165	Economizer	0%	20 days	01 Jan 06:00	21 Jan 06:00	BL	
166	Visual Inspection by TA	0%	1 day	01 Jan 06:00	02 Jan 06:00	MPW	
167	Set-Up Equipment, mark Cut and Cutting tube for Inner UT	0%	41 hrs	01 Jan 16:00	03 Jan 09:00	BL/CP-WRC	
168	Inner UT, total plan 21 panels (Near baffle 11 and less thickness 10 panels), estimate max 3 panels /day	0%	8 days	03 Jan 09:00	11 Jan 09:00	MHI	
169	Inner UT tube recovery (1 Panel have 4 tubes, total 168 Jy+RT and plug tube for panel that more defect	0%	8 days	06 Jan 09:00	14 Jan 09:00	ESCO	
170	Inspection for ECO hanger tubes and remove U-bolts (ECO-H03)	0%	2 days	12 Jan 09:00	14 Jan 09:00	ESCO	
171	Modification and installation of protector for row 5, 6 and 7, total 423 EA (ECO-M-03), remove refractory and anti gas short parts,	0%	20 days	01 Jan 06:00	21 Jan 06:00	ESCO	
172	Replacement of ECO, Hanger tube (ECO-R-01)	0%	2 days	12 Jan 09:00	14 Jan 09:00	ESCO	
173	Repairation of tube thickness reduction following inspection	0%	6 days	08 Jan 09:00	14 Jan 09:00	ESCO	
174	Install additional protection plates	0%	8 days	08 Jan 09:00	14 Jan 09:00	ESCO	
175	1rySH	0%	18 days	04 Jan 16:00	22 Jan 16:00	BL	
176	Visual Inspection by TA	0%	1 day	04 Jan 16:00	05 Jan 16:00	MHI	
177	Set-up equipment, mark cut and cutting tube for inner UT	0%	2 days	05 Jan 16:00	07 Jan 16:00	BL	
178	Inner UT, total plan 9 panels (inspected 2017 results, expected that less thickness), estimate max 3 panels /day	0%	5 days	07 Jan 16:00	12 Jan 16:00	MHI	

Task	Roller Up Progress	Inactive Milestone	Finish-only	Baseline Summary	Progress	Deadline
Critical Task	Roller Up Progress	Inactive Milestone	Finish-only	Baseline Summary	Progress	Deadline
Milestone	Roller Up Progress	Inactive Milestone	Finish-only	Baseline Summary	Progress	Deadline
Summary	Roller Up Progress	Inactive Milestone	Finish-only	Baseline Summary	Progress	Deadline
Roller Up Task	Roller Up Progress	Inactive Milestone	Finish-only	Baseline Summary	Progress	Deadline
Roller Up Critical Task	Roller Up Progress	Inactive Milestone	Finish-only	Baseline Summary	Progress	Deadline
Roller Up Milestone	Roller Up Progress	Inactive Milestone	Finish-only	Baseline Summary	Progress	Deadline

Project: Major Outage Date: 20 Apr 13:30

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2025 unit 1 Draft Outage Schedule

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ID	Task Name	% Complete	Duration	Start	Finish	RO	Dependencies
179	Inner UT tube recovery (1 panel)6 tubes, total 162 J (upper 1 J and lower 2 J))+RT and plug tube for panel that more defect	0%	10 days	12 Jan 16:00	22 Jan 16:00	EGCO	
180	Repairation of tube thickness reduction following inspection	0%	5 days	17 Jan 16:00	22 Jan 16:00	EGCO	
181	Install protectors at band tube (B07 Lower) Panel #12	0%	2 days	20 Jan 16:00	22 Jan 16:00	EGCO	
182	Modification and installation of 1ry SH Tube Anti-Vibration Rods (1SH-M-03), upper side is priority 50 set and lower side is priority 50 set is not possible, upper 12 J and sequent and 2 panel at same time, 6 day/2 rows/1 hole, 4 team/2 holes=6x2=16rowsMax	0%	14 days	08 Jan 16:00	22 Jan 16:00	EGCO	
183	Replacement of 1ry SH Tube (1SH-R-01), total 2 J	0%	2 days	20 Jan 16:00	22 Jan 16:00	EGCO	
184	Repair the protector plates and anti-gas short pass plates (1SH-M-04)	0%	2 days	20 Jan 16:00	22 Jan 16:00	EGCO	
185	Boiler Remove Scaffolding 2, 3 ry RH, SH and Economizer	0%	50 hrs	04 Feb 16:00	06 Feb 18:00	BL	
186	Economizer Hopper Cleaning	0%	6 hrs	06 Feb 08:00	07 Feb 08:00	BL	
187	Steam Drum	0%	1 day	16 Jan 08:00	17 Jan 08:00	BL	
188	Inspection of the internal condition of Steam Drum	0%	1 day	16 Jan 08:00	17 Jan 08:00	BL/MHI	
189	Bottom Ash handling Maintenance	0%	36.38 days	01 Jan 20:00	07 Feb 05:00	FGH	
190	Drag chain conveyor	0%	36.38 days	01 Jan 20:00	07 Feb 05:00	LB	
191	Pull DCC from original position	0%	2 hrs	01 Jan 20:00	01 Jan 22:00	BL	
192	Clean DCC (OPS request vacuum truck)	0%	2 days	03 Jan 22:00	03 Jan 22:00	OPS/BL	
193	DCC Maintenance	0%	30 days	03 Jan 22:00	02 Feb 22:00	BL ACC	
194	Inspection and measurement of liner thickness etc.	0%	1 day	03 Jan 22:00	04 Jan 22:00	BL ACC	
195	Replace upper and lower guide roller	0%	1 day	04 Jan 22:00	05 Jan 22:00	BL ACC	
196	Replace drive gear drive and non drive sprocket complete set	0%	9 days	05 Jan 22:00	14 Jan 22:00	BL ACC	
197	Welding of upper hopper of crusher	0%	4 days	14 Jan 22:00	18 Jan 22:00	BL ACC	
198	Welding and installation of DCC seal plates	0%	14 days	18 Jan 22:00	01 Feb 22:00	BL ACC	
199	Rust moving and Painting	0%	1 day	01 Feb 22:00	02 Feb 22:00	BL ACC	
200	DCC Inspection and refractory work	0%	14 days	18 Jan 22:00	01 Feb 22:00	ES	
201	BATC Maintenance	0%	30 days	03 Jan 22:00	02 Feb 22:00	BL ACC	
202	Open cover plates of BATC and inspection	0%	1 day	03 Jan 22:00	04 Jan 22:00	BL ACC	
203	Replace the upper and lower double disc pulley and Clinkle crusher	0%	1 day	04 Jan 22:00	05 Jan 22:00	BL ACC	
204	Replace bend pulley, tail pulley and drive pulley	0%	9 days	05 Jan 22:00	14 Jan 22:00	BL ACC	
205	Replace small pulley including horseback roller, return roller and side roller	0%	10 days	14 Jan 22:00	24 Jan 22:00	BL ACC	
206	Rust moving and Painting	0%	9 days	24 Jan 22:00	02 Feb 22:00	BL ACC	
207	Push DCC to original position	0%	3 hrs	07 Feb 03:00	07 Feb 03:00	BL	
208	Cleaning DCC spare tank and close man hole & Back part hopper	0%	1 hr	07 Feb 03:00	07 Feb 04:00	BL	
209	Fill water to DCC, DCC running test and BTA conveyor running test	0%	1 hr	07 Feb 04:00	07 Feb 05:00	OPS	
210	Boiler preparation for start	0%	4.88 days	02 Feb 08:00	07 Feb 05:00	BL/OPS	
211	Preserve water quality for filling/Washing	0%	1 day	02 Feb 08:00	03 Feb 22:00	BL	
212	Condenser Hot well (Local)	0%	1 day	02 Feb 22:00	03 Feb 22:00	TB/OPS	
213	CEP recirculation pump (Local)	0%	1 day	02 Feb 22:00	03 Feb 22:00	TB/OPS	
214	Deaerator recirculating pump (Local)	0%	1 day	02 Feb 22:00	03 Feb 22:00	TB/OPS	
215	Instrument gag all equipment	0%	1 day	02 Feb 22:00	03 Feb 22:00	C&I/OPS	

Project: Major Outage Date: 29 Apr 13:50	Task						
	Critical Task						
	Milestone						
	Summary						
	Roller Up Task						
	Roller Up Critical Task						
	Roller Up Milestone						

Project: Major Outage Date: 20 Apr 13:30

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2025 unit 1 Draft Outage Schedule

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ID	Task Name	% Complete	Duration	Start	Finish	RO	Dependencies
216	Hanger gag all	0%	1 day	02 Feb 22:00	03 Feb 22:00	BL/OPS	
217	Supply Aux. Unit 2 to unit 1 for heating up temp. for MSV	0%	10 hrs	02 Feb 08:00	02 Feb 18:00	TB/OPS	
218	Water quality for Start up (Filling and drain down from Boiler)	0%	0.42 days	03 Feb 22:00	04 Feb 08:00	OPS	
219	Fill water to WW, Steam drum, MSV and flushing and circulating by BCP A and B	0%	6 hrs	03 Feb 22:00	04 Feb 04:00	OPS	
220	M-BFP running circulation for increase water temperature,(60-70 C) or Deaerator Discharge line for MSV	0%	4 hrs	04 Feb 04:00	04 Feb 08:00	OPS	
221	Hydrostatic testing , external high pressure pump at RH, SH, Water wall tube	0%	0.33 days	04 Feb 08:00	04 Feb 16:00	OPS/BL	
222	Pressure rise from 0-37 barg	0%	2.25 hrs	04 Feb 08:00	04 Feb 10:15	OPS/BL	
223	Gag RH safety valve @ 37 barg	0%	15 mins	04 Feb 10:15	04 Feb 10:30	OPS/BL	
224	Pressure rise from 37 - 51 barg	0%	15 mins	04 Feb 10:30	04 Feb 10:45	OPS/BL	
225	Hold pressure @ 51 barg for inspection RH system	0%	1 hr	04 Feb 10:45	04 Feb 11:45	OPS/BL	
226	Pressure rise from 51 - 141.1 barg (2.5 - 3 barg/min)	0%	0.5 hrs	04 Feb 11:45	04 Feb 12:15	OPS/BL	
227	Gag Main steam pipe safety valve @ 141.1 barg.	0%	15 mins	04 Feb 12:15	04 Feb 12:30	OPS/BL	
228	Pressure rise from 141.1 - 160 barg.	0%	10 mins	04 Feb 12:30	04 Feb 12:40	OPS/BL	
229	Gag steam drum safety valve @ 160 barg.	0%	10 mins	04 Feb 12:40	04 Feb 12:50	OPS/BL	
230	Pressure rise from 160 - 200 barg (2.5 - 3 barg/min)	0%	10 mins	04 Feb 12:50	04 Feb 13:00	OPS/BL	
231	Hold pressure @ 200 barg.	0%	10 mins	04 Feb 13:00	04 Feb 13:10	OPS/BL	
232	Release pressure from 200 - 160 barg. (3 - 5 barg/min)	0%	10 mins	04 Feb 13:10	04 Feb 13:20	OPS/BL	
233	Remove gag steam drum safety valve @ 160 barg.	0%	10 mins	04 Feb 13:20	04 Feb 13:30	OPS/BL	
234	Hold pressure @ 160 barg. For internal inspection	0%	1.5 hrs	04 Feb 13:30	04 Feb 15:00	OPS/BL	
235	Release pressure from 160 - 141.1 barg. (3 - 5 barg/min)	0%	10 mins	04 Feb 15:00	04 Feb 15:10	OPS/BL	
236	Remove gag Main steam pipe safety valve @ 141.1 barg.	0%	15 mins	04 Feb 15:10	04 Feb 15:25	OPS/BL	
237	Release pressure from 141.1 - 0 barg. (3 - 5 barg/min)	0%	35 mins	04 Feb 15:25	04 Feb 16:00	OPS/BL	
238	Wrapping Equipment	0%	2.25 days	04 Feb 15:30	07 Feb 03:00	FGH	
239	Boiler spray test	0%	1 hr	07 Feb 03:00	07 Feb 04:00	OPS/SH	
240	Wall De-slagger Drive Test	0%	2 days	03 Feb 04:42	05 Feb 11:00	BL/LV	
241	LSB / Furnace temp probe Drive Test	0%	35 hrs	05 Feb 11:00	07 Feb 05:00	C&I/BL	
242	BCP, steam drum Blow down tank turn permit.	0%	24 hrs	02 Feb 22:00	03 Feb 22:00	BL	
243	Combustion air and flue gas Maintenance	0%	37.04 days	01 Jan 14:00	07 Feb 07:00	FGH	
244	COMMON Duct cleaning	0%	12 hrs	01 Jan 14:00	02 Jan 02:00	FGH	
245	Cleaning fly ash by Vacuum truck	0%	3.88 days	01 Jan 14:00	05 Jan 11:00	BL	
246	AH-A	0%	45 hrs	01 Jan 14:00	03 Jan 11:00	BL ACC	
247	AH-B	0%	2 days	03 Jan 11:00	05 Jan 11:00	BL ACC	
248	Cleaning by high pressure water	0%	6 days	03 Jan 11:00	09 Jan 11:00	BL	
249	AH-A	0%	3 days	03 Jan 11:00	06 Jan 11:00	BL ACC	
250	AH-B	0%	4 days	05 Jan 11:00	09 Jan 11:00	BL ACC	
251	AH-A	0%	25 days	06 Jan 11:00	31 Jan 11:00	BL	
252	Install scaffolding below cold end element for inspection	0%	2 days	06 Jan 11:00	08 Jan 11:00	ES	
253	As found location of Soot Blowing system	0%	1 day	08 Jan 11:00	09 Jan 11:00	BL ACC	

Project: Major Outage Date: 20 Apr 13:50	Task		Roll Up Progress		Inactive Milestone		Finish-only		Baseline Summary		
	Critical Task		Split		Inactive Summary		External Tasks			Progress	
	Milestone		External Tasks		Manual Task		External Milestone		Deadline		
	Summary		Project Summary		Duration-only						
	Roll Up Task		Group By Summary		Manual Summary Roll Up		Critical Split				
	Roll Up Critical Task		Inactive Task		Manual Summary		Baseline				

Project: Major Outage Date: 20 Apr 13:30

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2025 unit 1 Draft Outage Schedule

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ID	Task Name	% Complete	Duration	Start	Finish	RO	Dependencies
254	Sampling remove and install 1 sector of hot end, intermediate and cold end element for weight measurement and inspection	0%	7 days	09 Jan 11:00	16 Jan 11:00	BL ACC	
255	Remote Howden TA for inspection	0%	3 days	09 Jan 11:00	12 Jan 11:00	Howden	
256	Replace reducing gear unit	0%	10 days	16 Jan 11:00	26 Jan 11:00	BL ACC	
257	Inspection and replacement of seal plates	0%	4 days	26 Jan 11:00	30 Jan 11:00	BL ACC	
258	Remove scaffolding and close man hole	0%	1 day	30 Jan 11:00	31 Jan 11:00	ES	
259	AH B	0%	23.5 days	09 Jan 11:00	01 Feb 23:00	BL	
260	Install scaffolding below cold end element for inspection	0%	2 days	09 Jan 11:00	11 Jan 11:00	ES	
261	As found location of Soot Blowing system	0%	1 day	11 Jan 11:00	12 Jan 11:00	BL ACC	
262	Sampling remove and install 1 sector of hot end, intermediate and cold end element for weight measurement and inspection	0%	7 days	12 Jan 11:00	19 Jan 11:00	BL ACC	
263	Remote Howden TA for inspection	0%	3 days	12 Jan 11:00	15 Jan 11:00	Howden	
264	Replace reducing gear unit	0%	2 days	26 Jan 11:00	28 Jan 11:00	BL ACC	
265	Inspection and replacement of seal plates	0%	4 days	28 Jan 11:00	01 Feb 11:00	BL ACC	
266	Remove scaffolding and close man hole	0%	0.5 days	01 Feb 11:00	01 Feb 23:00	ES	
267	AH Fire fighting system test	0%	1 hr	01 Feb 11:00	01 Feb 12:00	OPS/SH	
268	FGD absorber tank	0%	27 days	01 Jan 14:00	28 Jan 14:00	FGH	

2025 unit 1 Draft Outage Schedule

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ID	Task Name	% Complete	Duration	Start	Finish	RO	Due Jan 1, 2025
372	Dismanling bolts the inner and outer casing at flange joints	0%	2 days	05 Jan 06:00	07 Jan 06:00	ESCO	Dec 31, 2024
373	Dismanling implel casing and rear casing	0%	3 days	07 Jan 06:00	10 Jan 06:00	ESCO	Jan 01, 2025
374	Install support the spacer inside the suction casing	0%	2 days	10 Jan 06:00	12 Jan 06:00	ESCO	Jan 02, 2025
375	Dismanling the coupling and the seal plate	0%	2 days	11 Jan 06:00	13 Jan 06:00	ESCO	Jan 03, 2025
376	Dismanling pilot valve and control oil supply line and connecting	0%	1 day	13 Jan 06:00	14 Jan 06:00	ESCO	Jan 04, 2025
377	Remove rotor and bearing complete set on Support	0%	2 days	14 Jan 06:00	16 Jan 06:00	ESCO	Jan 05, 2025
378	Remove rotor and bearing complete set to work shop	0%	2 days	16 Jan 06:00	18 Jan 06:00	ESCO	Jan 06, 2025
379	Clean and inspect casing lower and seal	0%	2 days	13 Jan 06:00	15 Jan 06:00	ESCO	Jan 07, 2025
380	Technical Advisor	0%	26 days	05 Jan 06:00	31 Jan 06:00	MH/ESCO	Jan 08, 2025
381	Cleaning Work	0%	1 day	05 Jan 06:00	06 Jan 06:00	MH/ESCO	Jan 09, 2025
382	Install rotor and bearing complete set	0%	10 days	06 Jan 06:00	16 Jan 06:00	MH/ESCO	Jan 10, 2025
383	Install pilot valve and control oil supply line and connecting	0%	1 day	15 Jan 06:00	16 Jan 06:00	MH/ESCO	Jan 11, 2025
384	Oil Flushing after reinstale oil piping	0%	12 days	16 Jan 06:00	28 Jan 06:00	MH/ESCO	Jan 12, 2025
385	Install the coupling and Dismanling support spacer and Realignment	0%	10 days	17 Jan 06:00	27 Jan 06:00	MH/ESCO	Jan 13, 2025
386	Install the coupling and the seal plate	0%	1 day	27 Jan 06:00	28 Jan 06:00	MH/ESCO	Jan 14, 2025
387	Fuction Test - Blade Pit	0%	1 day	28 Jan 06:00	29 Jan 06:00	MH/ESCO	Jan 15, 2025
388	Install implel casing and rear casing	0%	2 days	29 Jan 06:00	31 Jan 06:00	MH/ESCO	Jan 16, 2025
389	Close manhole	0%	1 day	30 Jan 06:00	31 Jan 06:00	MH/ESCO	Jan 17, 2025
390	Test run	0%	1 day	30 Jan 06:00	31 Jan 06:00	MH/ESCO	Jan 18, 2025
391	Steam Turbine Maintenance	0%	37.67 days	01 Jan 06:00	07 Feb 22:00	TB/EC&I	Jan 19, 2025
392	Turning gear and cooling down	0%	3 days	01 Jan 06:00	04 Jan 06:00	TB	Jan 20, 2025
393	LP1 Turbine	0%	18 days	01 Jan 06:00	19 Jan 06:00	TB	Jan 21, 2025
394	Dismanlne	0%	11 days	01 Jan 06:00	12 Jan 06:00	TB	Jan 22, 2025
395	Scaffold setting & disassembly of cross over pipe	0%	2 days	01 Jan 06:00	03 Jan 06:00	ES	Jan 23, 2025
396	Insulation remove of cross over pipe	0%	2 days	03 Jan 06:00	05 Jan 06:00	ES	Jan 24, 2025
397	Cross over pipe	0%	1 day	05 Jan 06:00	06 Jan 06:00	TB/ESCO	Jan 25, 2025
398	LP1 Outer casing	0%	0.5 days	07 Jan 06:00	07 Jan 18:00	TB/ESCO	Jan 26, 2025
399	Flow guide upper	0%	2 days	05 Jan 06:00	07 Jan 06:00	TB/ESCO	Jan 27, 2025
400	Upper inner casing & blade ring	0%	3 days	07 Jan 18:00	10 Jan 18:00	TB/ESCO	Jan 28, 2025
401	Erection of scaffolding for rotor inspection	0%	1.5 days	10 Jan 18:00	12 Jan 06:00	ES	Jan 29, 2025
402	LP rotor L-0 Ste&ite Inspection	0%	2 days	12 Jan 06:00	14 Jan 06:00	MH/ITB	Jan 30, 2025
403	Axial,radial clearance check (wait for confirm with MH)	0%	1 day	14 Jan 06:00	15 Jan 06:00	MH/ITB	Jan 31, 2025
404	Assembly	0%	4 days	15 Jan 06:00	19 Jan 06:00	TB	Feb 01, 2025
405	Erection of scaffolding for rotor assembly	0%	1 day	15 Jan 06:00	16 Jan 06:00	ES	Feb 02, 2025
406	Upper inner casing & blade ring	0%	3 days	16 Jan 06:00	19 Jan 06:00	TB/ESCO	Feb 03, 2025
407	Flow guide upper	0%	1.5 days	15 Jan 06:00	16 Jan 18:00	TB/ESCO	Feb 04, 2025
408	LP1 Outer casing	0%	1 day	15 Jan 06:00	16 Jan 06:00	TB/ESCO	Feb 05, 2025
409	Cross over pipe	0%	1.5 days	15 Jan 06:00	16 Jan 18:00	TB/ESCO	Feb 06, 2025
410	Insulation cross over pipe	0%	2 days	15 Jan 06:00	17 Jan 06:00	ES	Feb 07, 2025
411	Install Scaffold setting & assembly of cross over pipe	0%	1 day	15 Jan 06:00	16 Jan 06:00	ES	Feb 08, 2025

Project: Major Outage Date: 29 Apr 13:35

Task

Critical Task

Milestone

Summary

Rollup Task

Rollup Critical Task

Rollup Milestone

Rollup Progress

Split

External Task

Group By Summary

Rollup Inactive Task

Inactive Milestone

Inactive Milestone

Manual Task

Durationonly

Manual Summary Rollup

Manual Summary

Start-only

External Task

External Milestone

Critical

Critical Split

Baseline

Baseline Milestone

Baseline Summary

BLCP POWER		2025 unit 1 Draft Outage Schedule					Page 12 of 25	
ID	Task Name	% Complete	Duration	Start	Finish	RO	ID# 1, 2025 Div Jan Feb Mar	
412	LP2 Turbine	0%	20 days	01 Jan 06:00	21 Jan 06:00	TB	412	03
413	Dismantle	0%	11.5 days	01 Jan 06:00	12 Jan 18:00	TB		
414	Scaffold setting & disassembly of cross over pipe	0%	2 days	01 Jan 06:00	03 Jan 06:00	ES	414	06
415	Insulation remove of cross over pipe	0%	2 days	03 Jan 06:00	05 Jan 06:00	ES	415	05
416	Remove of cross over pipe	0%	1 day	05 Jan 06:00	06 Jan 06:00	TB/ESCO	416	06
417	LP2 Outer casing	0%	0.5 days	07 Jan 06:00	07 Jan 18:00	TB/ESCO	417	07
418	Flow guide upper	0%	2 days	07 Jan 06:00	07 Jan 06:00	TB/ESCO	418	07
419	Upper inner casing & blade ring	0%	3.5 days	07 Jan 18:00	11 Jan 06:00	TB/ESCO	419	07
420	Erection of scaffolding for rotor inspection	0%	1.5 days	11 Jan 06:00	12 Jan 18:00	ES	420	12
421	LP rotor L-0 Stellite Inspection	0%	2 days	14 Jan 06:00	16 Jan 06:00	MHI/TB	421	16
422	Axial,radial clearance check (wait for confirm with MHI)	0%	1 day	16 Jan 06:00	17 Jan 06:00	MHI/TB	422	17
423	Assembly	0%	4 days	17 Jan 06:00	21 Jan 06:00	TB	423	18
424	Erection of scaffolding for rotor assembly	0%	1 day	17 Jan 06:00	18 Jan 06:00	ES	424	18
425	Upper inner casing & blade ring	0%	3 days	18 Jan 06:00	21 Jan 06:00	TB/ESCO	425	18
426	Flow guide upper	0%	1 day	17 Jan 06:00	18 Jan 06:00	TB/ESCO	426	18
427	LP2 Outer casing	0%	1 day	17 Jan 06:00	18 Jan 06:00	TB/ESCO	427	18
428	Cross over pipe	0%	1.5 days	17 Jan 06:00	18 Jan 18:00	TB/ESCO	428	18
429	Insulation cross over pipe	0%	2 days	17 Jan 06:00	19 Jan 06:00	ES	429	19
430	Install Scaffold setting & assembly of cross over pipe	0%	1 day	17 Jan 06:00	18 Jan 06:00	ES	430	18
431	Turbine bearing inspection	0%	24 days	01 Jan 06:00	25 Jan 06:00	TB	431	18
432	Dismantle #1~#6 BRG cover	0%	2 days	03 Jan 06:00	05 Jan 06:00	TB/ESCO	432	18
433	#1~#6 BRG Inspection & Adjustment	0%	9 days	16 Jan 06:00	25 Jan 06:00	MHI/TB	433	18
434	#1~#6 Bearing Curvature Correction	0%	8 days	16 Jan 06:00	24 Jan 06:00	MHI/TB	434	18
435	LP1, LP2 root & blade inspection	0%	4 days	10 Jan 06:00	14 Jan 06:00	MHI/TB	435	14
436	Assembly #1~#6 BRG cover	0%	2 days	01 Jan 06:00	03 Jan 06:00	TB/ESCO	436	18
437	Major Valve Overhaul	0%	37.67 days	01 Jan 06:00	07 Feb 22:00	TB	437	18
438	Install scaffolding inside End closer	0%	1 day	01 Jan 06:00	02 Jan 06:00	ES	438	18
439	Remove Top End closer	0%	4 hrs	02 Jan 06:00	02 Jan 18:00	TB	439	18
440	Remove Instrument wiring	0%	4 hrs	02 Jan 10:00	02 Jan 14:00	C&I	440	18
441	Scaffolding adjustment after end closer remove	0%	4 hrs	02 Jan 14:00	02 Jan 18:00	ES	441	18
442	Remove insulation for all valve	0%	12 hrs	02 Jan 18:00	03 Jan 06:00	ES	442	18
443	MSV (RH)	0%	27.5 days	02 Jan 06:00	29 Jan 18:00	TB	443	18
444	Dismantle	0%	2 days	03 Jan 06:00	05 Jan 06:00	TB/ESCO	444	18
445	Spring Box	0%	0.5 days	03 Jan 06:00	03 Jan 18:00	TB/ESCO	445	18
446	Bonnet	0%	1.5 days	03 Jan 18:00	05 Jan 06:00	TB/ESCO	446	18
447	Valve	0%	0.5 days	04 Jan 06:00	05 Jan 06:00	TB/ESCO	447	18
448	<MSV Valve Body Welding - Machining Rectification>	0%	20.5 days	02 Jan 06:00	22 Jan 18:00	TB	448	18
449	Preparation	0%	1 day	03 Jan 06:00	04 Jan 06:00	MHI/TB	449	18
450	Measurement	0%	1 day	05 Jan 06:00	06 Jan 06:00	MHI/TB	450	18
451	Welding/ Heat treatment/NDT	0%	2.5 days	06 Jan 05:00	08 Jan 18:00	MHI/TB	451	18

Task

Critical Task

Milestone

Summary

Rolled Up Task

Rolled Up Critical Task

Rolled Up Milestone

Rolled Up Progress

External Task

Project Summary

Group By Summary

Inactive Task

Inactive Milestone

Inactive Milestone

Manual Task

Manual Summary

Manual Summary Rollup

Manual Summary

Start-only

Finish-only

External Task

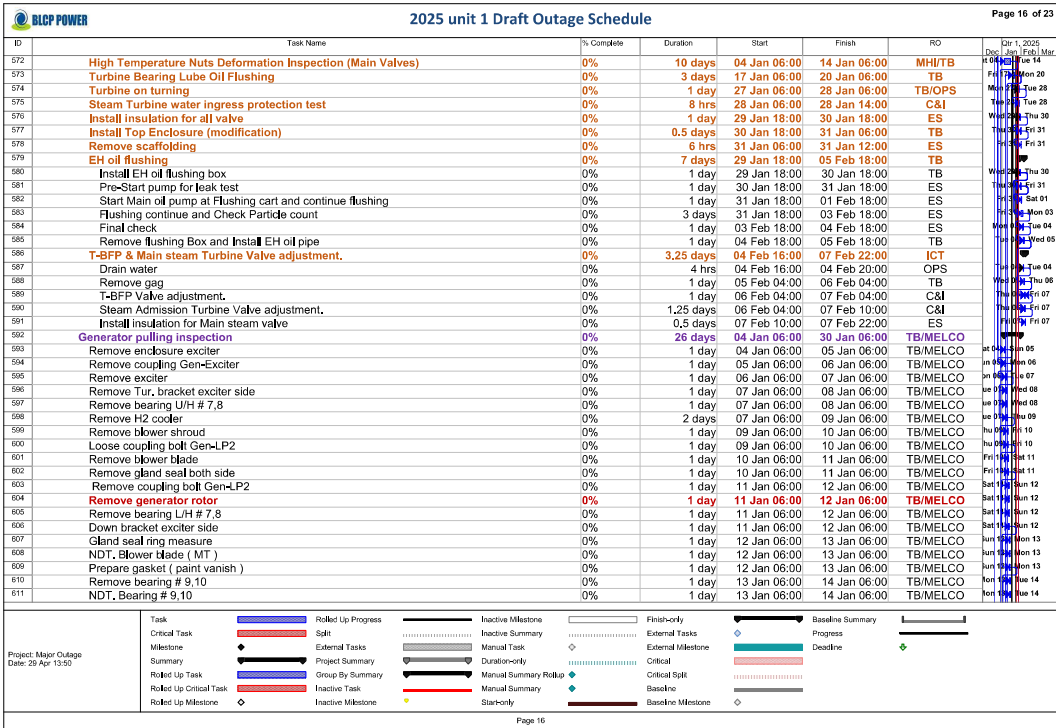
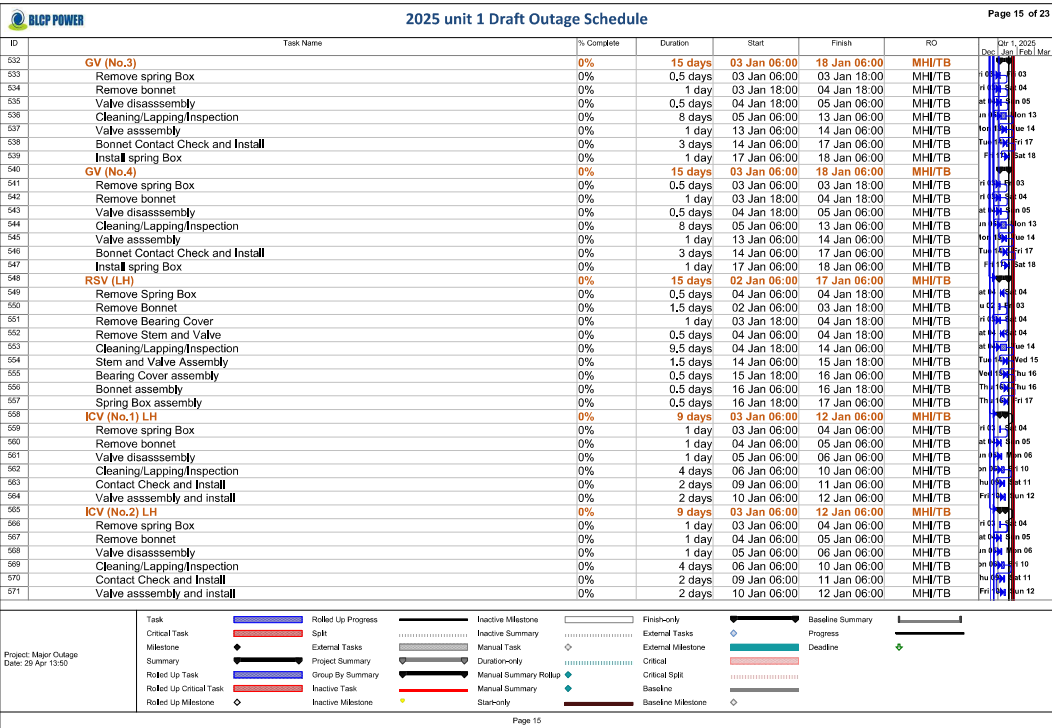
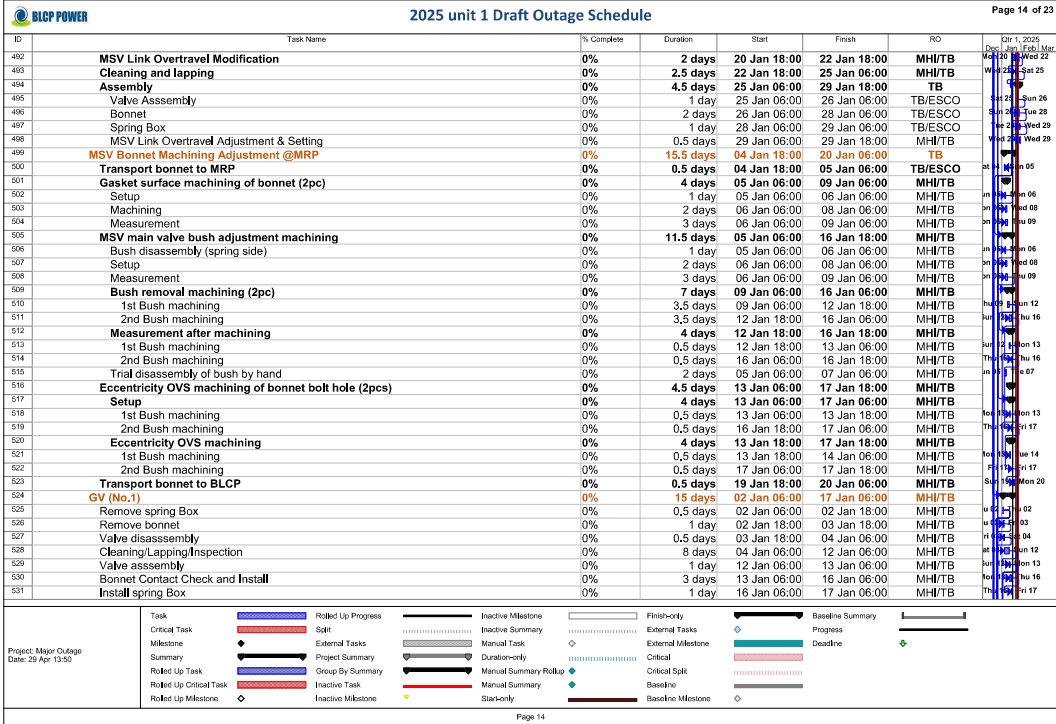
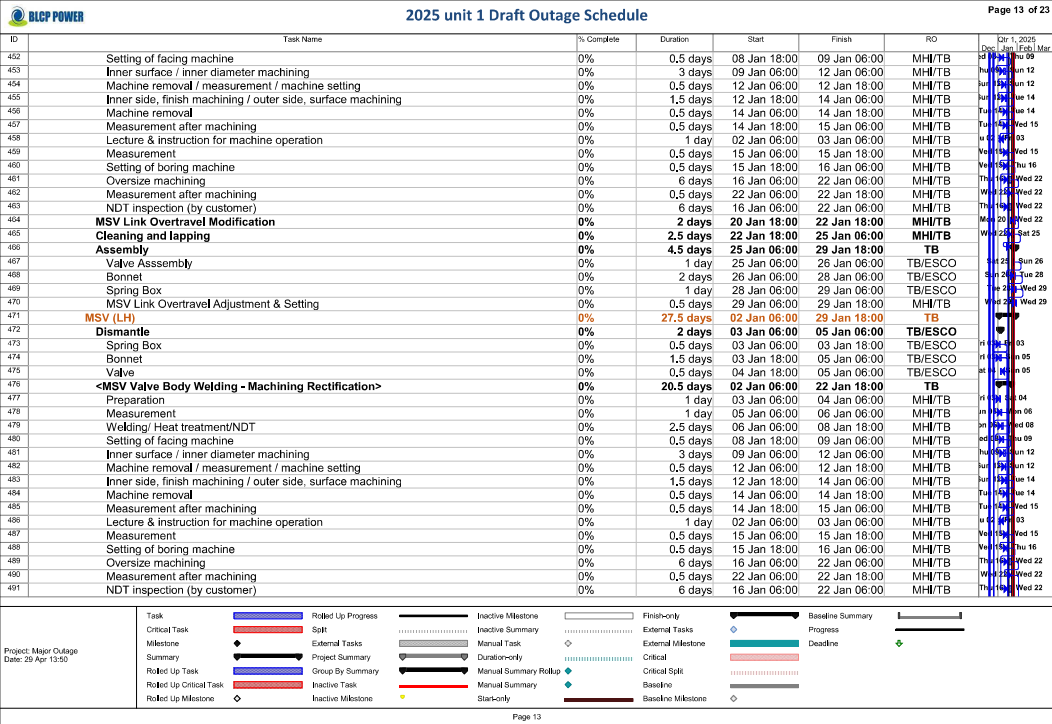
Critical Milestone

External

Critical Split

Baseline

Baseline Mile



ID	Task Name	% Complete	Duration	Start	Finish	RO	Dr 1, 2025 Dec 1, 2025 Dec 17, 2025
662	NDT PT	0%	1 day	16 Jan 06:00	17 Jan 06:00	TB	Mon 17 Jan 06
663	NDT RFT	0%	7 days	17 Jan 06:00	24 Jan 06:00	TB	Fri 18 Jan 06
664	NDT IRIS	0%	1 day	24 Jan 06:00	25 Jan 06:00	TB	Fri 18 Jan 06
665	Pressure test on shell side by pressurize air 5 bar	0%	1 day	25 Jan 06:00	26 Jan 06:00	TB	Sat 19 Jan 06
666	Assembly partition cover	0%	2 days	26 Jan 06:00	28 Jan 06:00	TB	Sun 20 Jan 06
667	Assembly perforated pate	0%	2 days	28 Jan 06:00	28 Jan 06:00	TB	Tue 21 Jan 06
668	Re-welding diaphragm of manhole & close manhole	0%	1 day	28 Jan 06:00	29 Jan 06:00	TB	Tue 21 Jan 06
669	Pressure test on tube side by demin. Water 200 bar	0%	1 day	29 Jan 06:00	30 Jan 06:00	TB	Wed 22 Jan 06
700	No.8 HP feed water heater	0%	29 days	01 Jan 06:00	30 Jan 06:00	TB	Wed 22 Jan 06
701	Remove diaphragm of manhole by machine	0%	2 days	01 Jan 06:00	03 Jan 06:00	TB	Thu 23 Jan 06
702	cooling down & air blow	0%	2 days	02 Jan 06:00	04 Jan 06:00	TB	Fri 24 Jan 06
703	Remove partition cover	0%	1 day	04 Jan 06:00	05 Jan 06:00	TB	Sat 25 Jan 06
704	Remove perforated plate	0%	1 day	05 Jan 06:00	06 Jan 06:00	TB	Sun 26 Jan 06
705	Tube cleaning	0%	8 days	06 Jan 06:00	14 Jan 06:00	TB	Mon 27 Jan 06
706	Tube dry out by air blow	0%	2 days	14 Jan 06:00	16 Jan 06:00	TB	Tue 28 Jan 06
707	NDT PT	0%	1 day	16 Jan 06:00	17 Jan 06:00	TB	Thu 18 Jan 06
708	NDT RFT	0%	7 days	17 Jan 06:00	24 Jan 06:00	TB	Fri 19 Jan 06
709	NDT IRIS	0%	1 day	24 Jan 06:00	25 Jan 06:00	TB	Fri 19 Jan 06
710	Pressure test on shell side by pressurize air 5 bar	0%	1 day	25 Jan 06:00	26 Jan 06:00	TB	Sat 20 Jan 06
711	Assembly partition cover	0%	2 days	26 Jan 06:00	28 Jan 06:00	TB	Sun 21 Jan 06
712	Assembly perforated pate	0%	2 days	28 Jan 06:00	28 Jan 06:00	TB	Tue 23 Jan 06
713	Re-welding diaphragm of manhole & close manhole	0%	1 day	28 Jan 06:00	29 Jan 06:00	TB	Tue 23 Jan 06
714	Pressure test on tube side by demin. Water 200 bar	0%	1 day	29 Jan 06:00	30 Jan 06:00	TB	Wed 24 Jan 06
715	CTCS ball strainer-A1,A2,B1,B2 Inspection grid strainer	0%	6 days	01 Jan 06:00	07 Jan 06:00	TB+ECT+OPS	Thu 25 Jan 06
716	Open manhole (Complete)	0%	1 day	01 Jan 06:00	02 Jan 06:00	TB	Fri 26 Jan 06
717	Internal inspection grid strainer by TB team	0%	2 days	01 Jan 06:00	03 Jan 06:00	TB	Sat 27 Jan 06
718	Replace sacrificial anode by TB team	0%	2 days	03 Jan 06:00	05 Jan 06:00	TB	Sun 28 Jan 06
719	Functional test grid strainer 3 party TB+ECT+OPS	0%	2 days	05 Jan 06:00	07 Jan 06:00	TB+ECT+OPS	Mon 29 Jan 06
720	Close manhole	0%	1 day	01 Jan 06:00	02 Jan 06:00	TB	Tue 30 Jan 06
721	Balance of Plant Maintenance	0%	37.67 days	01 Jan 06:00	07 Feb 22:00	BOP	Wed 31 Jan 06
722	Intake & Outfall	0%	29.5 days	01 Jan 06:00	30 Jan 18:00	BOP	Thu 1 Feb 06
723	Close Stop log (intake and inlet outfall) (Start at 13:00)	0%	2 days	01 Jan 06:00	03 Jan 06:00	BOP	Fri 2 Feb 06
724	Yearly Inspection support of shock & continue diffuser (NaOCL) at intake pit 1A and 1B	0%	3 days	03 Jan 06:00	06 Jan 06:00	BOP	Sat 3 Feb 06
725	Travelling screen, CWP inspection , Recondition	0%	20 days	03 Jan 06:00	23 Jan 06:00	BOP	Sun 4 Feb 06
726	Travelling screen A	0%	20 days	03 Jan 06:00	23 Jan 06:00	BOP/ES	Mon 5 Feb 06
727	Remove screen panel	0%	1 day	01 Jan 06:00	02 Jan 06:00	BOP	Tue 6 Feb 06
728	Install Scaffolding for Internal Inspection	0%	2 days	03 Jan 06:00	05 Jan 06:00	ES	Thu 7 Feb 06
729	Inspection	0%	7 days	05 Jan 06:00	12 Jan 06:00	BOP	Sun 12 Jan 06
730	Remove Scaffolding for Internal Inspection	0%	1 day	12 Jan 06:00	13 Jan 06:00	ES	Mon 13 Jan 06

Task	<div><div></div></div> Rolled Up Progress	<div><div></div></div> Inactive Milestone	<div><div></div></div> Finish-only	<div><div></div></div> Baseline Summary	<div><div></div></div>
Critical Task	<div><div></div></div> Soft	<div><div></div></div> Manual Task	<div><div></div></div> External Task	<div><div></div></div> Progress	<div><div></div></div> External Milestone
Milestone	<div><div></div></div> Diamond	<div><div></div></div> Don't	<div><div></div></div> Critical	<div><div></div></div> Critical	<div><div></div></div> Critical Mile
Summary	<div><div></div></div> Project Summary	<div><div></div></div> Manual Summary Rollup	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
Rollup Up Task	<div><div></div></div> Group By Summary	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
Rollup Up Critical Task	<div><div></div></div> Inactive Task	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
Rollup Up Milestone	<div><div></div></div> Inactive Milestone	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone

Task	<div><div></div></div> Rolled Up Progress	<div><div></div></div> Inactive Milestone	<div><div></div></div> Finish-only	<div><div></div></div> Baseline Summary	<div><div></div></div>
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Critical Task	<div><div></div></div> Soft	<div><div></div></div> Manual Task	<div><div></div></div> External Task	<div><div></div></div> Progress	<div><div></div></div> External Milestone
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Milestone	<div><div></div></div> Diamond	<div><div></div></div> Don't	<div><div></div></div> Critical	<div><div></div></div> Critical	<div><div></div></div> Critical Mile
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Summary	<div><div></div></div> Project Summary	<div><div></div></div> Manual Summary Rollup	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Rollup Up Task	<div><div></div></div> Group By Summary	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Rollup Up Critical Task	<div><div></div></div> Inactive Task	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Rollup Up Milestone	<div><div></div></div> Inactive Milestone	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Task	<div><div></div></div> Rolled Up Progress	<div><div></div></div> Inactive Milestone	<div><div></div></div> Finish-only	<div><div></div></div> Baseline Summary	<div><div></div></div>
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Critical Task	<div><div></div></div> Soft	<div><div></div></div> Manual Task	<div><div></div></div> External Task	<div><div></div></div> Progress	<div><div></div></div> External Milestone
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Milestone	<div><div></div></div> Diamond	<div><div></div></div> Don't	<div><div></div></div> Critical	<div><div></div></div> Critical	<div><div></div></div> Critical Mile
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Summary	<div><div></div></div> Project Summary	<div><div></div></div> Manual Summary Rollup	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Rollup Up Task	<div><div></div></div> Group By Summary	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Rollup Up Critical Task	<div><div></div></div> Inactive Task	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Rollup Up Milestone	<div><div></div></div> Inactive Milestone	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Task	<div><div></div></div> Rolled Up Progress	<div><div></div></div> Inactive Milestone	<div><div></div></div> Finish-only	<div><div></div></div> Baseline Summary	<div><div></div></div>
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Critical Task	<div><div></div></div> Soft	<div><div></div></div> Manual Task	<div><div></div></div> External Task	<div><div></div></div> Progress	<div><div></div></div> External Milestone
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Milestone	<div><div></div></div> Diamond	<div><div></div></div> Don't	<div><div></div></div> Critical	<div><div></div></div> Critical	<div><div></div></div> Critical Mile
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Summary	<div><div></div></div> Project Summary	<div><div></div></div> Manual Summary Rollup	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Rollup Up Task	<div><div></div></div> Group By Summary	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Rollup Up Critical Task	<div><div></div></div> Inactive Task	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Rollup Up Milestone	<div><div></div></div> Inactive Milestone	<div><div></div></div> Start-only	<div><div></div></div> Baseline	<div><div></div></div> Baseline	<div><div></div></div> Baseline Milestone
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Task	<div><div></div></div> Rolled Up Progress	<div><div></div></div> Inactive Milestone	<div><div></div></div> Finish-only	<div><div></div></div> Baseline Summary	<div><div></div></div>
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BLCP POWER		2025 unit 1 Draft Outage Schedule						Page 20 of 23	
ID	Task Name	% Complete	Duration	Start	Finish	RO	Jan 1, 2025	Jan 2, 2025	Jan 3, 2025
731	CWP inspection ,Recondition	0%	10 days	13 Jan 06:00	23 Jan 06:00	BOP	Doc	Jan	Feb
732	Travelling screen B	0%	20 days	03 Jan 06:00	23 Jan 06:00	BOP/ES			
733	Remove screen panel	0%	1 day	04 Jan 06:00	05 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
734	Install Scaffolding for Internal Inspection	0%	2 days	03 Jan 06:00	05 Jan 06:00	ES	Jan 06	Jan 06	Jan 06
735	Inspection	0%	7 days	05 Jan 06:00	12 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
736	Remove Scaffolding for Internal Inspection	0%	1 day	12 Jan 06:00	13 Jan 06:00	ES	Jan 06	Jan 06	Jan 06
737	CWP inspection ,Recondition	0%	10 days	03 Jan 06:00	23 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
738	Intake Pit A,B Burncase, Shell and Mud at Floor and Clean Bar Screen	0%	5 days	03 Jan 06:00	08 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
739	Open Stop log	0%	1.5 days	29 Jan 06:00	30 Jan 18:00	BOP	Jan 06	Jan 06	Jan 06
740	FGD System	0%	25 days	04 Jan 06:00	29 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
741	FGD Underground Pipe U1, Inspection (Flake Lining at Damage Area)	0%	5 days	12 Jan 06:00	17 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
742	FGD Canal Outfall U1 (Damage Area) , FRP Lining 2 Layer & Tissue 1 Layer	0%	10 days	08 Jan 06:00	18 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
743	FGD Seawater Pump 1A , 1B, 1C (Replace Packing)	0%	6 days	07 Jan 06:00	13 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
744	FGD Aeration Air Cooler 1A , 1B (Clean Inlet Strainer)	0%	2 days	13 Jan 06:00	15 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
745	FGD Aeration Blower 1A, 1B, 1C, 1D (Clean Suction Filter)	0%	4 days	17 Jan 06:00	21 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
746	FGD Aeration Air Filter 1A , 1B (Clean Filter)	0%	2 days	15 Jan 06:00	17 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
747	Aeration Blower Pipe Air Diffuser U1, Inspection	0%	3 days	04 Jan 06:00	07 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
748	Antifonn Net U1, Replace New Net	0%	2 days	07 Jan 06:00	09 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
749	FGD Seawater Pump 1A, Overhaul	0%	20 days	09 Jan 06:00	29 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
750	CWP system	0%	26 days	05 Jan 06:00	31 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
751	CWP Underground Pipe U1, Inspection (Coal Tar Painting at Damage Area)	0%	5 days	10 Jan 06:00	15 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
752	CWP 1A, Overhaul	0%	24 days	05 Jan 06:00	29 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
753	CWP 1B, Overhaul	0%	24 days	05 Jan 06:00	31 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
754	Demineralized water tank A	0%	20 days	04 Jan 06:00	24 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
755	Fire water tank A	0%	20 days	02 Jan 06:00	22 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
756	Plate heat exchanger mechanical Cleaning and Replace gasket works	0%	19 days	01 Jan 06:00	20 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
757	T-BFP A1/A2 , B1/B2 , Mechanical Cleaning, B-FPT Oil Cooler	0%	9 days	03 Jan 06:00	12 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
758	CCCW cooler B; Mechanical Cleaning (must be informed Chemist to collect deposit scale from cooler plate for analysis)	0%	9 days	01 Jan 06:00	10 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
759	CCCW cooler A; Mechanical Cleaning (must be informed Chemist to collect deposit scale from cooler plate for analysis)	0%	9 days	10 Jan 06:00	19 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
760	Main oil cooler A , Mechanical Cleaning	0%	8 days	04 Jan 06:00	12 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
761	Main oil cooler B , Mechanical Cleaning	0%	8 days	12 Jan 06:00	20 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
762	Condenser vacuum pump seal water cooler A B C, Mechanical Cleaning	0%	8 days	03 Jan 06:00	11 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
763	Air side seal cooler, Mechanical Cleaning	0%	7 days	05 Jan 06:00	12 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
764	HS side seal of cooler, Mechanical Cleaning	0%	7 days	05 Jan 06:00	12 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
765	Stator coil cooler water A,B, Mechanical Cleaning	0%	7 days	05 Jan 06:00	12 Jan 06:00	BOP	Jan 06	Jan 06	Jan 06
766	Main Plant & Boiler Feed System	0%	35.67 days	03 Jan 06:00	07 Feb 22:00	BOP	Jan 06	Jan 06	Jan 06
767	BFP-1A Overhaul	0%	20 days	07 Jan 06:00	27 Jan 06:00	BOP/MH	Jan 06	Jan 06	Jan 06
768	T-BFP-1A Overhaul	0%	20 days	03 Jan 06:00	23 Jan 06:00	BOP/MH	Jan 06	Jan 06	Jan 06

Task

Critical Task

Milestone

Summary

Rollup Up Task

Rollup Up Critical Task

Rollup Up Milestone

Rollup Up Progress

External Tasks

Project Summary

Group By Summary

Inactive Task

Inactive Milestone

Inactive Milestone

Manual Task

Duration-only

Manual Summary Rollup

Manual Summary

Staronly

Finish-only

External Tests

Critical Milestone

Critical Split

Baseline

Baseline Milestone

Baseline Summary

Progress

Deadline

Baseline

Project: Major Outage
Date: 20 Apr 13:50

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Project: Major Outage
 Date: 20 Apr 15:50

Task		Roll Up Progress		Inactive Milestone		Finish-only		Baseline Summary	
Critical Task		Split		Inactive Summary		External Tasks		Progress	
Milestone		External Tasks		Manual Task		External Milestone		Deadline	
Summary		Project Summary		Duration-only		Critical			
Roll Up Task		Group By Summary		Manual Summary Rollup		Critical Split			
Roll Up Critical Task		Inactive Task		Manual Summary		Baseline			
Roll Up Milestone		Inactive Milestone		Start-only		Baseline Milestone			

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Project: Major Outage
 Date: 20 Apr 15:50

Task		Roll Up Progress		Inactive Milestone		Finish-only		Baseline Summary	
Critical Task		Split		Inactive Summary		External Task		Progress	
Milestone		External Task		Manual Task		External Milestone		Deadline	
Summary		Project Summary		Duration-only		Critical			
Roll Up Task		Group By Summary		Manual Summary Rollup		Critical Split			
Roll Up Critical Task		Inactive Task		Manual Summary		Baseline			
Roll Up Milestone		Inactive Milestone		Start-only		Baseline Milestone			

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Project: Major Outage Date: 29 Apr 13:55

Milestone	External Task	Manual Task	External Milestone	Deadline
Summary	Project Summary	Duration-only	Critical	
Roller Up Task	Group By Summary	Manual Summary Roller	Critical Style	
Roller Up Critical Task	Inactive Task	Manual Summary	Baseline	
Roller Up Milestone	Inactive Milestone	Star-only	Baseline Milestone	

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หน่วยผลิตที่ 2

BLCP POWER

2024 unit 2 Draft Outage Schedule

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ID	Task Name	% Complete	Duration	Start	Finish	Sat 1, 2025						
						S	M	Tu	We	Th	F	Sa
40	Boiler inspection and replacement (if any)	100%	7 days	Sat 12/21/24 6:00 PM	Sat 12/28/24 6:00 PM							
41	Boiler inspection by MHI	100%	4.13 days	Sat 12/21/24 6:00 PM	Wed 12/25/24 9:00 PM							
42	Furnace	100%	1 day	Sat 12/21/24 6:00 PM	Sun 12/22/24 6:00 PM							
43	2ry SH	100%	2 days	Sun 12/22/24 6:00 PM	Tue 12/24/24 6:00 PM							
44	3ry SH	100%	27 hrs	Tue 12/24/24 6:00 PM	Wed 12/25/24 9:00 PM							
45	Polishing	100%	1 day	Sat 12/21/24 6:00 PM	Sun 12/22/24 6:00 PM							
46	1ry RH	100%	3 days	Sat 12/21/24 6:00 PM	Tue 12/24/24 6:00 PM							
47	2ry&3ry RH	100%	1 day	Tue 12/24/24 6:00 PM	Wed 12/25/24 6:00 PM							
48	1ry SH	100%	1 day	Sat 12/21/24 6:00 PM	Sun 12/22/24 6:00 PM							
49	Economizer	100%	1 day	Sun 12/22/24 6:00 PM	Mon 12/23/24 6:00 PM							
50	In housing (HDRs)	100%	2 days	Sat 12/21/24 6:00 PM	Mon 12/23/24 6:00 PM							
51	Boiler penthouse	100%	6 days	Sat 12/21/24 6:00 PM	Fri 12/27/24 6:00 PM							
52	Cut and open skin casing for gondola.	100%	1 day	Sat 12/21/24 6:00 PM	Sun 12/22/24 6:00 PM							
53	Visual Inspection all parts,	100%	2 days	Tue 12/24/24 6:00 PM	Thu 12/26/24 6:00 PM							
54	PT Check all weld of support,	100%	2 days	Wed 12/25/24 6:00 PM	Fri 12/27/24 6:00 PM							
55	Water Wall Tube	100%	7 days	Sat 12/21/24 6:00 PM	Sat 12/28/24 6:00 PM							
56	Furnace Tube	100%	6 days	Sat 12/21/24 6:00 PM	Fri 12/27/24 6:00 PM							
57	Check the condition of the pipe around the wall deslagger.	100%	2 days	Mon 12/23/24 6:00 PM	Wed 12/25/24 6:00 PM							
58	Inspection for bottom furnace wall tube.	100%	2 days	Sat 12/21/24 6:00 PM	Mon 12/23/24 6:00 PM							
59	PT Check	100%	2 days	Wed 12/25/24 6:00 PM	Fri 12/27/24 6:00 PM							
60	UT,Thickness Tube	100%	5 days	Sat 12/21/24 6:00 PM	Thu 12/26/24 6:00 PM							
61	Nose room	100%	2 days	Wed 12/25/24 6:00 PM	Fri 12/27/24 6:00 PM							
62	Visual Inspection	100%	2 days	Wed 12/25/24 6:00 PM	Fri 12/27/24 6:00 PM							
63	PT Check	100%	2 days	Wed 12/25/24 6:00 PM	Fri 12/27/24 6:00 PM							
64	Bottom room	100%	1 day	Fri 12/27/24 6:00 PM	Sat 12/28/24 6:00 PM							
65	Visual Inspection	100%	1 day	Fri 12/27/24 6:00 PM	Sat 12/28/24 6:00 PM							
66	PT Check	100%	1 day	Fri 12/27/24 6:00 PM	Sat 12/28/24 6:00 PM							
67	Superheater System	100%	5.5 days	Sat 12/21/24 6:00 PM	Fri 12/27/24 6:00 AM							
68	Secondary Superheater	100%	3 days	Sat 12/21/24 6:00 PM	Tue 12/24/24 6:00 PM							
69	Visual Inspection	100%	3 days	Sat 12/21/24 6:00 PM	Tue 12/24/24 6:00 PM							
70	PT Check	100%	3 days	Sat 12/21/24 6:00 PM	Tue 12/24/24 6:00 PM							
71	UT,Thickness Tube	100%	3 days	Sat 12/21/24 6:00 PM	Tue 12/24/24 6:00 PM							
72	Tertiary Superheater	100%	5.5 days	Sat 12/21/24 6:00 PM	Fri 12/27/24 6:00 AM							
73	Visual Inspection	100%	2 days	Sat 12/21/24 6:00 PM	Tue 12/24/24 6:00 PM							
74	PT Check	100%	3 days	Mon 12/23/24 6:00 PM	Fri 12/27/24 6:00 AM							
75	UT,Thickness Tube	100%	1 day	Mon 12/23/24 6:00 PM	Tue 12/24/24 6:00 PM							
76	Reheater System	100%	2 days	Sat 12/21/24 6:00 PM	Mon 12/23/24 6:00 PM							
77	Primary Reheater	100%	2 days	Sat 12/21/24 6:00 PM	Mon 12/23/24 6:00 PM							
78	Visual Inspection	100%	2 days	Sat 12/21/24 6:00 PM	Mon 12/23/24 6:00 PM							
79	PT Check	100%	2 days	Sat 12/21/24 6:00 PM	Mon 12/23/24 6:00 PM							

Task

Critical Task

Milestone

Summary

Rollod Up Task

Rollod Up Critical Task

Rollod Up Milestone

Rollod Up Progress

Split

External Tasks

Project Summary

Group By Summary

Inactive Task

Inactive Milestone

Inactive Milestone

Manual Task

Duration-only

Manual Summary Rollup

Manual Summary

Start-only

Externl-only

External Tasks

Critical

Critical Split

Baseline

Baseline Milestone

Baseline Summary

Progress

Deadline

Project: Unit 2 Execution Plan

Date: Mon 12/30/24 10:05 PM

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BCP POWER

2024 unit 2 Draft Outage Schedule

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ID	Task Name	% Complete	Duration	Start	Finish	Day	Start	Finish	Day	Start	Finish	Day	Start
120	Cut off tube	100%	3 days	Mon 12/16/24 5:00 AM	Thu 12/19/24 5:00 AM	Mon	12/16/24	12/19/24	Mon	12/16/24	12/19/24	Mon	12/16/24
121	Grinding and beveling.	100%	6 days	Tue 12/17/24 5:00 AM	Mon 12/23/24 5:00 AM	Tue	12/17/24	12/23/24	Tue	12/17/24	12/23/24	Tue	12/17/24
122	Fill up and welding	100%	7 days	Wed 12/18/24 5:00 AM	Wed 12/25/24 5:00 AM	Wed	12/18/24	12/25/24	Wed	12/18/24	12/25/24	Wed	12/18/24
123	RT	100%	8 days	Thu 12/19/24 8:00 AM	Fri 12/27/24 8:00 AM	Thu	12/19/24	12/27/24	Thu	12/19/24	12/27/24	Thu	12/19/24
124	Install anti gas short pass plate	100%	1 day	Thu 12/26/24 8:00 AM	Fri 12/27/24 8:00 AM	Thu	12/26/24	12/27/24	Thu	12/26/24	12/27/24	Thu	12/26/24
125	Install protector rear part	100%	7 days	Fri 12/20/24 8:00 AM	Fri 12/27/24 8:00 AM	Fri	12/20/24	12/27/24	Fri	12/20/24	12/27/24	Fri	12/20/24
126	ECO	100%	6 days	Fri 12/19/24 8:00 AM	Wed 12/25/24 8:00 AM	Fri	12/19/24	12/25/24	Fri	12/19/24	12/25/24	Fri	12/19/24
127	Install protector plate [10 set]	100%	5 days	Fri 12/20/24 8:00 AM	Wed 12/25/24 8:00 AM	Fri	12/20/24	12/25/24	Fri	12/20/24	12/25/24	Fri	12/20/24
128	Overlay building [0.01 met]	100%	2 days	Thu 12/19/24 8:00 AM	Sat 12/21/24 8:00 AM	Thu	12/19/24	12/21/24	Thu	12/19/24	12/21/24	Thu	12/19/24
129	Remove Scaffolding inside back part for ECO	100%	8 hrs	Sat 12/28/24 4:00 AM	Sat 12/28/24 12:00 PM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
130	Economizer hopper clean	100%	4 hrs	Sat 12/28/24 12:00 PM	Sat 12/28/24 4:00 PM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
131	Bolier pressure part election completion certificate submit	100%	0 days	Thu 12/26/24 12:00 AM	Thu 12/26/24 12:00 AM	Thu	12/26/24	12/26/24	Thu	12/26/24	12/26/24	Thu	12/26/24
132	Bolier preparation for start up	100%	15.37 days	Sun 12/15/24 12:00 AM	Mon 12/30/24 8:46 AM	Sun	12/15/24	12/30/24	Sun	12/15/24	12/30/24	Sun	12/15/24
133	Prepare water quality for filling/Washing	100%	3.04 days	Thu 12/26/24 8:00 AM	Sun 12/29/24 9:00 AM	Thu	12/26/24	12/29/24	Thu	12/26/24	12/29/24	Thu	12/26/24
134	Condenser Hot well (Local)	100%	1 day	Thu 12/26/24 8:00 AM	Fri 12/27/24 8:00 AM	Thu	12/26/24	12/27/24	Thu	12/26/24	12/27/24	Thu	12/26/24
135	CEP recirculation pump (Local)	100%	1 day	Sat 12/28/24 9:00 AM	Sun 12/29/24 9:00 AM	Sat	12/28/24	12/29/24	Sat	12/28/24	12/29/24	Sat	12/28/24
136	Deaerator recirculating pump (Local)	100%	1 day	Thu 12/26/24 8:00 AM	Fri 12/27/24 8:00 AM	Thu	12/26/24	12/27/24	Thu	12/26/24	12/27/24	Thu	12/26/24
137	Instrument gag al equipment	100%	1 day	Thu 12/26/24 8:00 AM	Fri 12/27/24 8:00 AM	Thu	12/26/24	12/27/24	Thu	12/26/24	12/27/24	Thu	12/26/24
138	Hanger gag al	100%	1 day	Thu 12/26/24 8:00 AM	Fri 12/27/24 8:00 AM	Thu	12/26/24	12/27/24	Thu	12/26/24	12/27/24	Thu	12/26/24
139	Water quality for Start up (Filling and drain down from Bolier)	100%	0.58 days	Fri 12/27/24 8:00 AM	Fri 12/27/24 10:00 PM	Fri	12/27/24	12/27/24	Fri	12/27/24	12/27/24	Fri	12/27/24
140	Fill water to WW, Steam drum for flushing and circulating by BCP	100%	10 hrs	Fri 12/27/24 8:00 AM	Fri 12/27/24 6:00 PM	Fri	12/27/24	12/27/24	Fri	12/27/24	12/27/24	Fri	12/27/24
141	Fill water to RH tube (Tentative)	100%	4 hrs	Fri 12/27/24 6:00 PM	Fri 12/27/24 10:00 PM	Fri	12/27/24	12/27/24	Fri	12/27/24	12/27/24	Fri	12/27/24
142	Hydrostatic testing , external high pressure pump at RH, SH, Water wall tube	100%	0.25 days	Fri 12/27/24 10:00 PM	Sat 12/28/24 4:00 AM	Fri	12/27/24	12/28/24	Fri	12/27/24	12/28/24	Fri	12/27/24
143	Pressure rise from 0-37 barg (Tentative)	100%	1.5 hrs	Fri 12/27/24 10:00 PM	Fri 12/27/24 11:30 PM	Fri	12/27/24	12/27/24	Fri	12/27/24	12/27/24	Fri	12/27/24
144	Gag RH safety valve @ 37 barg (Tentative)	100%	15 mins	Fri 12/27/24 11:30 PM	Fri 12/27/24 11:45 PM	Fri	12/27/24	12/27/24	Fri	12/27/24	12/27/24	Fri	12/27/24
145	Pressure rise from 37-61 barg (Tentative)	100%	15 mins	Fri 12/27/24 11:45 PM	Sat 12/28/24 12:00 AM	Fri	12/27/24	12/28/24	Fri	12/27/24	12/28/24	Fri	12/27/24
146	Hold pressure @ 61 barg for inspection RH system (Tentative)	100%	0.5 hrs	Sat 12/28/24 12:00 AM	Sat 12/28/24 12:30 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
147	Pressure rise from 0- 51 barg (2.5- 3 barg/min)	100%	2.5 hrs	Fri 12/27/24 10:00 PM	Sat 12/28/24 12:30 AM	Fri	12/27/24	12/28/24	Fri	12/27/24	12/28/24	Fri	12/27/24
148	Pressure rise from 51- 141.1 barg (2.5- 3 barg/min)	100%	10 mins	Sat 12/28/24 12:30 AM	Sat 12/28/24 12:40 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
149	Gag Main steam pipe safety valve @ 141.1 barg.	100%	10 mins	Sat 12/28/24 12:40 AM	Sat 12/28/24 12:50 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
150	Pressure rise from 141.1- 160 barg	100%	10 mins	Sat 12/28/24 12:50 AM	Sat 12/28/24 1:00 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
151	Gag steam drum safety valve @ 160 barg.	100%	10 mins	Sat 12/28/24 1:00 AM	Sat 12/28/24 1:10 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
152	Pressure rise from 160- 200 barg (2.5- 3 barg/min)	100%	10 mins	Sat 12/28/24 1:10 AM	Sat 12/28/24 1:20 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
153	Hold pressure @ 200 barg.	100%	20 mins	Sat 12/28/24 1:20 AM	Sat 12/28/24 1:40 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
154	Release pressure from 200- 160 barg. (3- 5 barg/min)	100%	10 mins	Sat 12/28/24 1:40 AM	Sat 12/28/24 1:50 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
155	Remove gag steam drum safety valve @ 160 barg.	100%	10 mins	Sat 12/28/24 1:50 AM	Sat 12/28/24 2:00 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
156	Hold pressure @ 160 barg. For internal inspection	100%	1 hr	Sat 12/28/24 2:00 AM	Sat 12/28/24 3:00 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
157	Release pressure from 160- 141.1 barg. (3- 5 barg/min)	100%	10 mins	Sat 12/28/24 3:00 AM	Sat 12/28/24 3:10 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24
158	Remove gag Main steam pipe safety valve @ 141.1 barg.	100%	10 mins	Sat 12/28/24 3:10 AM	Sat 12/28/24 3:20 AM	Sat	12/28/24	12/28/24	Sat	12/28/24	12/28/24	Sat	12/28/24

Task

Critical Task

Milestone

Summary

Roll'd Up Task

Roll'd Up Critical Task

Roll'd Up Milestone

Roll'd Up Progress

External Tasks

Group By Summary

Inactive Task

Inactive Milestone

Inactive Milestone

Manual Task

Duration-only

Manual Summary Roll'd Up

Manual Summary

Star-only

Finish-only

External Tasks

Critical

Critical Split

Baseline

Baseline Milestone

Baseline Summary

Progress

Deadline

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2024 unit 2 Draft Outage Schedule

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ID	Task Name	% Complete	Duration	Start	Finish	Sa	Half 1, 2025
159	Release pressure from 141.1 - 0 barg. (3 - 5 barg/min)	100%	40 mins	Sat 12/28/24 3:20 AM	Sat 12/28/24 4:00 AM	Sa	Jan 28
160	Paper seal Flushing RH system by BFP	100%	5 hrs	Sat 12/28/24 4:00 AM	Sat 12/28/24 9:00 AM	Sa	Jan 28
161	Paper seal Flushing SH and WW system by BFP	100%	5 hrs	Sat 12/28/24 9:00 AM	Sat 12/28/24 2:00 PM	Sa	Jan 28
162	Wall De-slagger Drive Test	100%	2 days	Sat 12/28/24 4:00 AM	Mon 12/30/24 4:00 AM	Sa	Mon 30
163	LSB / Furnace temp prob Drive Test	100%	2 days	Sat 12/28/24 4:00 AM	Mon 12/30/24 8:46 AM	Sa	Mon 30
164	BCP, steam drum , Blow down tank return permit.	100%	24 hrs	Thu 12/26/24 8:00 AM	Fri 12/27/24 8:00 AM	Thu	Fri 27
165	MFT test	100%	7 hrs	Sun 12/15/24 12:00 AM	Sun 12/15/24 7:00 AM	Sun	Sun 15
166	Boiler Fire Protection Deluge Sprinkler Test	100%	1 hr	Sun 12/29/24 9:00 PM	Sun 12/29/24 10:00 PM	Sun	Sun 29
167	Penthouse	100%	2 days	Sun 12/15/24 9:00 PM	Tue 12/17/24 9:00 PM	Sun	Jan 17
168	Penthouse vacuum cleaning ash	100%	2 days	Sun 12/15/24 9:00 PM	Tue 12/17/24 9:00 PM	Sun	Jan 17
169	Burner testing	100%	3 days	Tue 12/24/24 4:00 AM	Sat 12/28/24 2:30 PM	Tue	Jan 28
170	Boiler Safety Valves	100%	4 days	Tue 12/17/24 8:00 AM	Sat 12/21/24 8:00 AM	Tue	Jan 21
171	Steam Drum Safety Valve	100%	3 days	Tue 12/17/24 8:00 AM	Fri 12/20/24 8:00 AM	Tue	Jan 20
172	02HAG01AA400	100%	1 day	Tue 12/17/24 8:00 AM	Wed 12/18/24 8:00 AM	Tue	Wed 18
173	02HAG01AA401	100%	1 day	Tue 12/17/24 8:00 AM	Wed 12/18/24 8:00 AM	Tue	Wed 18
174	02HAG01AA402	100%	1 day	Wed 12/18/24 8:00 AM	Thu 12/19/24 8:00 AM	Wed	Thu 19
175	02HAG01AA403	100%	1 day	Wed 12/18/24 8:00 AM	Thu 12/19/24 8:00 AM	Wed	Thu 19
176	02HAG01AA404	100%	1 day	Thu 12/19/24 8:00 AM	Fri 12/20/24 8:00 AM	Thu	Fri 20
177	02HAG01AA405	100%	1 day	Thu 12/19/24 8:00 AM	Fri 12/20/24 8:00 AM	Thu	Fri 20
178	02HAG01AA406	100%	1 day	Thu 12/19/24 8:00 AM	Fri 12/20/24 8:00 AM	Thu	Fri 20
179	SH Outlet Safety Valve	100%	1 day	Fri 12/20/24 8:00 AM	Sat 12/21/24 8:00 AM	Fri	Sat 21
180	02LBA01AA100	100%	1 day	Fri 12/20/24 8:00 AM	Sat 12/21/24 8:00 AM	Fri	Sat 21
181	02LBA01AA101	100%	1 day	Fri 12/20/24 8:00 AM	Sat 12/21/24 8:00 AM	Fri	Sat 21
182	Bottom Ash handling Maintenance	99%	14.42 days	Sun 12/15/24 4:00 PM	Mon 12/30/24 2:00 AM	Sun	Mon 30
183	Drag chain conveyor	98%	14.21 days	Sun 12/15/24 9:00 PM	Mon 12/30/24 2:00 AM	Sun	Mon 30
184	Pull DCC from original position	100%	3 hrs	Sun 12/15/24 9:00 PM	Mon 12/16/24 12:00 AM	Sun	Mon 16
185	Install Scaffolding for protector plate	100%	0.75 days	Tue 12/17/24 10:00 PM	Wed 12/18/24 4:00 PM	Tue	Wed 18
186	Inspection seal plate	100%	7 days	Wed 12/18/24 4:00 PM	Wed 12/25/24 4:00 PM	Wed	Wed 25
187	Refractory work	100%	5 days	Wed 12/18/24 4:00 PM	Mon 12/23/24 4:00 PM	Wed	Mon 23
188	Remove scaffolding	100%	2 hrs	Mon 12/23/24 4:00 PM	Mon 12/23/24 6:00 PM	Mon	Mon 23
189	Push DCC to original position	50%	3 hrs	Sun 12/29/24 6:00 PM	Sun 12/29/24 9:00 PM	Sun	Sun 29
190	Cleaning DCC spare tank and close man hole & Back part hopper	0%	3 hrs	Sun 12/29/24 9:00 PM	Mon 12/30/24 12:00 AM	Sun	Mon 30
191	Fill water to DCC, DCC running test and BTA conveyor running test	0%	2 hrs	Mon 12/30/24 12:00 AM	Mon 12/30/24 2:00 AM	Mon	Mon 30
192	Bottom ash silo	100%	12.67 days	Sun 12/15/24 4:00 PM	Sat 12/28/24 8:00 AM	Sun	Jan 28
193	Clean and empty bottom ash silo	100%	16 hrs	Sun 12/15/24 4:00 PM	Mon 12/16/24 8:00 AM	Sun	Mon 16
194	Install scaffolding	100%	1 day	Mon 12/16/24 8:00 AM	Tue 12/17/24 8:00 AM	Mon	Tue 17
195	UTM Shell especially weld joint	100%	2 days	Fri 12/20/24 8:00 AM	Sun 12/22/24 8:00 AM	Fri	Sun 22
196	Rust removal by sandblasting	100%	2 days	Sun 12/22/24 8:00 AM	Tue 12/24/24 8:00 AM	Sun	Tue 24
197	Internal inspection	100%	1 day	Tue 12/24/24 8:00 AM	Wed 12/25/24 8:00 AM	Tue	Wed 25
198	Repainting for internal silo	100%	2 days	Wed 12/25/24 8:00 AM	Fri 12/27/24 8:00 AM	Wed	Fri 27

Task

Critical Task

Milestone

Summary

Rollup Up Task

Rollup Up Critical Task

Rollup Up Milestone

Rollup Up Progress

Split

External Tasks

Project Summary

Group By Summary

Inactive Task

Inactive Milestone

Inactive Milestone

Manual Task

Duration-only

Manual Summary Rollup

Manual Summary

Star-Only

Finish-only

External Tasks

External Milestone

Critical

Critical Split

Baseline

Baseline Milestone

Baseline Summary

Deadline

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ID	Task Name	% Complete	Duration	Start	Finish	Sa	Half 1, 2025
237	Internal inspection and repairing	100%	9 days	Tue 12/17/24 8:00 AM	Thu 12/26/24 8:00 AM	Tue	Jan 26
238	Final inspection	100%	6 hrs	Thu 12/26/24 8:00 AM	Thu 12/26/24 2:00 PM	Thu	Jan 26
239	Final rapping test /Close man hole	100%	1 day	Thu 12/26/24 2:00 PM	Fri 12/27/24 2:00 PM	Thu	Fri 27
240	Final Vacuum truck cleaning ESP hopper by OPS	100%	31 hrs	Fri 12/27/24 2:00 PM	Sat 12/28/24 9:00 PM	Fri	Sat 28
241	Power up insulator heater	100%	6 hrs	Sat 12/28/24 9:00 PM	Sun 12/29/24 3:00 AM	Sa	Sun 29
242	HV Tr and Discharge electrode IR testing (7 hrs)	100%	7 hrs	Sun 12/29/24 3:00 AM	Sun 12/29/24 10:00 AM	Sa	Sun 29
243	Air load testing (4 hrs)	100%	4 hrs	Sun 12/29/24 10:00 AM	Sun 12/29/24 2:00 PM	Sa	Sun 29
244	Gas load test common with draft test	0%	2 hrs	Tue 12/31/24 12:30 PM	Tue 12/31/24 2:30 PM	Tu	Tue 31
245	FGD system	100%	14 days	Sun 12/15/24 4:00 PM	Sun 12/29/24 4:00 PM	Sun	Jan 29
246	FGD Absorber tank	100%	13 days	Sun 12/15/24 4:00 PM	Sat 12/28/24 4:00 PM	Sun	Jan 28
247	Open manhole	100%	1 day	Sun 12/15/24 4:00 PM	Mon 12/16/24 4:00 PM	Sun	Mon 16
248	Cleaning	100%	2 days	Mon 12/16/24 4:00 PM	Wed 12/18/24 4:00 PM	Mon	Wed 18
249	Install scaffolding	100%	2 days	Wed 12/18/24 4:00 PM	Fri 12/20/24 4:00 PM	Wed	Fri 20
250	Inspection and repair	100%	6 days	Fri 12/20/24 4:00 PM	Thu 12/26/24 4:00 PM	Fri	Thu 26
251	Remove scaffolding	100%	1.5 days	Thu 12/26/24 4:00 PM	Sat 12/28/24 4:00 AM	Thu	Sat 28
252	Close manhole	100%	0.5 days	Sat 12/28/24 4:00 AM	Sat 12/28/24 4:00 PM	Sa	Sat 28
253	FGD relay pit	100%	13 days	Mon 12/16/24 4:00 PM	Sun 12/29/24 4:00 PM	Mon	Jan 29
254	FGD relay pit cleaning	100%	2 days	Mon 12/16/24 4:00 PM	Wed 12/18/24 4:00 PM	Mon	Wed 18
255	Install scaffolding	100%	2 days	Wed 12/18/24 4:00 PM	Fri 12/20/24 4:00 PM	Wed	Fri 20
256	Inspection and repair concrete	100%	7.5 days	Fri 12/20/24 4:00 PM	Sat 12/28/24 4:00 AM	Fri	Sat 28
257	Remove scaffolding	100%	1.5 days	Sat 12/28/24 4:00 AM	Sun 12/29/24 4:00 PM	Sa	Sun 29
258	FGD BUF-A seal air fan	100%	3 days	Mon 12/16/24 8:00 AM	Thu 12/19/24 8:00 AM	Mon	Thu 19
259	Inspection	100%	3 days	Mon 12/16/24 8:00 AM	Thu 12/19/24 8:00 AM	Mon	Thu 19
260	Replace air filter	100%	3 days	Mon 12/16/24 8:00 AM	Thu 12/19/24 8:00 AM	Mon	Thu 19
261	Re-alignment	100%	1 day	Wed 12/18/24 8:00 AM	Thu 12/19/24 8:00 AM	Wed	Thu 19
262	FGD BUF-B seal air fan	100%	3 days	Wed 12/18/24 8:00 AM	Sat 12/21/24 8:00 AM	Wed	Sat 21
263	Inspection	100%	3 days	Wed 12/18/24 8:00 AM	Sat 12/21/24 8:00 AM	Wed	Sat 21
264	Replace air filter	100%	3 days	Wed 12/18/24 8:00 AM	Sat 12/21/24 8:00 AM	Wed	Sat 21
265	Re-alignment	100%	1 day	Fri 12/20/24 8:00 AM	Sat 12/21/24 8:00 AM	Fri	Sat 21
266	Main fans	100%	14.33 days	Sun 12/15/24 12:00 AM	Sun 12/29/24 8:00 AM	Sun	Jan 29
267	IDF-A	100%	5 days	Sun 12/15/24 12:00 AM	Fri 12/20/24 12:00 AM	Sun	Jan 15
268	IDF start running for cooling down inside furnace	100%	0 days	Sun 12/15/24 12:00 AM	Sun 12/15/24 12:00 AM	Sun	Jan 15
269	IDF stop running for cooling down inside furnace	100%	0 days	Fri 12/20/24 12:00 AM	Fri 12/20/24 12:00 AM	Fri	Jan 20
270	PAF-A	100%	13.67 days	Sun 12/15/24 4:00 PM	Sun 12/29/24 8:00 AM	Sun	Jan 29
271	Open manhole	100%	1 day	Sun 12/15/24 4:00 PM	Mon 12/16/24 4:00 PM	Sun	Mon 16
272	PAF-A internal inspection	100%	7 days	Mon 12/16/24 4:00 PM	Mon 12/23/24 4:00 PM	Mon	Mon 23
273	PAF-A re-alignment after overhaul motor	100%	2 days	Wed 12/25/24 8:00 AM	Fri 12/27/24 8:00 AM	Wed	Fri 27
274	Close manhole	100%	1 day	Fri 12/27/24 8:00 AM	Sat 12/28/24 8:00 AM	Fri	Sat 28
275	Test run	100%	1 day	Sat 12/28/24 8:00 AM	Sun 12/29/24 8:00 AM	Sa	Sun 29
276	PAF-B	100%	12.08 days	Mon 12/16/24 4:00 PM	Sat 12/28/24 6:00 PM	Mon	Jan 28
<div><div><div>Task</div><div>Critical Task</div><div>Milestone</div><div>Summary</div><div>Rollup Up Task</div><div>Rollup Up Critical Task</div><div>Rollup Up Milestone</div></div><div><div>Rollup Up Progress</div><div>Split</div><div>External Tasks</div><div>Project Summary</div><div>Group By Summary</div><div>Inactive Task</div><div>Inactive Milestone</div></div><div><div>Inactive Milestone</div><div>Manual Task</div><div>Duration-only</div><div>Manual Summary Rollup</div><div>Manual Summary</div><div>Star-Only</div></div><div><div>Finish-only</div><div>External Tasks</div><div>External Milestone</div><div>Critical</div><div>Critical Split</div><div>Baseline</div><div>Baseline Milestone</div></div><div><div>Baseline Summary</div><div>Progress</div><div>Deadline</div></div></div>							
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ID	Task Name	% Complete	Duration	Start	Finish	Sa	Half 1, 2025
199	Remove scaffolding	100%	1 day	Fri 12/27/24 8:00 AM	Sat 12/28/24 8:00 AM	Fri	Sat 28
200	Combustion air and flue gas Maintenance	99%	16.6 days	Sun 12/15/24 12:00 AM	Tue 12/31/24 2:30 PM	Sun	Jan 31
201	COMMON Duct cleaning	100%	1 day	Sun 12/15/24 4:00 PM	Mon 12/16/24 4:00 PM	Sun	Mon 16
202	FGD common duct and mist eliminator cleaning and inspection	100%	1 day	Sun 12/15/24 4:00 PM	Mon 12/16/24 4:00 PM	Sun	Mon 16
203	Combustion air and flue gas Maintenance	100%	13.25 days	Sun 12/15/24 4:00 PM	Sat 12/28/24 10:00 PM	Sun	Jan 28
204	COMMON Duct cleaning and Inspection	100%	2 days	Sun 12/15/24 4:00 PM	Tue 12/17/24 4:00 PM	Sun	Tue 17
205	Cleaning fly ash by Vacuum truck	100%	2 days	Mon 12/16/24 8:00 AM	Wed 12/18/24 8:00 AM	Mon	Wed 18
206	AH-B	100%	1 day	Mon 12/16/24 8:00 AM	Tue 12/17/24 8:00 AM	Mon	Tue 17
207	AH-A	100%	1 day	Tue 12/17/24 8:00 AM	Wed 12/18/24 8:00 AM	Tue	Wed 18
208	Cleaning by high pressure water	100%	4 days	Tue 12/17/24 8:00 AM	Sat 12/21/24 8:00 AM	Tue	Sat 21
209	AH-B	100%	2 days	Tue 12/17/24 8:00 AM	Thu 12/19/24 8:00 AM	Tue	Thu 19
210	AH-A	100%	2 days	Thu 12/19/24 8:00 AM	Sat 12/21/24 8:00 AM	Thu	Sat 21
211	AH A	100%	7.5 days	Thu 12/19/24 8:00 AM	Thu 12/26/24 8:00 PM	Thu	Jan 26
212	Install scaffolding below cold end element for inspection	100%	2 days	Thu 12/19/24 8:00 AM	Sat 12/21/24 8:00 AM	Thu	Sat 21
213	As found location of Soot Blowing system	100%	1 day	Sat 12/21/24 8:00 AM	Sun 12/22/24 8:00 AM	Sat	Sun 22
214	Sampling remove and install 1 sector of hot end, intermediate and cold end element for weight measurement and inspection	100%	3 days	Sun 12/22/24 8:00 AM	Wed 12/25/24 8:00 AM	Sun	Wed 25
215	Inspection and replacement of seal plates	100%	1 day	Wed 12/25/24 8:00 AM	Thu 12/26/24 8:00 AM	Wed	Thu 26
216	Remove scaffolding and close man hole	100%	0.5 days	Thu 12/26/24 8:00 AM	Thu 12/26/24 8:00 PM	Thu	Thu 26
217	AH B	100%	7.5 days	Sat 12/28/24 8:00 AM	Sat 12/28/24 8:00 PM	Sa	Sat 28
218	Install scaffolding below cold end element for inspection	100%	2 days	Sat 12/28/24 8:00 AM	Mon 12/23/24 8:00 AM	Sat	Mon 23
219	As found location of Soot Blowing system	100%	1 day	Mon 12/23/24 8:00 AM	Tue 12/24/24 8:00 AM	Mon	Tue 24
220	Sampling remove and install 1 sector of hot end, intermediate and cold end element for weight measurement and inspection	100%	2 days	Tue 12/24/24 8:00 AM	Thu 12/26/24 8:00 AM	Tue	Thu 26
221	Inspection and replacement of seal plates	100%	2 days	Thu 12/26/24 8:00 AM	Sat 12/28/24 8:00 AM	Thu	Sat 28
222	Remove scaffolding and close man hole	100%	0.5 days	Sat 12/28/24 8:00 AM	Sat 12/28/24 8:00 PM	Sa	Sat 28
223	AH Fire fighting system test	100%	2 hrs	Sat 12/28/24 8:00 PM	Sat 12/28/24 10:00 PM	Sa	Sat 28
224	ESP plant	99%	16.27 days	Sun 12/15/24 8:00 AM	Tue 12/31/24 2:30 PM	Sun	Jan 31
225	Continued Rapping by OPS	100%	1.75 days	Sun 12/15/24 8:00 AM	Tue 12/17/24 2:00 AM	Sun	Tue 17
226	Manual transfer ash by OPS	100%	1 day	Sun 12/15/24 8:00 AM	Mon 12/16/24 8:00 AM	Sun	Mon 16
227	ESP: B	100%	12.25 days	Mon 12/16/24 8:00 AM	Sat 12/28/24 2:00 PM	Mon	Jan 28
228	Vacuum truck cleaning	100%	1 day	Mon 12/16/24 8:00 AM	Tue 12/17/24 8:00 AM	Mon	Tue 17
229	Pre-Rapping test	100%	1 day	Mon 12/16/24 8:00 AM	Tue 12/17/24 8:00 AM	Mon	Tue 17
230	Internal inspection and repairing	100%	9 days	Tue 12/17/24 8:00 AM	Thu 12/26/24 8:00 AM	Tue	Jan 26
231	Final inspection	100%	6 hrs	Thu 12/26/24 8:00 AM	Thu 12/26/24 2:00 PM	Thu	Jan 26
232	Final rapping test /Close man hole	100%	1.5 days	Thu 12/26/24 2:00 PM	Sat 12/28/24 2:00 AM	Thu	Sat 28
233	Final Vacuum truck cleaning ESP hopper by OPS	100%	0.5 days	Sat 12/28/24 2:00 AM	Sat 12/28/24 2:00 PM	Sa	Sat 28
234	ESP: A	100%	12.54 days	Mon 12/16/24 8:00 AM	Sat 12/28/24 9:00 PM	Mon	Jan 28
235	Vacuum truck cleaning	100%	1 day	Mon 12/16/24 8:00 AM	Tue 12/17/24 8:00 AM	Mon	Tue 17
236	Pre-Rapping test	100%	1 day	Mon 12/16/24 8:00 AM	Tue 12/17/24 8:00 AM	Mon	Tue 17

<div>Task</div> <div>Critical Task</div> <div>Milestone</div> <div>Summary</div> <div>Rollup Task</div> <div>Rollup Critical Task</div> <div>Rollup Milestone</div>	<div>Rollup Progress</div> <div>Split</div> <div>External Tasks</div> <div>Project Summary</div> <div>Group By Summary</div> <div>Inactive Task</div> <div>Inactive Milestone</div>	<div>Inactive Milestone</div> <div>Manual Task</div> <div>Duration-only</div> <div>Manual Summary Rollup</div> <div>Manual Summary</div> <div>Start-only</div>	<div>Final-only</div> <div>External Tasks</div> <div>External Milestone</div> <div>Critical</div> <div>Critical Split</div> <div>Baseline</div> <div>Baseline Milestone</div>	<div>Progress</div> <div>Deadline</div> <div>Progress</div> <div>Deadline</div>
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Project: Unit 2 Execution Plan
Date: Mon 12/30/24 10:55 PM

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BLCP POWER

2024 unit 2 Draft Outage Schedule

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ID	Task Name	% Complete	Duration	Start	Finish	Sat 11/1/2025						
						S	S	N	S	N	S	M
357	No.6 HP feed water heater Internal inspection	100%	15.04 days	Sun 12/15/24 12:00 AM	Mon 12/30/24 1:00 AM							
358	Install scaffolding for open manhole	100%	0.5 days	Sun 12/09/24 12:00 AM	Sun 12/15/24 12:00 AM	Sun	12	15				
359	Remove insulation cladding around man hole	100%	0.5 days	Sun 12/15/24 12:00 PM	Mon 12/16/24 12:00 AM	Sun	15					
360	Remove diaphragm of manhole by machine	100%	2 days	Mon 12/16/24 12:00 AM	Wed 12/18/24 12:00 AM	Mon						
361	Cooling	100%	0.5 days	Wed 12/18/24 12:00 AM	Wed 12/18/24 12:00 PM	Wed	18					
362	Remove partition cover	100%	0.5 days	Wed 12/18/24 12:00 PM	Thu 12/19/24 12:00 AM	Wed	18					
363	Remove perforated plate	100%	0.5 days	Wed 12/18/24 12:00 PM	Thu 12/19/24 12:00 AM	Wed	18					
364	Tube cleaning (1500 tubes)	100%	3 days	Thu 12/19/24 12:00 AM	Sun 12/22/24 12:00 AM	Thu	19					
365	Tube dry out by air blow	100%	1 day	Sun 12/22/24 12:00 AM	Mon 12/23/24 12:00 AM	Sun	22					
366	NDT RVI	100%	0.5 days	Mon 12/23/24 12:00 AM	Mon 12/23/24 12:00 PM	Mon	23					
367	NDT PT	100%	17 hrs	Mon 12/23/24 12:00 AM	Mon 12/23/24 5:00 PM	Mon	23					
368	NDT RFT & IRIS	100%	1 day	Mon 12/23/24 5:00 PM	Tue 12/24/24 5:00 PM	Mon	23					
369	Repaired	100%	2 days	Tue 12/24/24 5:00 PM	Tue 12/26/24 5:00 PM	Tue	24					
370	Assembly partition cover	100%	1 day	Thu 12/26/24 5:00 PM	Fri 12/27/24 5:00 PM	Thu	26					
371	Assembly perforated plate	100%	1 day	Thu 12/26/24 5:00 PM	Fri 12/27/24 5:00 PM	Thu	26					
372	Re-welding diaphragm of manhole & close manhole	100%	1 day	Fri 12/27/24 5:00 PM	Sat 12/28/24 5:00 PM	Fri	27					
373	Pressure test on tube side by demin. Water 200 bar (Hydro test)	100%	1 day	Sat 12/28/24 5:00 PM	Sun 12/29/24 5:00 PM	Sat	28					
374	De-Isolate system and cancel safety document	100%	1 hr	Sun 12/29/24 5:00 PM	Sun 12/29/24 6:00 PM	Sun	29					
375	Re-install insulation&Cladding	100%	2 hrs	Sun 12/29/24 6:00 PM	Sun 12/29/24 8:00 PM	Sun	29					
376	Remove scaffolding	100%	5 hrs	Sun 12/29/24 8:00 PM	Mon 12/30/24 1:00 AM	Sun	29					
377												
378	No.7 HP feed water heater water packing	100%	14 days	Sun 12/15/24 4:00 AM	Sun 12/29/24 4:00 AM	Sun	15					
379	No.8 HP feed water heater water packing	100%	14 days	Sun 12/15/24 4:00 AM	Sun 12/29/24 4:00 AM	Sun	15					
380	Oil Purifier Repair Painting	90%	9 days	Fri 12/20/24 8:00 AM	Sun 12/29/24 8:00 AM	Fri	20					
381	Remove equipment & protection	100%	0.5 days	Fri 12/20/24 8:00 AM	Fri 12/20/24 8:00 PM	Fri	20					
382	Mobilization and Site Set Up / Set Up Electrical	100%	0.5 days	Fri 12/20/24 8:00 PM	Sat 12/21/24 8:00 AM	Fri	20					
383	Manufacturing process product	100%	4.5 days	Fri 12/20/24 8:00 PM	Wed 12/25/24 8:00 AM	Fri	20					
384	Protection Area	100%	1 day	Wed 12/25/24 8:00 AM	Thu 12/26/24 8:00 AM	Wed	25					
385	Remove Damaged Lining	100%	1 day	Wed 12/25/24 8:00 AM	Thu 12/26/24 8:00 AM	Wed	25					
386	Surface Preparation & Surface Inspection	100%	3 days	Wed 12/26/24 8:00 AM	Sat 12/28/24 8:00 AM	Wed	26					
387	Install New Coating System	100%	3 days	Thu 12/26/24 8:00 AM	Sun 12/29/24 8:00 AM	Thu	26					
388	Final Visual Inspect and Handover by Spark Test and DFT	80%	1 day	Sat 12/28/24 8:00 AM	Sun 12/29/24 8:00 AM	Sat	28					
389	CRH spool pipe (As found RH inspection results and confirm to TB on 22 Dec 24)	100%	8.17 days	Sun 12/22/24 12:00 AM	Mon 12/30/24 4:00 AM							
390	Install scaffolding and remove insulation	400%	1 day	Sun 12/22/24 12:00 AM	Mon 12/23/24 12:00 AM	Sun	22	23				
391	Remove spool pipe and install blind flange	400%	2 days	Mon 12/23/24 12:00 AM	Wed 12/25/24 12:00 AM	Mon						
392	Drain water for RH system	400%	4 hrs	Sat 12/28/24 4:00 AM	Sat 12/28/24 8:00 AM	Sat	28					
393	Remove Blind Flange & install RH spool pipe;	400%	2 hrs	Sat 12/28/24 4:00 AM	Sun 12/29/24 4:00 AM	Sat	28					
394	Install turbine	400%	1 day	Sun 12/29/24 4:00 AM	Mon 12/30/24 4:00 AM	Sun	29					
395	Steam Turbine water ingress protection test	100%	0.25 days	Sun 12/15/24 12:00 AM	Sun 12/15/24 6:00 AM	Sun	15					
396	Balance Of Plant Maintenance	100%	14.58 days	Sun 12/15/24 12:00 AM	Sun 12/29/24 2:00 PM							
397	Intake & Outfall	100%	13.25 days	Sun 12/15/24 12:00 AM	Sat 12/28/24 6:00 AM							
				</								

BLCP POWER

2024 unit 2 Draft Outage Schedule

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ID	Task Name	% Complete	Duration	Start	Finish	S	S	S	S	S	M
505	Replace seal air gasket of scraper	100%	1 day	Fri 12/20/24 9:00 PM	Sat 12/21/24 9:00 PM						
506	Tightening all bolts on the planetary gear	100%	1 day	Fri 12/20/24 9:00 PM	Sat 12/21/24 9:00 PM						
507	Install scaffolding for replace bottom liner	100%	1 day	Sat 12/21/24 9:00 PM	Sun 12/22/24 9:00 PM						
508	Replace bottom liner for separator	100%	2 days	Sun 12/22/24 9:00 PM	Tue 12/24/24 9:00 PM						
509	Remove scaffolding for replace bottom liner	100%	0,5 days	Tue 12/24/24 9:00 PM	Wed 12/25/24 9:00 AM						
510	Lifting install journal roller and close journal cover	100%	1 day	Wed 12/25/24 9:00 AM	Thu 12/26/24 9:00 AM						
511	Install scaffolding after install all journal roller	100%	0,5 days	Wed 12/25/24 9:00 PM	Thu 12/26/24 9:00 AM						
512	Tightening all bolts lock journal cover all journal roller	100%	0,5 days	Wed 12/25/24 9:00 PM	Thu 12/26/24 9:00 AM						
513	Install limit switch for Outlet valve	100%	0,5 days	Thu 12/26/24 9:00 AM	Thu 12/26/24 9:00 PM						
514	Adjust gap journal roller with grinding table	100%	0,5 days	Thu 12/26/24 9:00 AM	Thu 12/26/24 9:00 PM						
515	Adjust lubricant oil level all journal roller	100%	0,5 days	Thu 12/26/24 9:00 AM	Thu 12/26/24 9:00 PM						
516	Calibration roll lift for journal roller	100%	0,5 days	Thu 12/26/24 9:00 AM	Thu 12/26/24 9:00 PM						
517	Adjust gap hydraulic hydraulic loading system	100%	1 day	Thu 12/26/24 10:00 PM	Fri 12/27/24 10:00 PM						
518	Annual Inspection, Repairs and Modifications to Pulverizer - 2C	100%	13 days	Sun 12/15/24 9:00 AM	Sat 12/28/24 9:00 AM						
519	PM 8,000 hrs for internal pulverize	100%	5 days	Thu 12/19/24 9:00 AM	Tue 12/24/24 9:00 AM						
520	PM 8,000 hrs for hydraulic system , lubrication system	100%	2 days	Sat 12/21/24 9:00 AM	Mon 12/23/24 9:00 AM						
521	Pulverizer-2C (replace journal roller no.1&2)	100%	13 days	Sun 12/15/24 9:00 AM	Sat 12/28/24 9:00 AM						
522	Dismantle and remove limit switch for Outlet valve	100%	0,5 days	Sun 12/15/24 9:00 AM	Sun 12/15/24 9:00 PM						
523	Lifting journal roller for replacementframe support deflector middle housing	100%	1 day	Sun 12/15/24 9:00 AM	Mon 12/16/24 9:00 AM						
524	Replace frame support deflector liner for middle housing	100%	5 days	Sun 12/15/24 9:00 AM	Fri 12/20/24 9:00 AM						
525	Replace liner ring for journal roller no3 and re-lighten bolts planetary gear	100%	2 days	Thu 12/19/24 9:00 AM	Fri 12/21/24 9:00 AM						
526	Replace liner protection plate journal roller 2 sets	100%	3 days	Tue 12/17/24 9:00 AM	Fri 12/20/24 9:00 AM						
527	Install scaffolding for replace bottom liner and lower cone	100%	0,5 days	Sat 12/21/24 9:00 AM	Sat 12/21/24 9:00 PM						
528	Replaced bottom liner of separator	100%	2 days	Tue 12/24/24 9:00 AM	Thu 12/26/24 9:00 AM						
529	Replaced lower cone of separator	100%	4 days	Sat 12/21/24 9:00 AM	Wed 12/25/24 9:00 AM						
530	Remove scaffolding after complete work replace bottom liner	100%	0,5 days	Wed 12/25/24 9:00 PM	Thu 12/26/24 9:00 AM						
531	Replace seal air gasket of scraper	100%	1 day	Thu 12/26/24 9:00 AM	Fri 12/27/24 9:00 AM						
532	Lifting install journal roller and close journal cover	100%	1 day	Fri 12/27/24 9:00 AM	Sat 12/28/24 9:00 AM						
533	Install scaffolding after install all journal roller	100%	0,5 days	Fri 12/27/24 9:00 AM	Fri 12/27/24 9:00 PM						
534	Install limit switch for Outlet valve	100%	0,5 days	Fri 12/27/24 9:00 AM	Fri 12/27/24 9:00 PM						
535	Adjust gap journal roller with grinding table	100%	1 day	Fri 12/27/24 9:00 AM	Sat 12/28/24 9:00 AM						
536	Install hydraulic cylinder loading for journal roller	100%	0,5 days	Fri 12/27/24 9:00 AM	Fri 12/27/24 9:00 PM						
537	Adjust lubricant oil level all journal roller	100%	0,5 days	Fri 12/27/24 9:00 AM	Fri 12/27/24 9:00 PM						
538	Calibration roll lift for journal roller	100%	0,5 days	Fri 12/27/24 9:00 AM	Fri 12/27/24 9:00 PM						
539	Adjust gap hydraulic hydraulic loading system	100%	1 day	Thu 12/26/24 10:00 PM	Fri 12/27/24 10:00 PM						
540	Annual Inspection, Repairs and Modifications to Pulverizer - 2D	100%	13 days	Sun 12/15/24 9:00 AM	Sat 12/28/24 9:00 AM						
541	PM 8,000 hrs for internal pulverize	100%	5 days	Thu 12/19/24 9:00 AM	Tue 12/24/24 9:00 AM						
542	PM 8,000 hrs for hydraulic system , lubrication system	100%	2 days	Sat 12/21/24 9:00 AM	Mon 12/23/24 9:00 AM						
543	Pulverizer-2D (Replace rotary separator complete set) Start 12 DEC 2024	100%	13 days	Sun 12/15/24 9:00 AM	Sat 12/28/24 9:00 AM						

Task

Critical Task

Milestone

Summary

Rollup Up Task

Rollup Up Critical Task

Rollup Up Milestone

Roll Up Progress

External Tasks

Project Summary

Group By Summary

Inactive Task

Inactive Milestone

Inactive Milestone

Manual Task

Duration-only

Manual Summary

Start-only

Finish-only

External Tasks

External Milestone

Critical

Critical Split

Baseline

Baseline Milestone

Baseline Summary

Deadline

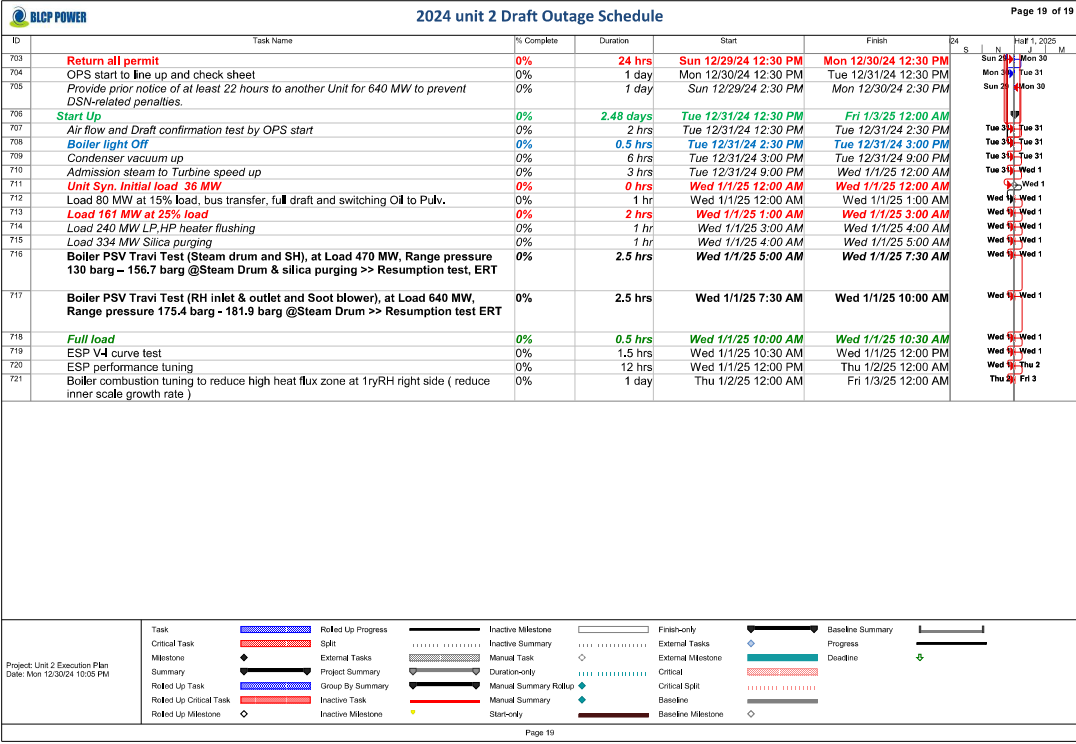
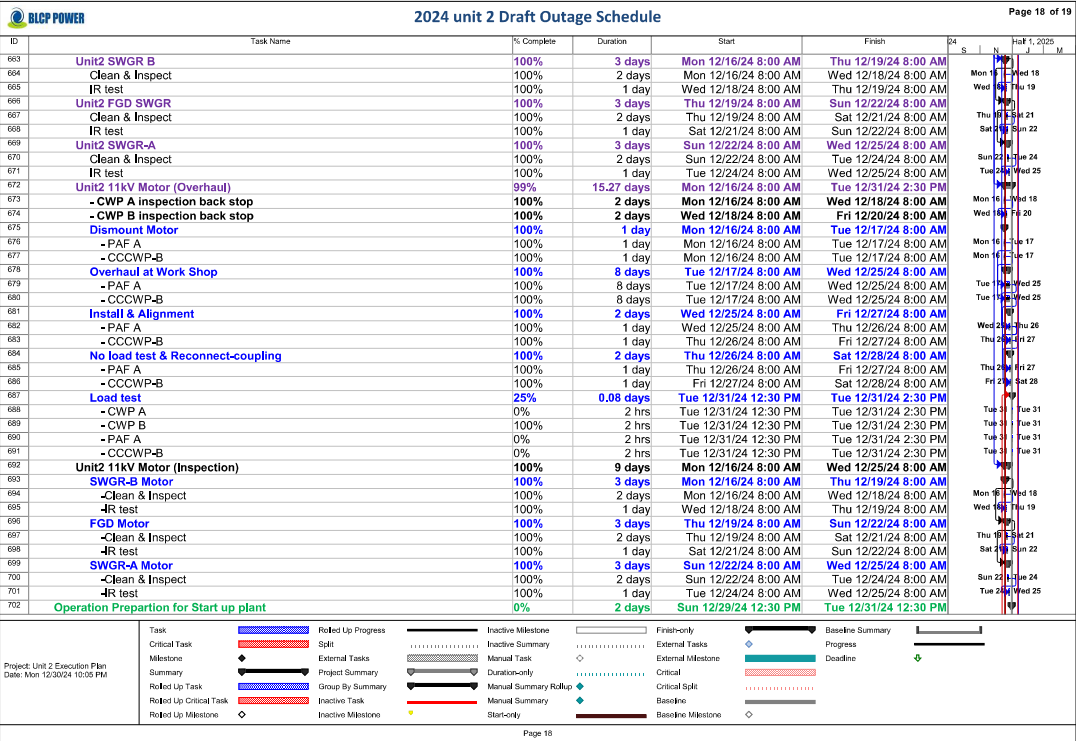
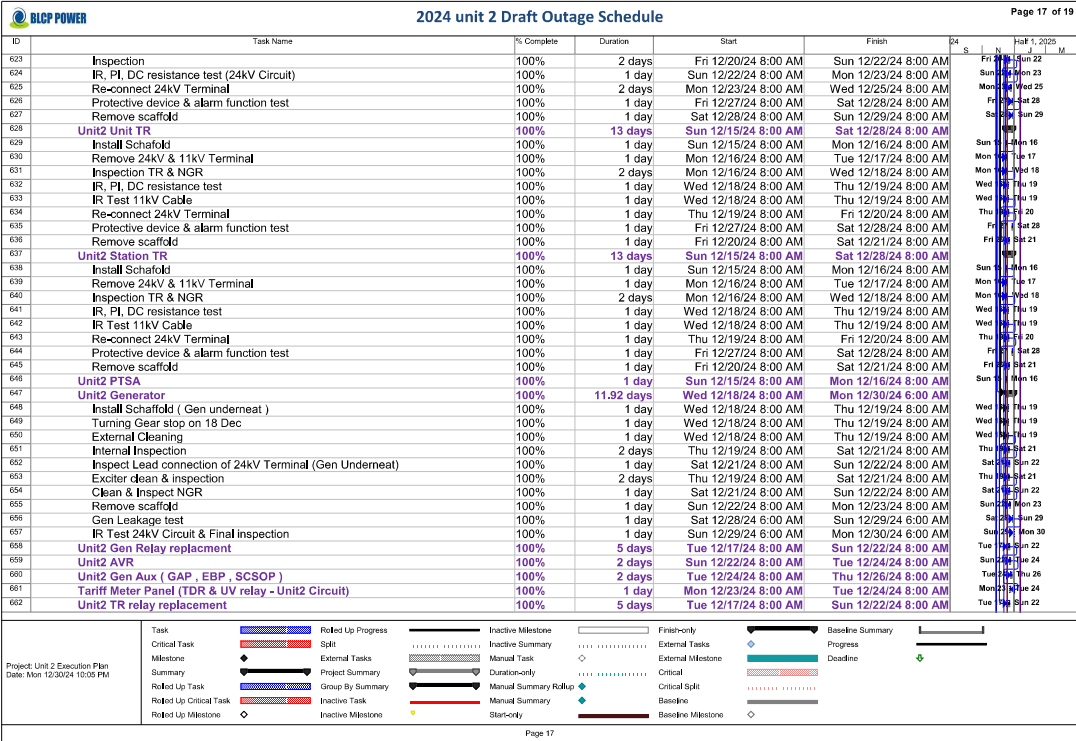
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Project: Unit 2 Execution Plan

Date: Mon 12/30/24 10:05 PM

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BLCP POWER		2024 unit 2 Draft Outage Schedule				Page 16 of 25			
ID	Task Name	% Complete	Duration	Start	Finish	Half 1, 2025			
583	Pulv 2D - Dismantle/clean/inspect and reassembly 2 sets	100%	2 days	Fri 12/20/24 9:00 AM	Sun 12/22/24 9:00 AM	Fri 12/20/24	Sat 12/21/24	Sun 12/22/24	Mon 12/23/24
584	Pulv 2E - Dismantle/clean/inspect and reassembly 1 sets	100%	2 days	Sun 12/22/24 9:00 AM	Tue 12/24/24 9:00 AM	Sun 12/22/24	Mon 12/23/24	Tue 12/24/24	Wed 12/25/24
585	Pulv 2F - Dismantle/clean/inspect and reassembly 5 sets	100%	2 days	Tue 12/24/24 9:00 AM	Thu 12/26/24 9:00 AM	Tue 12/24/24	Wed 12/25/24	Thu 12/26/24	Fri 12/27/24
586	Annual inspection primary Hot & Cold air damper for Pulverizer system	100%	10 days	Mon 12/16/24 9:00 AM	Thu 12/26/24 9:00 AM	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24
587	Inspect primary Hot shut-off Damper for PUL 2A & 2B	100%	4 days	Mon 12/16/24 9:00 AM	Fri 12/20/24 9:00 AM	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24
588	Inspect primary Hot shut-off Damper for PUL 2C & 2D	100%	4 days	Thu 12/19/24 9:00 AM	Mon 12/23/24 9:00 AM	Thu 12/19/24	Fri 12/20/24	Sat 12/21/24	Sun 12/22/24
589	Inspect primary Hot shut-off Damper for PUL 2E & 2F	100%	4 days	Sun 12/22/24 9:00 AM	Thu 12/26/24 9:00 AM	Sun 12/22/24	Mon 12/23/24	Tue 12/24/24	Wed 12/25/24
590	Annual inspection Outlet valve for Pulverizer system	100%	11 days	Sun 12/15/24 9:00 AM	Thu 12/26/24 9:00 AM	Sun 12/15/24	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24
591	Disconnect and remove limit switch for Outlet valve	100%	1 day	Sun 12/15/24 9:00 AM	Mon 12/16/24 9:00 AM	Sun 12/15/24	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24
592	Inspect Outlet valve for PUL 2A & 2B	100%	3 days	Mon 12/16/24 9:00 AM	Thu 12/19/24 9:00 AM	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24
593	Inspect Outlet valve for PUL 2C & 2D	100%	3 days	Thu 12/19/24 9:00 AM	Sun 12/22/24 9:00 AM	Thu 12/19/24	Fri 12/20/24	Sat 12/21/24	Sun 12/22/24
594	Inspect Outlet valve for PUL 2E & 2F	100%	3 days	Sun 12/22/24 9:00 AM	Wed 12/25/24 9:00 AM	Sun 12/22/24	Mon 12/23/24	Tue 12/24/24	Wed 12/25/24
595	Install limit switch for Outlet valve	100%	1 day	Wed 12/25/24 9:00 AM	Thu 12/26/24 9:00 AM	Wed 12/25/24	Thu 12/26/24	Fri 12/27/24	Sat 12/28/24
596	Annual inspection Dust collector for coal bunker - unit 2 (floor 6)	99%	13 days	Mon 12/16/24 9:00 AM	Sun 12/29/24 9:00 AM	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24
597	Internal cleaning suction pipe for dust collector	99%	13 days	Mon 12/16/24 9:00 AM	Sun 12/29/24 9:00 AM	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24
598	EPT Maintenance	99%	16.27 days	Sun 12/15/24 8:00 AM	Tue 12/31/24 2:30 PM	Sun 12/15/24	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24
599	Support work for apply portable earth at 500KV Line#1	100%	1 day	Sun 12/15/24 8:00 AM	Mon 12/16/24 8:00 AM	Sun 12/15/24	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24
600	Apply simulation to Gen relay protection panel	100%	1 day	Sun 12/15/24 8:00 AM	Mon 12/16/24 8:00 AM	Sun 12/15/24	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24
601	Bay6 500KV GIS	100%	4 days	Sun 12/15/24 8:00 AM	Thu 12/19/24 8:00 AM	Sun 12/15/24	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24
602	Clean & inspect Bushing LA & CVT (by bucket elevator)	100%	2 days	Mon 12/16/24 8:00 AM	Wed 12/18/24 8:00 AM	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24
603	Test relay & Meter	100%	3 days	Sun 12/15/24 8:00 AM	Wed 12/18/24 8:00 AM	Sun 12/15/24	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24
604	Clean & Inspect GIS	100%	2 days	Tue 12/17/24 8:00 AM	Thu 12/19/24 8:00 AM	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24	Fri 12/20/24
605	Replace 87L relay	100%	3 days	Mon 12/16/24 8:00 AM	Thu 12/19/24 8:00 AM	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24
606	Bay4 500KV GIS	100%	7 days	Mon 12/16/24 8:00 AM	Mon 12/23/24 8:00 AM	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24
607	Install Scaffold	100%	1 day	Mon 12/16/24 8:00 AM	Tue 12/17/24 8:00 AM	Mon 12/16/24	Tue 12/17/24	Wed 12/18/24	Thu 12/19/24
608	Oil sampling for OF cable	100%	1 day	Fri 12/20/24 8:00 AM	Sat 12/21/24 8:00 AM	Fri 12/20/24	Sat 12/21/24	Sun 12/22/24	Mon 12/23/24



ภาคผนวก ง-2

ข้อกำหนดการทำงานในบริเวณที่มีเสียงดัง

BLCP INSTRUCTION		BLCP	I	SHE	01	007	I
Title: Noise protection							
Author(s):	Safety and Security Engineer		Date		15 Jan 2024		
Owner(s):	Safety and Health Engineer		Date		16 Jan 2024		
Endorsed By:	SHE Manager		Date		19 Jan 2024		
Endorsed By:	Deputy General Manager		Date		20 Jan 2024		
Endorsed By:	General Manager		Date		21 Jan 2024		
Approved By:	Managing Director						
Next Review Target:	February 2026						
Agreed Procedure:		No					
Associated Documents:	BLCPP-MP-SHE-01-003 Hearing Conservation Policy BLCPP-P-SHE-01-001 Hazards Identification, Risk Assessment and Control of Risks BLCPP-P-SHE-01-003 Use of Personal Protective Equipment and Safety Equipment BLCPP-F-SHE-01-003 Noise Risk Assessment BLCPP-DCC-LAW-0600 กฎกระทรวงกำหนดมาตรฐานในการบริหาร จัดการ และ ดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับ พลังงานเสียง และสั่น พ.ร.บ. 2550 BLCPP-DCC-LAW-0643 ประกาศกระทรวงมหาดไทยว่าด้วยการข่มขู่และห้ามไม่ให้บุคคลอื่นกระทำความผิดเกี่ยวกับความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ร.บ. 2550 หรือต้องร่วมแจ้งหน่วยงานและหน่วยงานที่เกี่ยวข้องให้ทราบ BLCPP-DCC-LAW-0644 ประกาศกรมสวัสดิการและคุ้มครองแรงงาน เรื่อง คุ้มครองความปลอดภัยในการทำงานเกี่ยวกับเสียง พ.ร.บ. 2550						
Change History							
Rev	Date	Author	Owner	Endorsed By	Authorized By	Modifications/Reason for change	Status
A	11/09/06	RWD	Safety Engineer	N/A	SHE Mgr	First Issue	Withdrawn
B	28/11/06	RWD	Safety Engineer	N/A	SHE Mgr	Second Issue	Withdrawn
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Noise Protection		Page 1 of 7			BLCPP-I-SHE-01-007-I		

C	18/10/10	PM	SHM	SHM	GM	1. Issue to BLCPP template and new coding (refer to BLCPP-P-CS-01-001) 2. Add Hearing conservation program	Withdrawn
D	06/12/12	Safety Engineer	SH Mgr.	SH Mgr.	GM	Adding hearing protection must be wore on item # 5	Withdrawn
E	05/03/15	Safety Engineer	SH Mgr.	OD	GM	Revised the Control of record Add Disposable hearing protection for CCB & Work shop	Withdrawn
F	22/03/17	Safety Engineer	SH Mgr.	OD	DGM	Add definition of TWA, dB (A) and table summarizes the differences between ear plugs and ear muffs	Withdrawn
G	05/04/19	Safety Engineer	SH Mgr.	OD	GM	<ul style="list-style-type: none"> Adding Decibel, TWA, Hearing Protection Zone, Sound level meter, Noise dosimeter into tem#3 Adding hearing conservation program into item #4 Updated standard limit of noise level into item #5 	Withdrawn
H	25/02/22	Safety and Security Engineer/ Occupational Health Engineer	SH Mgr.	DGM/GM	MD	1. Revised Author responsibility from Safety Engineer to Safety and Security Engineer and Occupational Health Engineer 2. Revised Endorsed responsibility from OD to DGM and GM 3. Revised Approved responsibility from GM to MD 4. Revised instruction coding from SH to SHE	Withdrawn
I		Safety and Security Engineer/ Safety and Health Engineer	SHE Mgr.	DGM/ GM	MD	Regular review with minor updated by 1) Added an associated documents (BLCPP-DCC-LAW-0600 and BLCPP-DCC-LAW-0644) 2) Added the meaning of an Audiometry Test into item 3 3) Added the details of the legal requirement about impact or impulse noise and sound level measurement standards to item 5. 4) Deleted the repeated item for items 6-7 and the repeated information in item 5.	Issued

CONTENTS

1. Introduction/Purpose
 2. Scope
 3. Definition
 4. Responsibilities
 5. Instruction
 6. Training
 7. Control of Records
 8. Review and Audit
- Appendix
Appendix A: Ear plugs and ear muffs comparison for using

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Noise Protection

BLCPP-I-SHE-01-007-I

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1. Introduction/Purpose

This Instruction sets out the precautions to be considered when working in the noise exposure area at BLCPP Power Station.

2. Scope

This Instruction to be considered as part of the control measures when working is required noise risk assessment. The risk of noise induced hearing loss can be reduced by the implementation of the precautions, control of noise source, or passive control by effective PPE used.

3. Definition

Time-weighted average (TWA) sound level - That sound level, which is constant over an 8 hours of exposure would result in the same noise dose as is measured.

Decibel (dB) - Unit of measurement of sound level.

dB (A) - A decibel, or dB, is an appraised signal strength in terms of relative loudness heard by the ears.

Action level - An 8 hours time-weighted average of 85 decibels measured on the A-scale, slow response of noise level at working area.

Criterion sound level - A sound level of 85 decibels.

Noise dosimeter - An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

Representative exposure - Measurements of an employee's noise dose or 8 hours time-the weighted average sound level that the employers deem to be representative of the exposures of other staff in the workplace.

Sound level meter - An instrument for the measurement of sound level.

Hearing Protection Zones - A working area that noise level exceeds standard limit or noise level over 85 dB (A).

Audiometry Test - is a type of hearing test that is performed to measure changes in a worker's hearing ability over time. An audiometry exam evaluates your hearing function in terms of tone, balance and sound intensity. It focuses on the functioning of the inner ear. The human ear can perceive sounds with tones that range between 20 and 20,000 Hertz.

4. Responsibilities

Nominated Supervisors are responsible for determining what control measures are required to reduce the risk to the lowest level reasonably practicable whenever work activities are exposed to noise, a written noise risk assessment must be carried out by a Competent Risk

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Assessor. Safety and Security Engineer/ Safety and Health Engineer are responsible for providing risk assessment training and auditing compliance with this instruction.

SHE Team is responsible to conduct the hearing conservation program in case of the Time Weighted Average-TWA (the daily personal noise exposure for a normal 8 hour working day) of 85 dB (A) is exceeded.

The hearing conservation program consists of:

- Hearing conservation policy
- Noise monitoring practice
- Hearing monitoring
- Noise contour map with signs and noise level alert communication.
- Noise level control with personal protection equipment (PPE) enforcement.
- Audiometric sting test and compare the result with baseline audiogram.
- Review noise management program.

All staff are required to wear hearing protection in Hearing Protection Zones, to use and maintain such equipment by training and instruction provided.

All staff are required to report plant defects that are producing high noise levels to their line manager immediately so that arrangements can be made for a noise assessment to be carried out.

5. Instruction

To control the exposure of all staff, the contractors and visitors engaged by BLCPP Power Station to noise, the following instruction will be applied:

- Where the Time Weighted Average-TWA (the daily personal noise exposure for a normal 8 hour working day) of 85 dB(A) is exceeded, engineering solutions will be applied where practical to do so, to reduce the noise to the lowest level reasonably practical.
- Where the peak sound pressure level of impact or impulse noise exceeded 140 dB(A) or continuous steady noise exceeded 115 dB(A), the job shall be stopped until it is improved in accordance with standard requirements, and engineering solutions shall be applied or managed to control the sound level that staff will be exposed to not exceed the standard requirement. If none of the above can be actuated, PPE shall be provided, and a warning sign installed.
- In plant areas where the noise intensity cannot be reduced to TWA of 85 dB(A), then these areas will be designated as Hearing Protection Zones in which the wearing of hearing protection will be mandatory when the plant is running.
- Noise surveys will be undertaken by the Safety and Health department in all plant areas by a pre-determined plan at designated positions around the plant.
- Sound level measurement shall use standard equipment of the International Electrotechnical Commission or equivalent as follows, and calibration shall be performed by a noise calibrator that complies with the IEC 60942 standards.
 - The sound level meter shall comply with IEC 61672 or IEC 651 Type 2 standards.
 - The noise dosimeter shall comply with the IEC 61252 standard.

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- The impulse or impact noise meter shall comply with the IEC 61672 or IEC 60804 standard.

- The results of the noise surveys will be communicated to all persons who may be affected.
- All BLCP staff will undergo audiometric testing yearly for the first years following their baseline audiogram taken at the time of joining BLCP Power Station and every year thereafter.
- Contractors will be advised in writing at the Tendering Stage of the Contract of the requirement to wear hearing protection in Hearing Protection Zones and this will be reinforced during health and safety induction courses for contractors' staff before starting work.
- BLCP Staff will be consulted with the Safety, Health and Environment department regard to the selection of hearing protection.
- All BLCP staff that exposes noise will receive training on hearing awareness by the Safety, Health and Environment department.
- BLCP staff, contractor workers who work or perform jobs at hearing protection zone that means noise level exceeded standard limit [over 85dB (A)] warning sign shall wear personal hearing protection (earplugs or earmuffs) at all working times to reduce the noise level.

Noise Risk Assessment

All staff are required to report plant defects that are producing high noise levels to their line manager immediately so that arrangements can be made for a noise assessment to be carried out. Noise risk assessments are to be carried out by the nominated supervisor when their staff report high noise levels or when required by using Noise Risk Assessment Form (BLCP-F-SHE-01-003).

Hearing Protection Zones

Hearing Protection Zones are areas of the plant where noise intensity levels exceed TWA of 85 dB (A) for 8 hours when the plant is running. Inside Hearing Protection Zones, all persons must wear hearing protection (earplugs or earmuffs) when the plant is running. These zones will be designated at every point of access by the following safety sign and the words, "Hearing Protection Must Be Worn".



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Hearing Protection for staff and visitors

Disposable hearing protection equipment will be available at the following locations:

- Administration Building (the 1st floor at the exit door near the driver, maid room, and first aid room)
- Control Center Building (CCB - Main plant) 3rd floor and 1st floor in front of elevator area.
- Control Center Building (CCB - MHO)
- Turbine building (In front of the entrance of unit 2 and the side of the turbine building units 1 and 2, both left and right.)
- Workshop
- Jetty office.

Workshop. The Contractors are required to provide hearing protection for their staff and visitors requiring access to Hearing Protection Zones when the plant is running, or where noise levels exceed the standard limits or noise level over 85 dB(A).

Reference noise protection program based on local regulatory requirements such as Department of Labour Protection and Welfare (DLPW) regulation B.E. 2559 (BLCP-DCC-LAW-0600) and announcement B.E. 2561 (BLCP-DCC-LAW-0644)

6. Training

Training will be provided for the concerned Managers by the Owner of this instruction. The Managers will then cascade training to their team members as appropriate via briefing and/or on-the-job training.

7. Control of Records

All records covered within this instruction provide evidence of the ongoing operation and should be managed by the requirements of the BLCP-P-EN-12-004 Documented Information System. All records must be readily available for scrutiny and other audits.

8. Review and Audit

All BLCP Procedures and Instructions will be subject to review every two years unless the need arises before the planned review date. Additionally, this procedure will be subject to audit by BLCP-P-TBU-02-001 Safety Health Environment ISMS Audit review. Any inaccuracies or omissions in this procedure should be notified to the procedure Owner immediately.

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Appendix A: Earplugs and earmuffs comparison for using

The following table summarizes the differences between earplugs and earmuffs.

Comparison of Hearing Protection	
Earplugs	Earmuffs
Advantages: <ul style="list-style-type: none"> • small and easily carried • convenient to use with other personal protection equipment (can be worn with earmuffs) • more comfortable for long-term wear in hot, humid work areas • convenient for use in confined work areas 	Advantages: <ul style="list-style-type: none"> • less attenuation variability among users • designed so that one size fits most head sizes • easily seen at a distance to assist in the monitoring of their use • not easily misplaced or lost • maybe worn with minor ear infections
Disadvantages: <ul style="list-style-type: none"> • requires more time to fit • more difficult to insert and remove • require good hygiene practices • may irritate the ear canal • easily misplaced • more difficult to see and monitor usage 	Disadvantages: <ul style="list-style-type: none"> • less portable and heavier • more inconvenient for use with other personal protective equipment. • more uncomfortable in the hot, humid work area • more inconvenient for use in confined work areas • may interfere with the wearing of safety or prescription glasses: wearing glasses results in breaking the seal between the earmuffs and the skin and results in decreased hearing protection.



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ภาคผนวก ง-3

โครงการอนุรักษ์การได้ยินของพนักงานโรงไฟฟ้าบีแอลซีพี

BLCP POLICY		BLCP	MP	SHE	01	003	G
Title: <div>Hearing Conservation Policy</div>							
	Title	Signature		Date			
Author(s):	Occupational Health Engineer			28 Nov 2022			
Owner(s):	SHE Manager			29 Nov 2022			
Endorsed By: according to CMAM	Deputy General Manager			30 Nov 2022			
	General Manager			1 Dec 2022			
Approved By: according to CMAM	Managing Director			1 Dec 2022			
Next Review Date:	November 2024	Effective Date :		2 Dec 2022			
		Key Policies :		No			
Associated Documents:	1. BLCP-DCC-LAW-0653 หลักเกณฑ์และวิธีการจัดทำมาตรการอนุรักษ์การได้ยินในสถานประกอบกิจการ 12 มิถุนายน 2561 2. BLCP-I-SHE-01-007; Noise Protection						

Change History							
Rev	Date	Author	Owner	Endorsed By	Authorized By	Modifications/Reason for change	Status
A	8/09/10	PM	SHM	GM	MD	First Issue	Withdrawn
B	14/12/12	Safety Engineer	SHM	GM	MD	Merge the policy from six to five items	Withdrawn
C	17/08/15	Safety Engineer	SHM	GM	MD	- Add more safety engineer responsibility - Revise the review frequency to of this policy (twice years review)	Withdrawn
D	27/11/17	Safety Engineer	SHM	GM	MD	- To follow up new version of ISO 14001 requirement by change stakeholders to interested parties	Withdrawn
E	16/04/20	Assistant SH Manager	SHM	DGM/GM	MD	1. Annual review 2. Revised Author responsibility from Safety Engineer to Assistant SH Manager	Withdrawn

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						LAW-0269 : Announcement by Department of Labor Protection and Welfare for hearing conservation program B.E 2553 /ประกาศกรมสวัสดิการและคุ้มครองแรงงานเรื่อง หลักเกณฑ์และวิธีการจัดทำโครงการอนุรักษ์การได้ยินในสถานประกอบกิจการ พ.ศ. 2553 to BLCP-DCC-LAW-0653 หลักเกณฑ์และวิธีการจัดทำมาตรการอนุรักษ์การได้ยินในสถานประกอบกิจการ 12 มิถุนายน 2561	
F	26/11/21	Occupational Health Engineer	SH Mgr.	DGM/GM	MD	1. Revised Author responsibility from Assistant SH Manager to Occupational Health Engineer 2. Added DGM to Endorsed responsibility 3. Revised policy coding from SH to SHE	Withdrawn
G	2/12/22	Occupational Health Engineer	SH Mgr.	DGM/GM	MD	Regular review without change	Issued

CONTENTS

1. Introduction/Purpose
 2. Scope
 3. Definition
 4. Responsibilities
 5. Policy
 6. Training
 7. Control of Records
 8. Review and Audit
- Appendix: N/A

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1. INTRODUCTION/PURPOSE

The purpose of this policy is to define a hearing conservation policy in accordance with the Department of Labor Protection and Welfare for hearing conservation.

2. SCOPE

This policy is applicable to all activities within BLCP Power's scope of responsibility.

3. DEFINITION

Hearing conservation means the different measures taken to reduce exposure to noise, such as wearing hearing protection.

4. RESPONSIBILITY

The SH Manager is responsible for this policy and development of suitable procedures to ensure that it is successfully implemented.

The Occupational Health Engineer is responsible for coordinating the noise control and hearing conservation program, for directing periodic monitoring and evaluation of sources of potentially high noise exposure and ensuring that education and training is accomplished for relevant employees and contractors.

5. POLICY

BLCP Power Station prepare hearing conservation through the proper use of hearing protection and annual hearing test to detect early evidence of a decline in the ability to hear and according to the SHE Policy concerning the Safety, Health and the Environment of our employees, contractors, stakeholders and interested parties in accordance with Thai law on hearing conservation.

(English Version)

BLCP Power is committed to implement hearing conservation by the following means:

1. Establish and implement the Safety Health and Environment management system to comply with all relevant laws and regulations that support hearing conservation.
2. Where practicable eliminate or suppress sources of noise.
3. Perform noise monitoring and hearing surveillance. Communicate with employees, contractors and interested parties in matters of hearing conservation.
4. Encouraging all employees and interested parties to take responsibility and provide the necessary resources to support the hearing conservation program.
5. The hearing conservation program will be reviewed and updated annually in order to allow continuous improvement.

(Thai Version) บริษัท บีแอลซีพี เพาเวอร์ จำกัด มุ่งมั่นที่จะให้มีการดำเนินการด้านการอนุรักษ์การได้ยิน โดยกำหนดนโยบายการอนุรักษ์การได้ยินดังนี้

1. ดำเนินการและพัฒนาระบบการจัดการอาชีวอนามัยและความปลอดภัย ตามมาตรฐานความปลอดภัยที่เกี่ยวข้องอย่างเหมาะสมและสอดคล้องกับข้อกำหนดของกฎหมายและข้อกำหนดอื่นๆ เพื่อสนับสนุนในด้านการอนุรักษ์การได้ยิน
2. ดำเนินการลด และกำจัด แหล่งกำเนิดเสียงให้ได้มากที่สุดเท่าที่สามารถทำได้
3. ดำเนินการเฝ้าระวัง ติดตาม ตรวจสอบ พื้นที่ ที่มีเสียงดัง และสื่อสารให้พนักงาน ผู้รับเหมา รวมทั้งผู้เกี่ยวข้องทุกคนให้ทราบ
4. ส่งเสริม สนับสนุนให้พนักงานและผู้มีส่วนเกี่ยวข้องทุกคน มีส่วนร่วมและให้การสนับสนุนทรัพยากรทั้งในเรื่อง บุคลากร เวลา งบประมาณ และการฝึกอบรมที่เหมาะสมและเพียงพอ เพื่อสนับสนุนการดำเนินกิจกรรมอนุรักษ์การได้ยินที่จัดทำขึ้นในองค์กร
5. จัดให้มีการประเมินผลการดำเนินโครงการ นโยบายการอนุรักษ์การได้ยินที่กำหนดไว้ข้างต้นเป็นประจำทุกปี เพื่อให้มีการปรับปรุงอย่างต่อเนื่อง

6. TRAINING

This policy will be communicated to staff and contractors via site induction training and safety forums.

7. CONTROL OF RECORDS

There are no records associated with this policy.

8. REVIEW AND AUDIT

This policy will be reviewed and updated annually unless the need arises before the planned review date. Any hearing conservation procedures and instructions will be subject to review and audit in accordance with the requirements of BLCP-P-SHE-03-003 – Safety, Health and Environment Audit and Review. Any inaccuracies or omissions in this policy should be notified to the policy owner immediately.

ภาคผนวก จ

สำเนาเอกสารเกี่ยวกับการจัดการคุณภาพน้ำ

ภาคผนวก จ-1

แผนผังระบบรวบรวมน้ำภายในโครงการ

BLCP Drawing No. : M0-MN-GC-PP-00018	SUPPLIER DRAWING NO./ MITSUBISHI DRAWING NO. / SUPPLIER NAME 97000-2121	PLAN RECORD	REVISIONS		CHECKED	APPROVED
			Rev. No.	Description (Date)		
			14	Revised according to Plant Modification No. 1179 (the detail please see amendment) (Refer Change request # BLCP-DCC-CN-0309)		
			15	In addition, a new NaOCl skid unit includes a metering diaphragm pump, a digital flow measurement, material UPVC, inline static mixer UPVC, a control panel, and the electrical work (power cable and control) in P&ID for Potable Water. (BLCP-DCC-CN-0437)		
			16	Plant Modification No. 1438 and 1528: Project replace some portion of Raw water pipe header unit 1 and unit 2 from carbon steel pipeline to Syler pipeline. The purpose of this modification is to reduce possibility of pipe leakage from internal corrosion which affect to plant efficiency in case of could not stop leakage. This case is relate to PI-1217 which make leak and performamce of BATC belt cleaning system drop.BLCP-DCC-CN-0440		

AS BUILT

A4 x
A3 x
Total

SHEETS WITH COVER

TITLE

RAW WATER & DEMINERALIZED WATER SYSTEM FLOW DIAGRAM

BLCP DRAWING NO.

M0-MN-GC-PP-00018

REV. NO.

SUPPLIER NAME/SUPPLIER DRAWING NO./
MITSUBISHI DRAWING NO.

97000-2121

16



BLCP POWER


BLCP POWER PROJECT

AMENDMENT RECORD

REVISED	DESCRIPTION	AMENDMENT	REMARK
14	Revised according to Plant Modification # PI# 1179. The Treated waste water Zero discharge project. To install new raw water supply from raw water metering station to Clarifier (BLCP-DCC-CN-0309)	13-Jun-16	
15	Plant Modification No. 1627 Addition a new NaOCl Injection Skid for control Free residual Chlorine in Potable water for supply to Jetty Area to improvement FRC content in Potable water at Jetty around 0.2 – 0.5 ppm. (BLCP-DCC-CN-0437)	4-Oct-22	
16	Plant Modification No. 1438 and 1528: Project replace some portion of Raw water pipe header unit 1 and unit 2 from carbon steel pipeline to Syler pipeline. The purpose of this modification is to reduce possibility of pipe leakage from internal corrosion which affect to plant efficiency in case of could not stop leakage. This case is relate to PI-1217 which make leak and performamce of BATC belt cleaning system drop. BLCP-DCC-CN-0440	5-Oct-22	

ภาคผนวก จ-2

แผนผังระบบบำบัดน้ำเสียภายในโครงการ

BLCP Drawing No.: M0-MN-GN-PP-01510 SUPPLIER NAME / DRAWING NO.: 53106-1601	PLAN RECORD	REVISIONS		CHECKED	APPROVED
		Rev. No.	Description (Date)		
		4	Revised according to Plant Modification No. 437 (Addition of Sludge level transmitter) (Refer Change Request # PGS-DCC-CN-0062)		
		5	Revised according to PI No. 661 (Addition new manual valve at dehydrator sludge inlet pipe. (Refer Change Request # BLCP-DCC-CN-0116)		
		6	Revised according to Plant Modification No. 832 and wo#3713552. Modification addition new pressure control valve and maunal isolate valve for pressure control valve . (Refer Change request # BLCP-DCC-CN-0204)		
	7	Revised according to Plant Modification No. .976,977,978,979. Install permanence level indicator for calculate. (Refer Change request # BLCP-DCC-CN-0260)			
			Revised according to Plant Modification No. 769 and wo#3871927. Addition new line and isolation valve to transfer waste water between regular and irregular basin. (Refer Change request # BLCP-DCC-CN-0261)		
	8		Addition of pipeline tie line between the common discharge of Agitation Blower for the Waste Water Treatment Plant in page no. 7 of P&ID. BLCP-DCC-CN-0446		
<div style="border: 1px solid black; padding: 5px; display: inline-block;">AS BUILT</div>					
A4 x A3 x Total 10					
SHEETS WITH COVER					
TITLE					
WASTE TREATMENT PLANT FLOW DIAGRAM					
BLCP DRAWING NO.					REV. NO.
M0-MN-GN-PP-01510					
SUPPLIER DRAWING NO.					
53106-1601					8
 BLCP POWER					
BLCP POWER PROJECT					

REVISIONS	
Rev. No.	DESCRIPTION (DATE)
1	1. Added the trough and drain pipe at the bottom of cake hopper based on BLOP' comment.
	2. Added the following items as per design progress.
	1) Piping Size and Material.
	2) Legend table of piping material
	3) Flexible Joint and Silencer in discharge line of agitation blower [DWW-001, Sheet2]
	4) Air Chamber in discharge line of diaphragm type pump [DWW-002, Sheet3]
	5) Pressure Relief Valve in discharge line of diaphragm type pump [DWW-002, Sheet1]
	6) Pressure Indicator in suction line of magnetic drive pump [DWW-002, Sheet3]
	7) Detail of wastewater [DWW-001, Sheet1, 2]
	8) Detail of oil separator unit [DWW-001, Sheet1]
	9) Sampling points
	10) Caustic soda injection line to irregular waste water storage basin [DWW-001, Sheet2]
	11) Agitator in pH adjustment tank [DWW-002, Sheet1]
	12) Service water line to clarifier unit and sludge thickener unit for maintenance [DWW-002, Sheet1, 2]
	13) Reducing valve and pressure indicator in service water line [DWW-002, Sheet1]
	14) Instrument air line [DWW-002, Sheet2]
	3. Revised the following items as per design progress.
	1) Symbol of pump and blower
	2) Capacity of sulfuric acid dosing pump for waste water treatment plant [DWW-002, Sheet3]
	1.2m ³ /Hr → 2.5m ³ /Hr
	3) Capacity of caustic soda dosing pump for waste water treatment plant [DWW-002, Sheet3]
	1.2m ³ /Hr → 2.5m ³ /Hr
	4) Capacity of PAC dosing pump for pH adjustment tank [DWW-002, Sheet3]
	20L/Hr → 0.03m ³ /Hr
	5) Capacity of polymer dosing pump for flocculation tank [DWW-002, Sheet3]
	350L/Hr → 0.36m ³ /Hr
	6) Inlet/Outlet valve type of sulfuric acid dosing pump for waste water treatment plant [DWW-002, Sheet3]
	(Aug. 19, 2004)
2	1. Added the following items.
	1) Service water line for priming of self-priming pumps [DWW-001 Sheet2 / DWW-002 Sheet1]
	2) Isolation valve in turbidity and pH instrument of treated water line [DWW-002, Sheet1]
	3) Flexible joint in inlet of dehydrator [DWW-002, Sheet2]
	4) Service water line for maintenance of pH instrument in pH adjustment tank [DWW-002 Sheet1]
	2. Modified the capacity and head of polymer dosing pump for dehydrator
	3m ³ /Hr x 20m → 1~3m ³ /Hr x 35m [DWW-002 Sheet 3]
	3. Modified the type of flow instrument on dehydrator inlet
3	FIG → FI [DWW-002 Sheet 2]
	4. Revised the cloud marked points as per design progress.
	(Jan. 7, 2005)
	1. Following design change is incorporated.
	FCN-0-MHIN-RB4-GNA-1026
	2. Added MNS No.
	3. Changed the material of instrument air piping. (Carbon Steel + Galv. → SUS304)
	4. Issued as AS BUILT DRAWING.
	(Aug. 30, 2006)

AMENDMENT RECORD

REVISED	DESCRIPTION	AMENDMENT ISSUE DATE	REMARK
4	<p>Revised according to Plant Modification # No.437 (Addition of Sludge level transmitter)</p> <p>Revised sheets No.: 1. Revised sheet No.4 (DWW-004)</p>	- 3 APR 2009	
5	<p>Revised according to Plant Modification No. 661 (Addition new manual valve at dehydrator sludge inlet pipe.) (Refer Change request # BLCP-DCC-CN-0116) Revised sheet No. 1. Sheet No. DWW-004</p>	3 Feb. 2010	
6	<p>Revised according to Plant Modification No. 832 and wo#3713552. Modification addition new pressure control valve and maunal isolate valve for pressure control valve . (Refer Change request # BLCP-DCC-CN-0204)</p> <p>Revised sheet No. 1. Sheet No. DWW-004</p>	8 Feb. 2012	
7	<p>Revised according to Plant Modification No. 387 and WO# 3871927. Additional new line and isolation valve to transfer waste water between regular and irregular basin. (Refer Change request # BLCP-DCC-CN-0261) Revised sheet No. 1. Sheet No. DWW-004 (sheet No. 2)</p>	11 Apr. 2013	
8	<p>Plant Modification No. 1694 Addition of a new isolating valve 3" and pipe tie line between the common discharge of the Aeration Blower for the Sewage Treatment Plant and Agitation Blower for the Waste Water Treatment Plant. Purpose of Modification; 1. The Sewage Treatment Plant is improving (DO) dissolved oxygen by 2-4 ppm from 5-7 ppm during regular operation due to the existing dissolved oxygen control relatively high dissolved oxygen more than the control criteria. 2. Energy saving due to Agitation Blowers for Waste Water Treatment Plant compressed air through the Sewage Treatment Plant instead of the Aeration Blowers. (BLCP-DCC-CN-0446)</p>	18-APR-23	<p>Sompong Thumthan Assistant Operations Manager</p> <p>Phakorn Suwansing Mechanical Engineer</p>

CONTENTS

NO.	SUBCONTRACTOR DRAWING NO.	REV.	DESCRIPTION	PAGE
1	DWW-000 [Sheet No.1]	4	WASTE WATER TREATMENT PLANT SYMBOL & ABBREVIATION	1
2	DWW-004 [Sheet No.1]	7	WASTE WATER TREATMENT PLANT P & I DIAGRAM	2
3	DWW-004 [Sheet No.2]	9	WASTE WATER TREATMENT PLANT P & I DIAGRAM	3
4	DWW-004 [Sheet No.3]	8	WASTE WATER TREATMENT PLANT P & I DIAGRAM	4
5	DWW-004 [Sheet No.4]	12	WASTE WATER TREATMENT PLANT P & I DIAGRAM	5
6	DWW-004 [Sheet No.5]	6	WASTE WATER TREATMENT PLANT P & I DIAGRAM	6

PIPING SYMBOLS

INSTRUMENT SYMBOLS & IDENTIFICATION LETTERS

	UNDICIDED (TYPE) VALVE		PROCESS LINE
	GATE VALVE		BLOWER LINE
	GLOBE VALVE		BLIND FLANGE
	CHECK VALVE		FLANGE
	NEEDLE VALVE		UNION
	BALL VALVE		SPADE BLIND
	3 WAY BALL VALVE		SPECTACLE BLIND
	BALL VALVE WITH JACKET		RESTRICTION ORIFICE
	Y-GLOBE VALVE		CAP (BUTT WELD TYPE)
	BUTTERFLY VALVE		CAP (SOCKET WELD OR SCREWED TYPE)
	REDUCING VALVE		HOSE CONNECTION
	DIAPHRAGM VALVE		Y TYPE STRAINER
	SAFETY VALVE		I TYPE STRAINER
	SLIDE VALVE		BUCKET TYPE STRAINER
	AIR FLOW CONTROL VALVE		STEAM TRAP
	PNEUMATIC OPERATED CONTROL VALVE		SIGHT GLASS
	SELF ACTUATED CONTROL VALVE		EXPANSION JOINT
	MOTOR OPERATED VALVE		FLEXIBLE JOINT
	SOLENOID OPERATED VALVE		OPEN FUNNEL
	PNEUMATIC OPERATED ON-OFF VALVE		PIT
WITH SUBSCRIPT			EJECTOR
FF : FAIL FIX			FLAME ARRESTOR
FC : FAIL CLOSE			VENDOR SCOPE
	FOOT VALVE		SAMPLING POINT
	PRESSURE RELIEF VALVE		AIR CHAMBER
	BACK PRESSURE VALVE		
	EXHAUST VALVE		

	LOCALLY MOUNTED INSTRUMENT
	DCS INSTRUMENT
	CONTROL PANEL
	LOCALLY MOUNTED TRANSMITTER
	ORIFICE
	VENTURI TUBE
	POSITIVE DISPLACEMENT FLOW METER
	PADDLE WHEEL FLOW METER
	MAGNETIC FLOW METER
	VORTEX METER
	AREA METER
	PITOT TUBE
	MASS FLOW METER
	FLAPPER SIGHT GLASS
	AIR REGULATOR-1 (AR-1)
	AIR REGULATOR-2 (AR-2)
	DRIP FUNNEL (DF-1)
	PRESSURE GAUGE WITH DIAPHRAGM SEAL
	AIR FILTER REGULATOR

EXAMPLE OF LETTERING

FC 123 { F : FIRST LETTER
C : SUCCEEDING LETTERS
123 : LOOP NUMBER

EXAMPLE OF LETTERING

A	ANALYZER (WITH CORRESPONDING UNIT AS A SUBSCRIPT e.g. A_{PH} , A_{TC})
C	CONDUCTIVITY
D	DENSITY OR SPECIFIC GRAVITY
E	VOLTAGE
F	FLOW RATE
H	HAND
L	LEVEL
M	MOISTURE OR HUMIDITY
P	PRESSURE
R	REMOTE (VALVE)
S	SPEED OR FREQUENCY
T	TEMPERATURE
TC	TORQUE
U	MULTIVARIABLE
V	VISCOSITY
W	WEIGHT OR FORCE
X	ANOTHER

MEANINGS OF SUCCEEDING LETTERS

A	ALARM
C	CONTROL
E	ELEMENT
G	GAUGE
I	INDICATION
K	COMPUTER CONTROL
L	LOGGING
Q	QUANTITY
R	RECORDING
S	SWITCH
T	TRANSMISSION OR CONVERSION
U	MULTIFUNCTION
V	VALVE
W	WELL
X	ANOTHER
Y	CALCULATION
Z	EMERGENCY OR SAFETY

NOTE

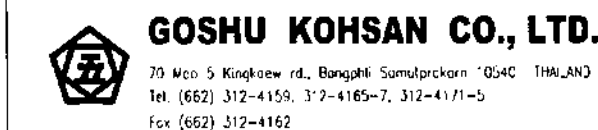
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A1	CARBON STEEL/HOT DIP GALV
A2	CARBON STEEL/INNER HRL
A3	SUS-304
A4	SUS-316L
A5	PVC ASTM D1785
A6	FRP D.N 1695 PN10
A7	HDPE PN6
A8	CARBON STEEL/INNER TEFLON LINING

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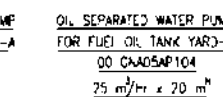
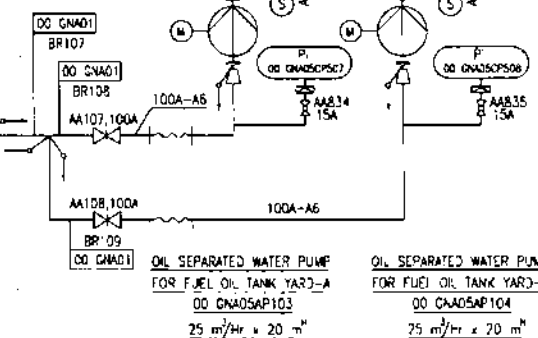
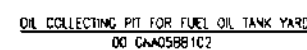
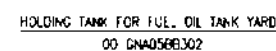
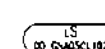
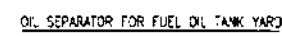
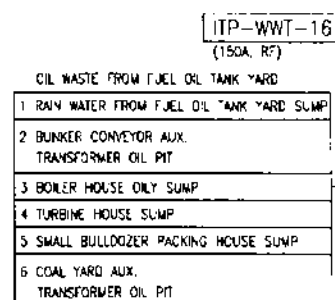
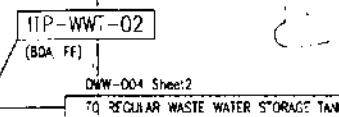
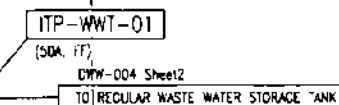
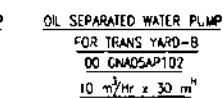
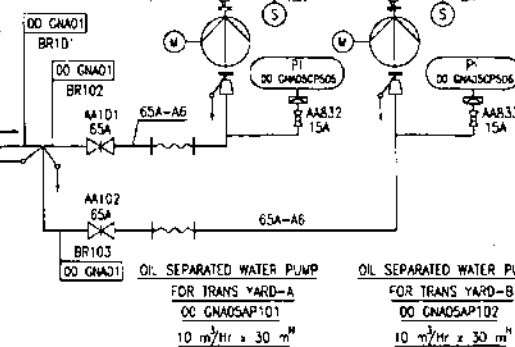
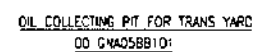
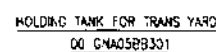
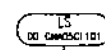
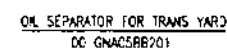
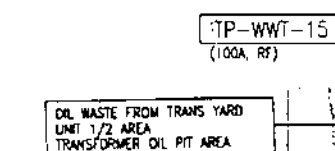
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2	Rev. as mark	17-05-04	CHA	KM	HS
1	Rev. as mark	11-12-03	CHA	KM	HS
0	First issued	01/12/03	CHA	KM	HS



Rev.	Description	Date	Draw	Checked	Approved
4	As built drawing	20-07-06	PSR	KT	KM
3	Rev. as mark	30-06-04	CHA	KM	KM
2	Rev. as mark	17-05-04	CHA	KM	HS
1	Rev. as mark	11-12-03	CHA	KM	HS
0	First issued	01/12/03	CHA	KM	HS



Project Name :					
BLCP POWER PROJECT					
Messrs :					
MITSUBISHI HEAVY INDUSTRIES LTD.					
Title :					
WASTEWATER TREATMENT PLANT SYMBOL & ABBREVIATION					
JOB NO.		PJ-0311002		Drawing No	Rev
Sheet :	1	Scale :	NONE	DWW-000	4
Sheet No :	1	Format :	A3		
				07385 - 53106 - 1101	



NOTE

- A0 : CARBON STEEL
- A1 : CARBON STEEL/HOT DEPT DVAL
- A2 : CARBON STEEL/INNER HRL
- A3 : SUS-304
- A4 : SUS-316L
- A5 : PVC ASTM D1785
- A6 : FRP DN : 695 PN10
- A7 : HDPE PN5
- A8 : CARBON STEEL/INNER TEFLON LINING

7	AS built drawing	26-07-06	—	379	723
Rev.	Description	Date	Draw	Checked	Approved



7	As built drawing	20-07-06	PSR	KT	RS
6	Rev. cs marks	12-11-04	PSR	SN	KW
5	Rev. cs marks	01-11-04	PSR	SN	KW
4	Rev. cs marks	10-09-04	PSR	SN	KW
3	Rev. cs marks	30-06-04	PSR	K	KW
2	Rev. cs marks	17-05-04	TP	KW	KW
1	Rev. cs marks, pipe sizedemat.	26-03-04	TP	KW	HS
0	First issued	11-12-03	TP	KW	HS
Rev.	Description	Date	Draw	Checked	Approved



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Tel. (552) 312-4159, 312-4165-7, 312-4171-5

Project Name :

BLCF POWER PROJECT

MESSRS :

MITSUBISHI HEAVY INDUSTRIES LTD.

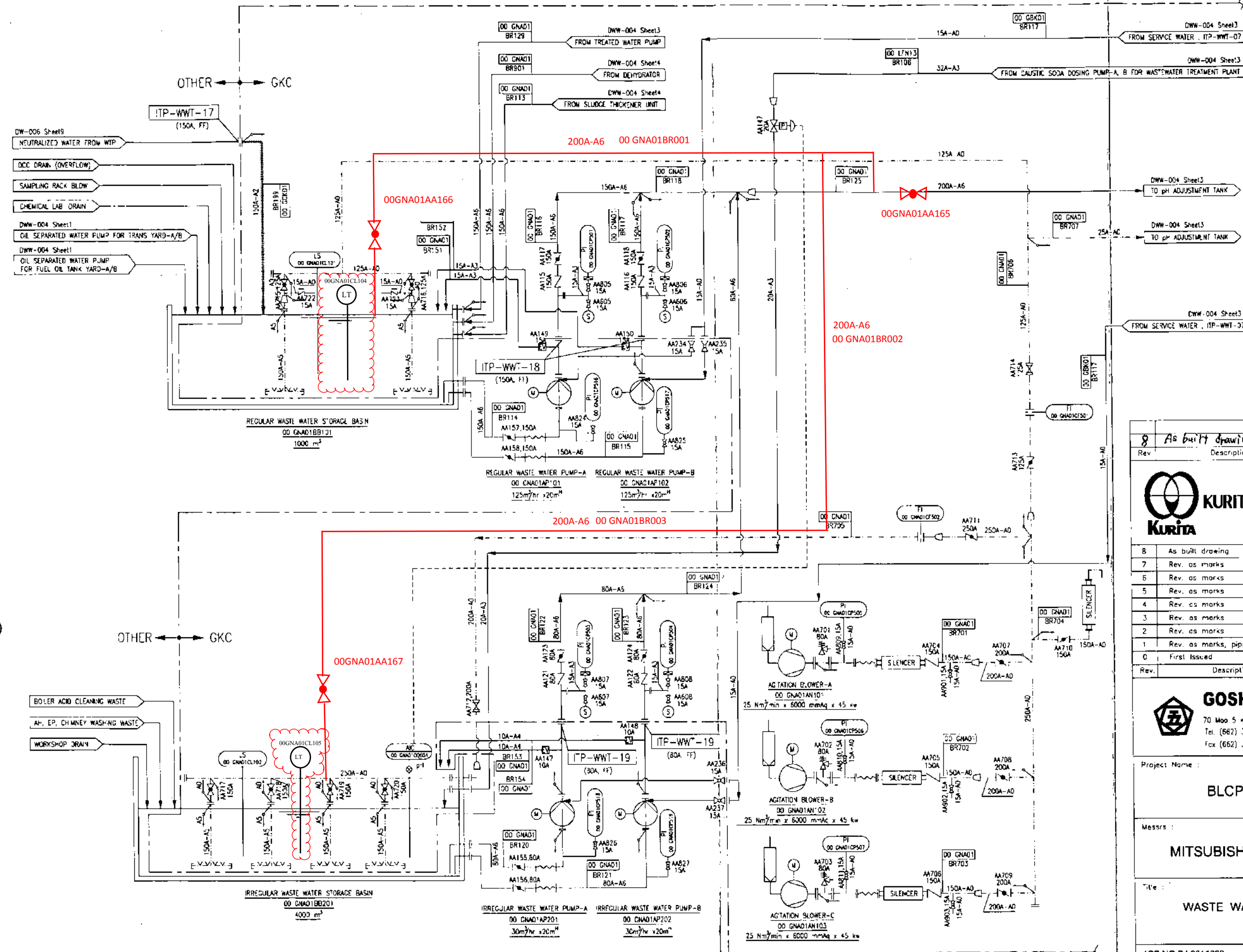
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WASTE WATER TREATMENT PLANT
P & I DIAGRAM

JOB NO. PJ-0311002				Drawing No.	Rev.
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Sheet No. :	1	Format :	A3		

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- NOTE
- A0 : CARBON STEEL
 - A1 : CARBON STEEL/HOT D.P.I GALV
 - A2 : CARBON STEEL/INNER HRL
 - A3 : SUS-304
 - A4 : SUS-316L
 - A5 : PVC ASTM D1785
 - A6 : FRP DN 1695 PN10
 - A7 : HOPE PMS
 - A8 : CARBON STEEL/INNER TEFLON LINING



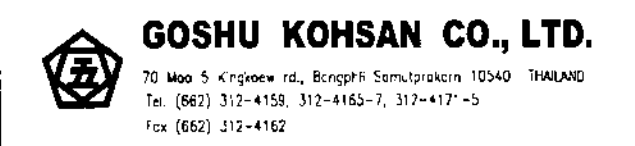
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6	Rev. as marks	12-11-04	PSR	KT	RS
5	Rev. as marks	01-11-04	PSR	KT	KM
4	Rev. as marks	10-09-04	PSR	SW	KM
3	Rev. as marks	30-08-04	PSR	KT	KM
2	Rev. as marks	17-05-04	TP	KM	KM
1	Rev. as marks, pipe size&mat.	20-01-04	TP	KM	HS
0	First Issued	11-12-03	TP	KM	HS
Rev.	Description	Date	Draw	Checked	Approved



Project Name :

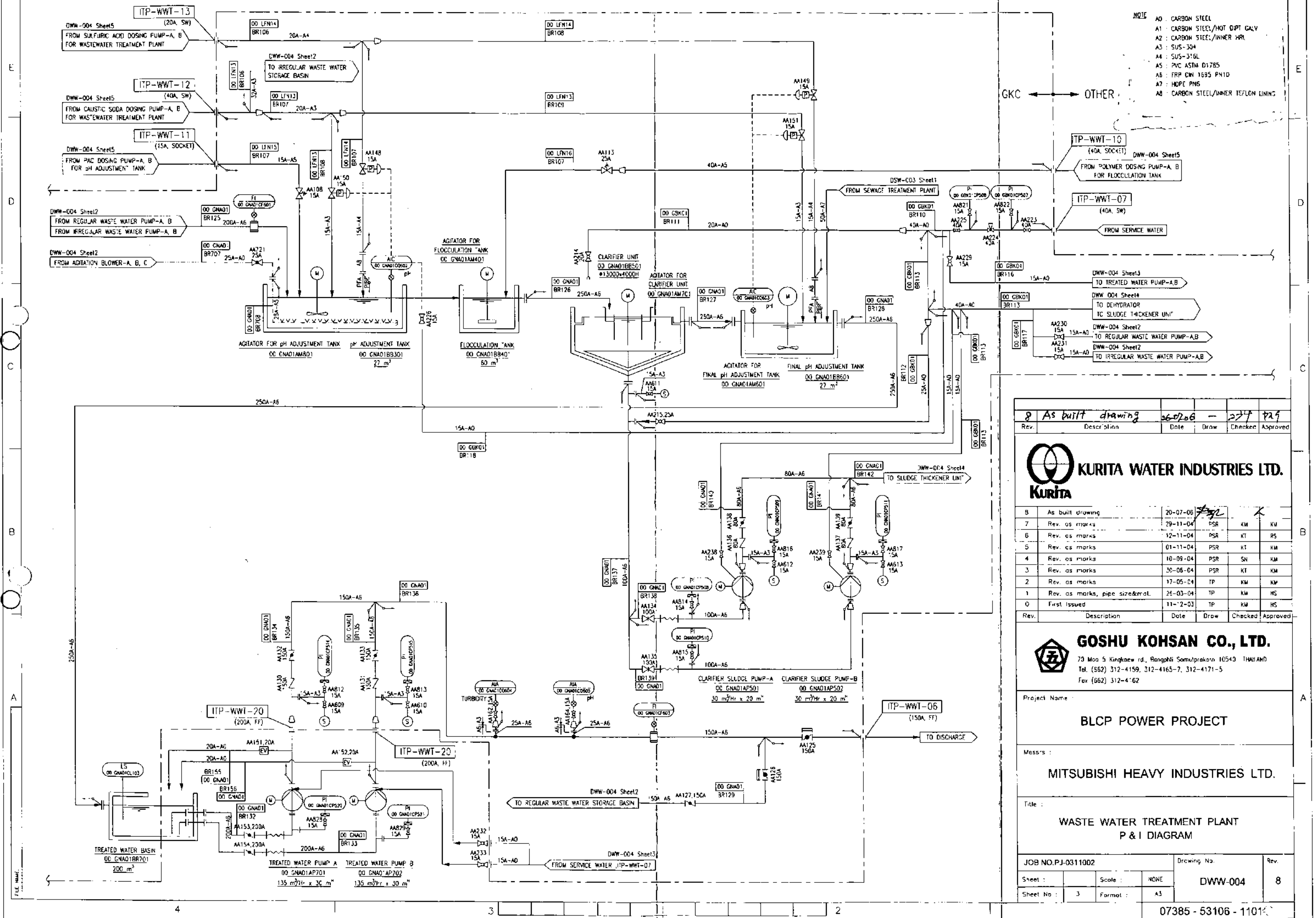
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Messrs : **MITSUBISHI HEAVY INDUSTRIES LTD.**

Title : **WASTE WATER TREATMENT PLANT P & I DIAGRAM**

JOB NO. PJ-0311002	Drawing No.	Rev.
Sheet : 2	Scale : NONE	DWW-004
Sheet No. : 2	Format : A3	9

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- NOTE
- A0: CARBON STEEL
 - A1: CARBON STEEL/HOT DIP GALV
 - A2: CARBON STEEL/INNER WRN
 - A3: SUS-304
 - A4: SUS-316L
 - A5: PVC ASTM D1785
 - A6: FRP DN 1695 PN10
 - A7: HDPE PMS
 - A8: CARBON STEEL/INNER TEFLON LINING

8	As built drawing	26-02-06	-	27/	22/
Rev.	Description	Date	Draw	Checked	Approved

KURITA WATER INDUSTRIES LTD.

8	As built drawing	26-02-06	PSR	KM	KM
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6	Rev. as marks	12-11-04	PSR	KT	PS
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2	Rev. as marks	17-05-04	TP	KM	KM
1	Rev. as marks, pipe size & mat.	26-03-04	TP	KM	HS
0	First issued	11-12-03	TP	KM	HS
Rev.	Description	Date	Draw	Checked	Approved

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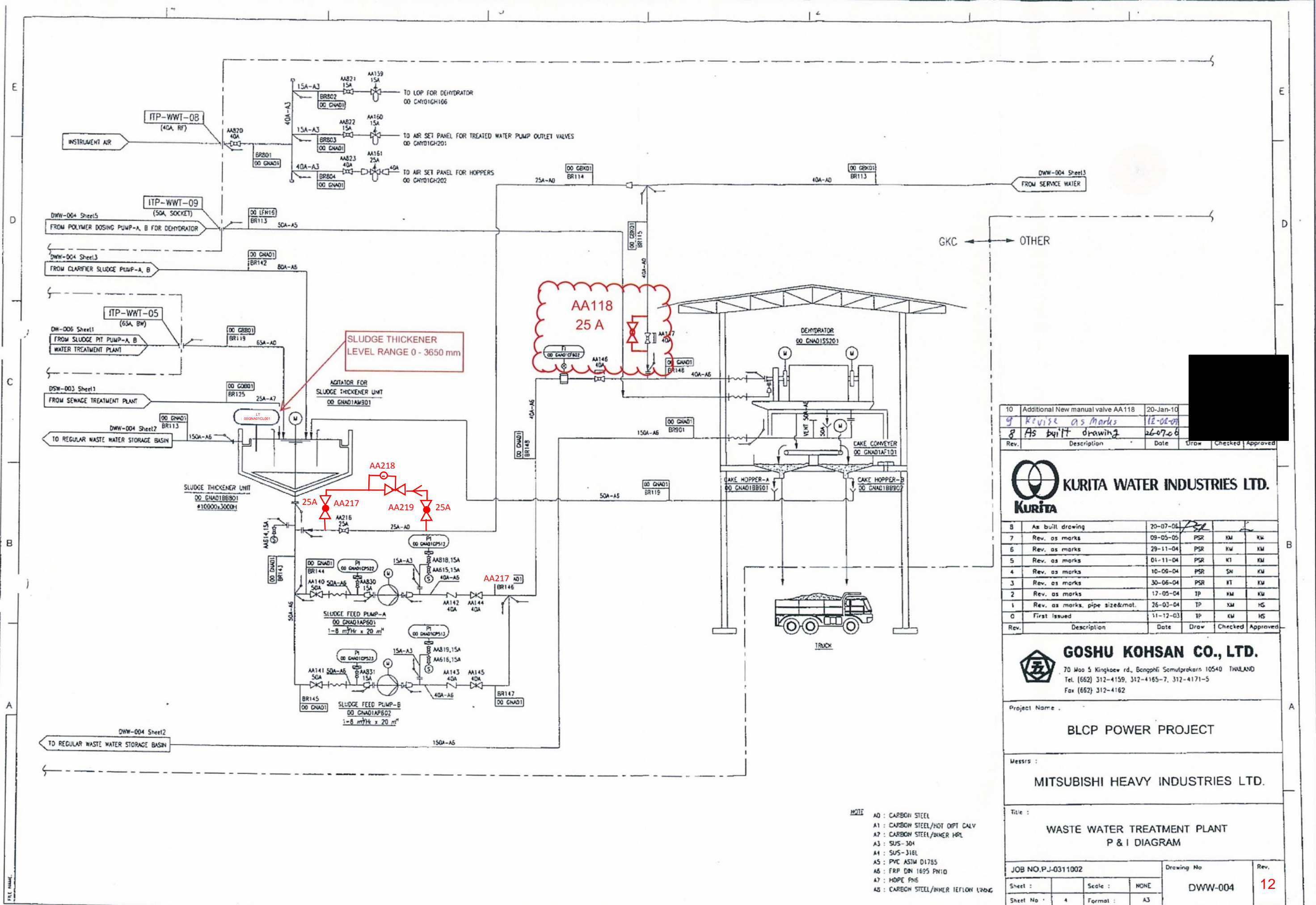
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Mess's: **MITSUBISHI HEAVY INDUSTRIES LTD.**

Title: **WASTE WATER TREATMENT PLANT P & I DIAGRAM**

JOB NO. PJ-0311002	Drawing No.	Rev.
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Sheet No: 3	Format: A3	

07385 - 53106 - 1101



10	Additional New manual valve AA118	20-Jan-10			
9	Revise as Marks	12-02-09			
8	As built drawing	26-07-06			
Rev.	Description	Date	Draw	Checked	Approved

KURITA WATER INDUSTRIES LTD. Kurita					
Rev.	Description	Date	Draw	Checked	Approved
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7	Rev. as marks	09-05-05	PSR	KM	KM
6	Rev. as marks	29-11-04	PSR	KM	KM
5	Rev. as marks	01-11-04	PSR	KM	KM
4	Rev. as marks	10-09-04	PSR	SN	KM
3	Rev. as marks	30-06-04	PSR	KT	KM
2	Rev. as marks	17-05-04	TP	KM	KM
1	Rev. as marks, pipe size & mat.	26-03-04	TP	KM	HS
0	First issued	11-12-03	TP	KM	HS
Rev.	Description	Date	Draw	Checked	Approved

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Project Name :
BLCP POWER PROJECT
 Messrs :
MITSUBISHI HEAVY INDUSTRIES LTD.

Title :
**WASTE WATER TREATMENT PLANT
P & I DIAGRAM**

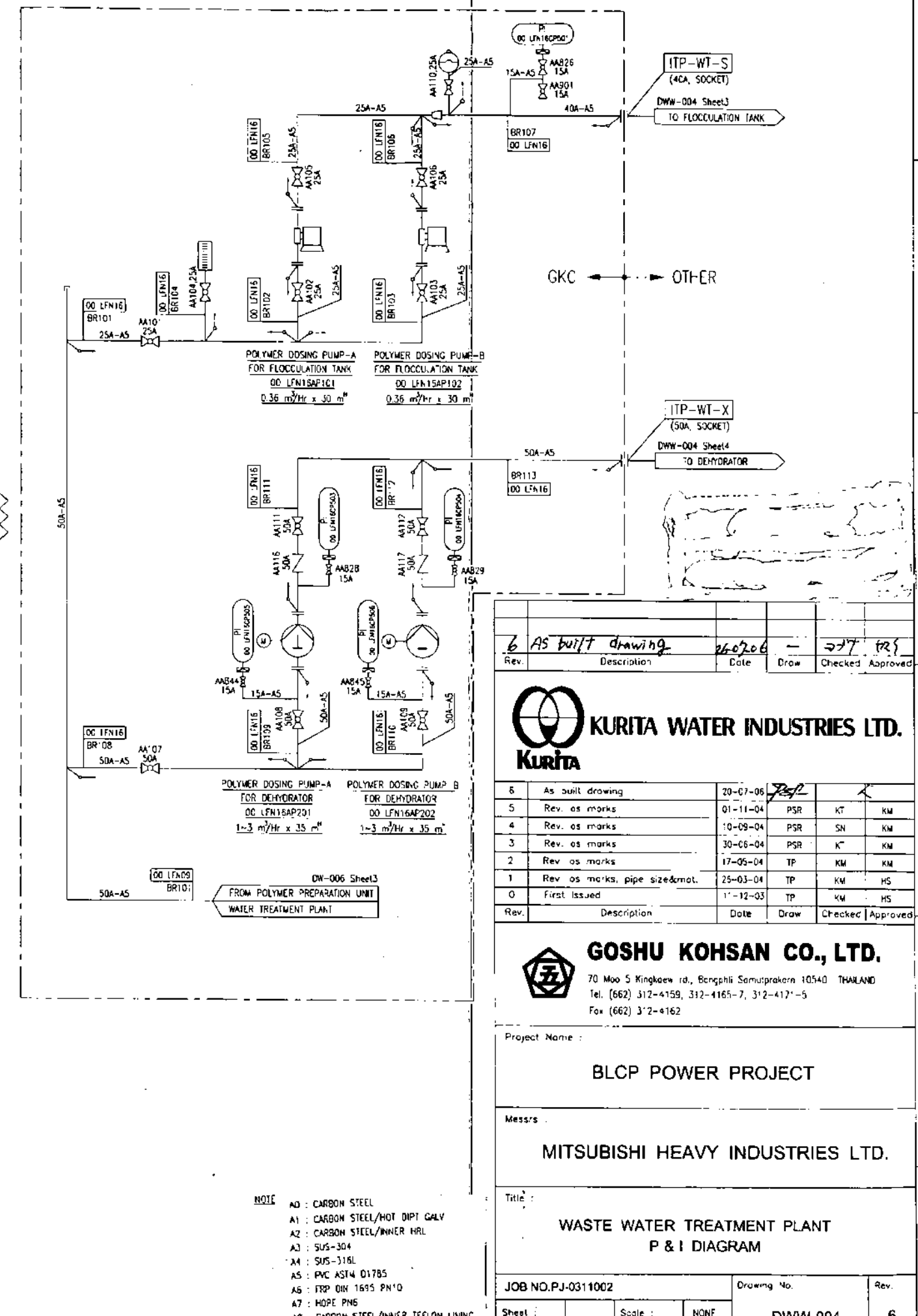
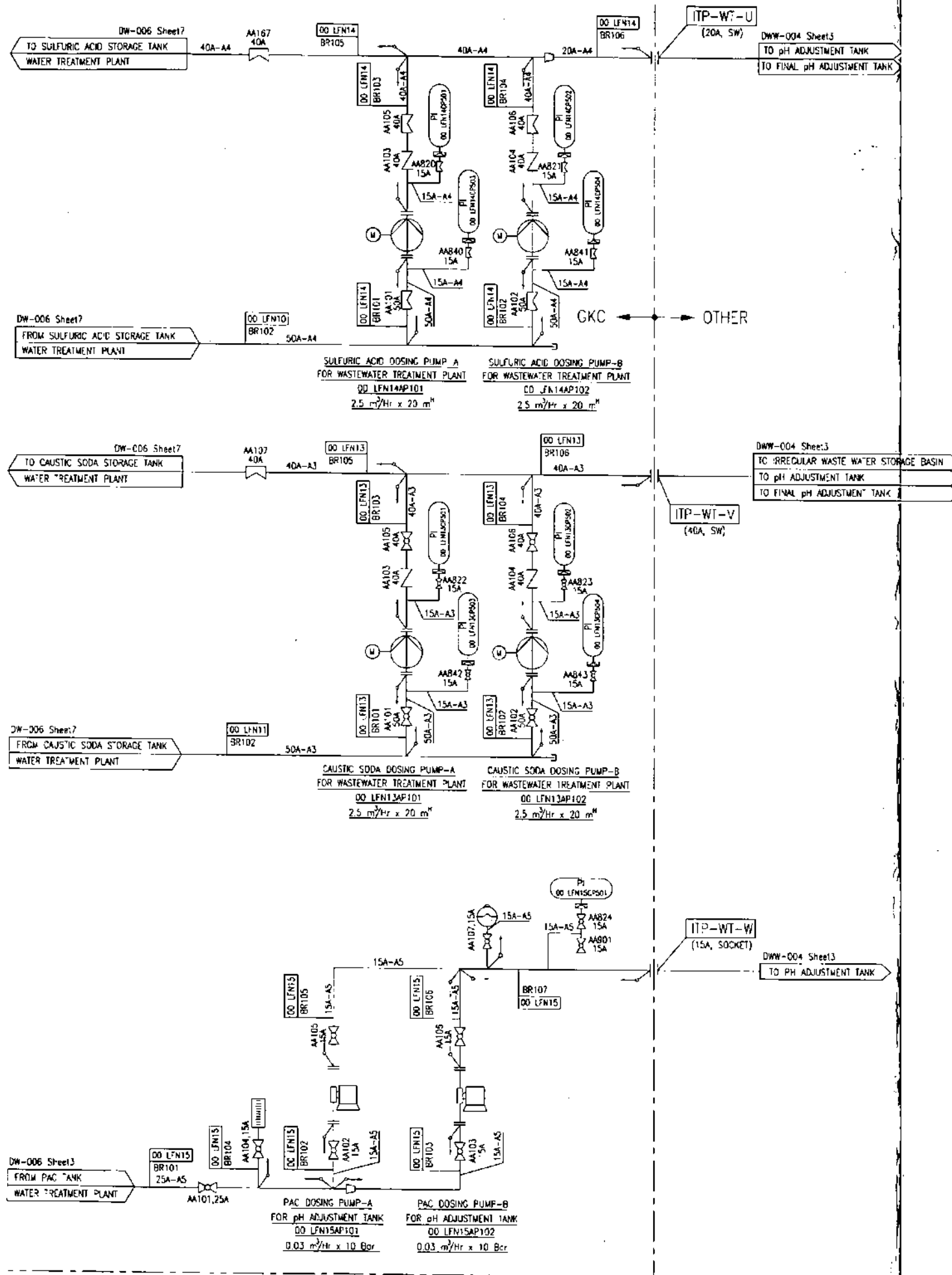
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Sheet No :	Format :	A3		

- NOTE
- A0 : CARBON STEEL
 - A1 : CARBON STEEL/HOT DPT CALV
 - A2 : CARBON STEEL/INNER HRL
 - A3 : SUS-304
 - A4 : SUS-316L
 - A5 : PVC ASTM D1785
 - A6 : FRP DN 1695 PN10
 - A7 : HDPE FNS
 - A8 : CARBON STEEL/INNER TEFION LINED

BLCP-DCC-CN-0204

(M0-MN-GN-PP-01510 (53106-1101))

53106-1101



NOTE

- A0 : CARBON STEEL
- A1 : CARBON STEEL/HOT DIP GALV
- A2 : CARBON STEEL/INNER HRL
- A3 : SUS-304
- A4 : SUS-316L
- A5 : PVC ASTM D1785
- A6 : FRP DR 1695 PN10
- A7 : HDPE PN6
- A8 : CARBON STEEL/INNER TEFLON LINING

Rev.	Description	Date	Draw	Checked	Approved
6	As built drawing	26-02-06	277	TS	
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3	Rev. as marks	30-06-04	PSR	K	KM
2	Rev. as marks	17-05-04	TP	KM	KM
1	Rev. as marks, pipe sized mat.	25-03-04	TP	KM	HS
0	First issued	11-12-03	TP	KM	HS


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 Fax (662) 312-4162

Project Name :		
BLCP POWER PROJECT		
Mess/s :		
MITSUBISHI HEAVY INDUSTRIES LTD.		
Title :		
WASTE WATER TREATMENT PLANT P & I DIAGRAM		
JOB NO. PJ-0311002	Drawing No.	Rev.
Sheet : 5	Scale : NONE	DWW-004 6
Sheet No. : 5	Format : A3	

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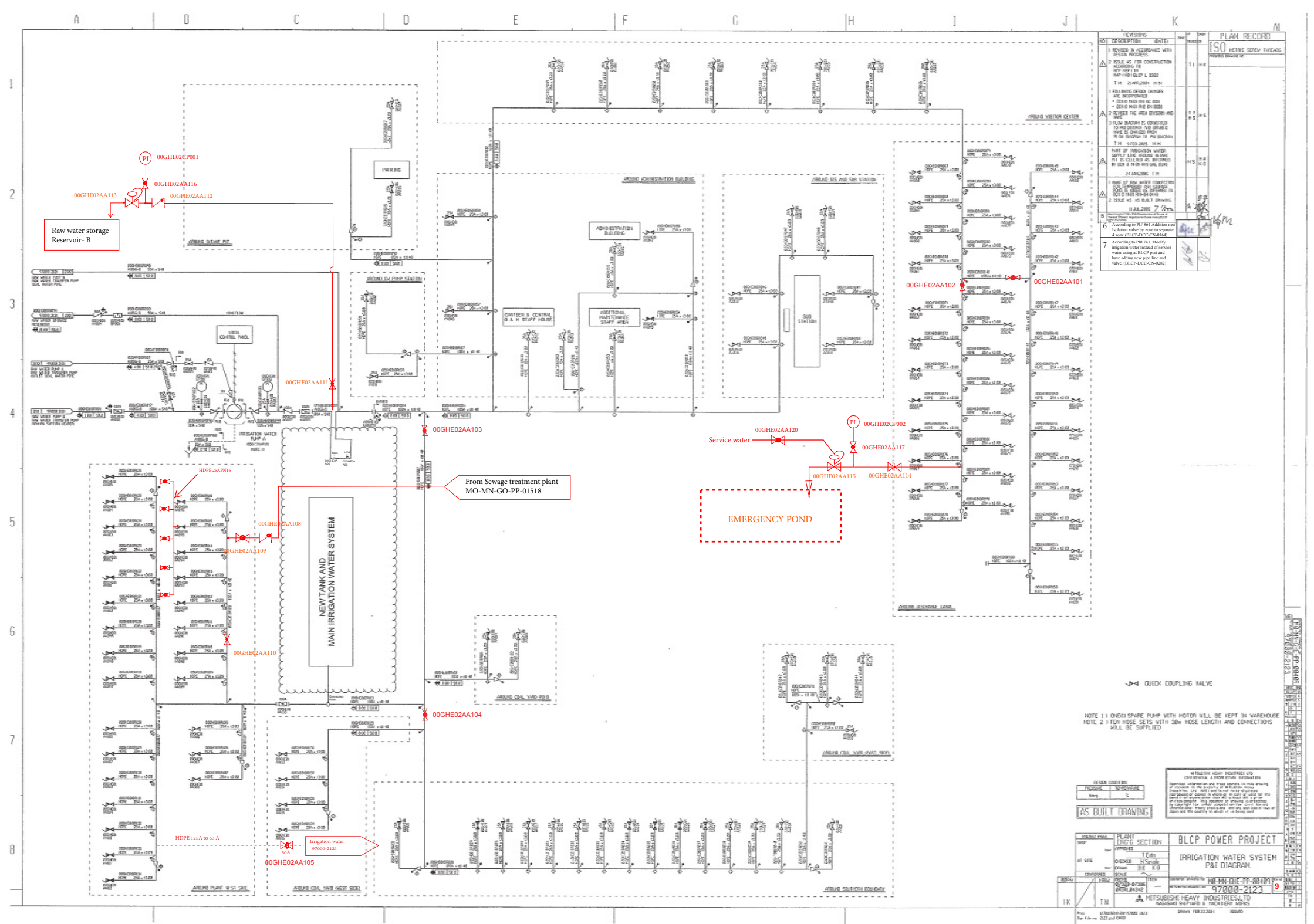
ภาคผนวก จ-3

แผนผังตำแหน่งติดตั้งบ่อรวบรวมน้ำที่ผ่านการบำบัด
จากระบบบำบัดน้ำเสียของโครงการ

BLCP Drawing No. : M0-MN-GHE-PP-00409	SUPPLIER DRAWING NO./ MITSUBISHI DRAWING NO. / SUPPLIER NAME 97000-2123	PLAN RECORD	REVISIONS		CHECKED	APPROVED
			Rev. No.	Description (Date)		
			9	Revised according to Plant Modification No. 734 and 1183 (the detail please see amendment) (Refer Change request # BLCP-DCC-CN-0310)		
			9	Revised according to Plant Modification No. 1181 (the detail please see amendment) (Refer Change request # BLCP-DCC-CN-0317)		
<div>AS BUILT</div> <div>A4 x A3 x Total</div> <div>SHEETS WITH COVER</div>						
TITLE <div>IRRIGATION WATER SYSTEM P&I DIAGRAM</div>						
BLCP DRAWING NO. M0-MN-GHE-PP-00409					REV. NO. 9	
SUPPLIER NAME/SUPPLIER DRAWING NO./ MITSUBISHI DRAWING NO. 97000-2123						
<div>BLCP POWER PROJECT</div>						

AMENDMENT RECORD

REVISED	DESCRIPTION	AMENDMENT	REMARK
8	Revised according to Plant Modification # PI# 734. The Treated waste water Zero discharge project. To install irrigation water supply instead of service water for cleaning the jetty floor and install new potable water supply 3 point at jetty PI# 1183. Modify Irrigation water pipe and valve to FGD emergency basin. (BLCP-DCC-CN-0310)	13-Jun-16	
9	Revised according to Plant Modification # PI# 1181. Modify pipe line for Irrigation water discharge return back to Raw water basin B (BLCP-DCC-CN-0317)	Oct. 25, 2016	



ภาคผนวก จ-4

รายละเอียดการออกแบบระบบบำบัดน้ำเสียของโครงการ

Revision Control			
Page Number	Description of Amendment	Amendment Revision	Date Amended Pages Inserted

Part I. Waste Water Treatment Plant

1. Function

The contaminated drains of various qualities from different areas of the plant are collected by the drainage system and sent to the Waste Water Treatment Plant (WWTP) for treatment to meet the effluent quality, as mentioned hereinafter, before discharging to the sea. The plant is a common facility for the two units.

The contaminated run-off water from coal yard and rain water from boiler & EP areas will be sent to the Coal Yard Waste Water Treatment Plant (CWWTP), which is described in the Part II of this document.

2. System Description

The Waste Water Treatment Plant includes the following major equipment and facilities:-

- One (1) 1,000 m³ Regular Waste Water Storage Basin
- One (1) 4,000 m³ Irregular Waste Water Storage Basin
- One (1) 10 m³/h Oil Separator for Trans Yard
- One (1) 25 m³/h Oil Separator for Fuel Oil Tank Yard
- One (1) pH Adjustment Tank
- One (1) Flocculation Tank
- One (1) Clarifier Unit
- One (1) Final pH Adjustment Tank
- One (1) Treated Water Basin
- One (1) Sludge Thickener Unit
- One (1) Dehydrator

- Two (2) Cake Hoppers
- Two (2) Regular Waste Water Pumps
- Two (2) Irregular Waste Water Pumps
- Two (2) Clarifier Sludge Pumps
- Two (2) Sludge Feed Pumps
- Two (2) Treated Water Pumps
- Two (2) Oil Separated Water Pump for Trans Yard
- Two (2) Oil Separated Water Pump for Fuel Oil Tank Yard
- Three (3) Agitation Blowers
- H₂SO₄ dosing system
- NaOH dosing system
- Polymer dosing system
- PAC dosing system
- Interconnecting piping, valves, instrumentation and controls

Various contaminated drains are classified as follows:

Oily drain

For design of the Waste Water Treatment Plant, the following oily drains are considered as the intermittent drain:

- Rainwater from the fuel oil storage area, the transformer yard and the turbine oil tank area
- Boiler house, IDF area, and Turbine Generator bldg. equipment floor drain
- Fuel Oil Service Station drain

- Bulldozer Parking drain

Contaminated but oil-free drain

For design of the Waste Water Treatment Plant, the following contaminated drain is considered as the continuous drain:

- DCC overflow

Chemical drain

For design of the Waste Water Treatment Plant, the following chemical drains are considered as the continuous drain:

- Chemical Laboratory drain
- Sampling rack blow
- Chemical Injection Pump/Tank Area drain
- Demineralizing System Regeneration Waste

And the following chemical drains are considered as the intermittent drain:

- Washing waste of Regenerative Air Heater and Chimney
- Drain of Chemical Cleaning of Boiler
- Boiler Hydrostatic Test drain

As the Boiler Blowdown during normal operation is expected to be within the Water Quality Standard, it will be directly directed to the sea. Hence the Boiler Blowdown is not considered as the continuous drain in the WWTP capacity. In the case the Boiler Blowdown quality does not meet the Water Quality Standard during a short period, it can be directed to the Regular or Irregular Waste Water Storage Basin via the Boiler House Chemical Sump and can be treated by the WWTP as the irregular /intermittent drain. A sampling point is provided in the Boiler Blowdown Tank drain pipe.

Oily drain is collected separately in oily waste water sumps and passed through the oil separators before further treatment in the waste water treatment plant. Two numbers of CPI type oil separators are provided.

The separated oil collects into an oil collection pit for periodic disposal and the water is pumped into the regular waste water storage basin of the Waste Water Treatment Plant.

There will be two waste water storage basins in the treatment plant. The regular waste water storage basin is fed with regular drains like the DCC overflow, sampling rack & chemical laboratory drains, boiler & turbine area equipment floor drains, and rainwater in transformer areas. The irregular waste water storage basin is used for irregular drains generated during air heater washing, etc. as mentioned above. A set of agitation blowers will supply air to these basins for aeration and mixing.

Water from either of the basins will be fed by separate sets of waste water pumps to a pH adjustment tank, where pH will be controlled by dosing acid (H_2SO_4) and alkali ($NaOH$) as required. PAC will also be added to the tank as required to coagulate suspended solids in the waste water. The water in the tank will be agitated by the same set of agitation blowers provided for the waste water basins. The overflow from this tank will be fed to the flocculation tank, where flocculation will take place with the addition of polymer. Then the waste water will be fed to the clarifier unit. The sludge from the clarifier will be pumped to a sludge thickener while the clear water will go into a tank for final adjustment of pH by dosing acid/alkali as needed. The treated water from sewage treatment plant will also be fed to this tank. The water will finally collect in the treated water basin from where it will be discharged by a set of treated water pumps.

Apart from the waste water sludge mentioned above, the sludge thickener will also accept the sludge from the sewage treatment plant and the pretreatment plant. The separated water from the thickener will overflow to the regular waste water storage basin by gravity. The sludge will be fed to the dehydrator by a set of sludge feed pumps. Polymer will be dosed into the sludge to help the dehydration. The dehydrated sludge will be carried by a cake conveyor to the cake hopper for final disposal by trucks. The separated water from dehydrator will be transferred to the regular waste water storage basin by gravity.

3. Design Criteria

The system will be designed as per the industry practice and to comply with the requirements of the applicable standard.

The waste water balance for two units for design of the Waste Water Treatment Plant will be as mentioned in Attachment-1.

The treated water quality after WWTP will be as mentioned in Table-1.

3.1 Operating Conditions

The waste water flow rate to the pH adjustment tank is 100 m³/hr.

Oily water flow rates to the Oil Separators for Trans Yard and for Fuel Oil Tank Yard are 10 m³/hr and 25 m³/hr respectively.

A portion of the various drains coming to WWTP is rainwater. In estimating the rainwater quantity, the design rainfall of 135.4 mm/day has been considered.

The WWTP capacity of 100 m³/hour will be adequate to handle the regular drain & a part of the irregular drain. The irregular waste water storage basin capacity will be sufficient to store the largest of all incoming intermittent drains. The regular waste water storage basin will be capable of storing design inflow of about 12 hours.

Two cake hoppers of 21m³ capacity, which correspond to total two days capacity per two hoppers, are provided for storage and discharge of sludge to trucks.

3.2 Functional Constraints

The separation of oil or sludge will be by gravity. Hence all the basins, tanks and clarifiers will be designed to provide sufficient retention time for gravity separation. The flow velocity will be sufficiently low as required for the separation process.

Effluent of the WWTP will be monitored by in-line pH & SS analyzers and a laboratory type oil-in-water analyzer is provided to monitor the oil content in the effluent.

3.3 Physical Constraints

The installation levels of pH adjustment tank, flocculation tank, clarifier, sludge thickener etc. in WWTP will be decided so that gravity flow at desired rate is possible in such equipment.

The plant layout will ensure easy access to monitor instruments and maintenance items and will avoid dead pockets as far as possible.

The material for aboveground waste water piping will be FRP. Buried pipes will be HDPE or 304 stainless steel. The pipes for acid/alkali/hypochlorite dosing will be carbon steel/stainless steel/PVC as applicable.

4. Process Control

pH measuring and controlling instruments on the first and the final pH adjustment tanks will regulate the control valves in the respective acid and alkali dosing lines to these tanks. The signal from the same instrument in the final pH adjustment tank will be used to regulate two automatic on-off valves in the effluent line after the tank – one for collection in the treated water basin if the pH is within acceptable limits and the other for re-circulating back to regular waste water storage basin if pH is unacceptable after treatment.

A magnetic type flow indicator is installed in the inlet of the pH adjustment tank to monitor the flow.

pH monitoring instruments will be provided in the final discharge line after treated water basin, and SS monitoring instruments will be provided in the treated water basin.

Oil-in-water analyzer (non-continuous automatic type as mentioned Vol. III 6.1.23) is provided for manual analyzing for residual oil.

5. System Operation

The plant will be operated continuously depending on the drain collection in the regular waste water storage basin. The sequential operation of the equipment in the plant will be built in the control logic.

The WWTP will be provided with PLC based automatic controls. The PLC is interfacing with DCS by communication network.

Normally, operator can monitor main status of equipment in Wastewater treatment system and monitor main alarms. Furthermore, operator initiate group sequence command to the Wastewater treatment system from OPS at CCR.

In remote mode, group sequence command is initiated manually by push button at OPS. In local mode, Individual operation(waste water pumps, treated water pumps, clarifier sludge pumps, sludge feed pumps and various dosing pumps) and monitoring will be carried out from local control panel in local control room of water treatment plant house.

The PLC is common to the Sewage Treatment Plant. For detail of system operation of the Sewage Treatment Plant, refer to the Sewage Treatment Plant Design Manual.

Interlocks

Suitable interlocks for safe operation of the pumps depending on the levels of the corresponding tanks on the suction side will be provided.

Alarms

Alarms required for monitoring of WWTP are provided in the local control room. Main alarm will be sent to DCS, and they are monitored at OPS in CCR.

6. References

1. Waste Water Treatment Plant Flow Diagram (Dwg. Nos. 53106-1101, Rev. 0)
2. Sewage Treatment Plant Design Manual (Dwg. No. 97000-2262-29, Rev. 0)
3. Contract Specification Vol. II, Sec. 1.7.2.2 Water Quality Standards
4. Contract Specification Vol. III, Sec. 2.1.1 Meteorological Data

Part II. Coal Yard Waste Water Treatment Plant

1. Function

An additional Coal Yard Waste Water Treatment Plant (CWWTP) is provided to receive the rainwater run-off water in the Coal yard with HDPE sheet, Pier and Boiler & EP area drain. The drains will be treated to keep the limit of Thai Water Quality Standard (refer to Table-1) before discharging to the sea. The plant is a common facility for the two units.

2. System Description

The Coal Yard Waste Water Treatment Plant includes the following major equipment and facilities:-

- Outward wall with inscribed open ditch surrounding the entire coal yard
- One (1) Motorized gate installed at connecting channel between Coal Yard and Coal Yard Pond
- One (1) 8,000 m³ Coal Yard Pond to serve as a buffer storage pond for accumulation of rainwater and sedimentation of coarse particles
- Two (2) Coal Yard Pond Transfer Pump to transfer waste water to pH Control Tank
- One (1) pH Control Tank for chemical dosing to limit the pH of rain water runoff within acceptable limit for preparation of flocculation to assist in sedimentation in the subsequent stages
- NaOH dosing system
- H₂SO₄ dosing system
- One (1) Flocculation Tank for chemical dosing to assist in sedimentation and thus reduction of suspended solids from rainwater runoff

- Two (2) Coagulating Chemical (PAC and Polymer) dosing system
- One (1) Agitation Blower for better mixing of chemicals in pH Control Tank and Flocculation Tank
- One (1) Sedimentation Tank with flow straightener for sedimentation of suspended solids from the waste water
- One (1) Treated Water Tank for storage of clean water
- Two (2) Treated Water Transfer Pumps for discharging treated water to the Outfall
- One (1) Safety Shower with Eye Washer
- Interconnecting piping, valves, instrumentation and controls

In addition, as a part of the Yard Spray system, two (2) Water Pumps for coal yard spray are installed at the Treated Water Tank, and a raw water make-up system to Treated Water Tank is provided.

For storage of rainwater run-off in the coal yard, two storage area is designated - one is the coal yard and the other is in Coal Yard Pond. The entire coal storage stock pile is surrounded with open ditch having an outward wall of adequate height. Instead of directing the Boiler, EP Drain accumulation to this skirt walled coal yard area, a separate 8,000 m³ Coal Yard Pond is provided to gather all the rainwater. Rainwater runoff from the coal yard will also be directed to this pond. The coal yard open ditch is connected with the Coal Yard Pond through an open channel and a motorized gate. Two 50% Coal Yard Pond Transfer Pumps are installed at the Coal Yard Pond with floating flexible suction piping for transferring the surface water of the waste water from the Coal Yard Pond to pH Control Tank.

Besides the above, one pH Control Tank and one Flocculation Tank are provided for the purpose of waste water pH recovery and to assist in chemical mixing for sedimentation. Flow from pH Control Tank to Treated Water Tank, through Flocculation Tank and Sedimentation Tank, is effected through spillover flow mechanism.

Sedimentation Tank is equipped with a flow straightener near the entry of the tank. This flow straightener assists in reducing the flow turbulence in the subsequent part of Sedimentation Tank and thus assist in sedimentation through reduction of agitation.

After sedimentation, the clear water will spillover to Treated Water Tank for final discharge to the Outfall or for spray for coal yard. Water reserve in this tank will always be maintained to a normal level for spray water use purpose either through supply of treated waste water or supply of raw water through a different pipe route.

Two Water Pumps are provided as a part of the Yard Spray System for supplying spray water from the Treated Water Tank for coal dust suppression in the coal handling facility. The Water Pumps are installed in the Treated Water Tank instead of any other reservoir, to avoid possibility of getting the spray nozzle clogged by suspended coal dust particles.

Also other Two Treated Water Transfer Pumps are installed in Treated Water Tank for discharging any excess waste water to the Outfall. The capacity of each of the transfer pumps in the Coal Yard Pond and Treated Water Tank are rated at 300 m³/h.

3. Design Criteria

The system will be designed as per the industry practice and to comply with the requirements of the applicable standard.

The treated water quality after CWWTP will be as mentioned in Table-1. For monitoring of the treated water quality during normal operation, pH & SS monitoring instruments will be provided in the final discharge line after treated water tank.

3.1 Operating Conditions

The capacity of CWWTP is 600 m³/h. A substantial portion of this drain is rainwater. In estimating the rainwater quantity, the maximum rainfall of "209 mm in three days"^(*) and the maximum rainfall intensity of "70 mm/h" has been considered instead of the design rainfall of 135.4 mm/day.

(*) Recorded maximum rainfall data in both 3 & 5 continuous days in the past decade around Map 1a Phut area

According to the study of the maximum storage volume shown in Figure 2, the total waste water storage capacity of the coal yard and Coal Yard Pond are designed to hold the maximum rainwater run-off storage of 29,150 m³.

3.2 Functional Constraints

The separation of particles will be by gravity. Hence the coal yard pond and the sedimentation tank will be designed to provide sufficient retention time for gravity separation. The flow velocity will be sufficiently low as required for the separation process.

As the CWWTP is occasionally utilized only during the rainy season, the standby facilities are basically not provided.

3.3 Physical Constraints

pH control tank, flocculation tank, sedimentation tank and treated water tank are located outdoor and the installation levels of these tanks will be decided so that gravity flow at desired rate is possible in such equipment.

The plant layout will ensure easy access to monitor instruments and maintenance items and will avoid dead pockets as far as possible.

The material for aboveground Coal Yard Spray System water piping will be carbon steel. Buried pipes will be HDPE. The pipes for acid/alkali dosing will be PVC.

4. Process Control

4.1 pH control at pH control tank

pH will be adjusted by injection of H₂SO₄ and NaOH.

4.2 Level control for treated water tank

Level of treated water tank is regulated to XXX (m) by the CWWTP treated water tank control valve.

4.3 Analyzer

pH & SS monitoring instruments will be provided in treated water tank.

5. System Operation

The operation of the plant is dependent on water collection in the pond, which, in turn, is dependent on rainfall.

The rainwater runoff is stored in the Coal Yard, Open Ditch and Coal Yard Pond. The stored water in the Coal Yard Pond is eventually transferred to the Treated Water Tank through pH Control Tank, Flocculation Tank and Sedimentation Tank for pH adjustment and suspended solid removal before the final discharge to the Outfall. Attempt should always be made to keep the coal yard pond buffer capacity of 8,000 m³ empty as a preparatory caution for accommodating the heavy rain.

In the flow path, the pumped waste water from the Coal Yard Pond is directed to the pH Control Tank to adjust the pH level within the Thai Water Quality Standard (5.5 - 9.0). The treated water in pH Control Tank then spills over to Flocculation Tank for coagulant chemical injection and mixing for removal of the suspended solids in the subsequent Sedimentation Tank, and finally the clear water spills over to Treated Water Tank for temporary storage.

From the Treated Water Tank, this clear water is used for coal yard water spray for dust suppression when the water in treated water tank is at normal level. If the level of Treated Water Tank increases beyond the normal level required for storing the spray water to the coal handling facilities, the clear water is discharged to the Outfall by the Treated Water Transfer Pumps.

The operating philosophy of Coal Yard Waste Water Treatment Plant has three distinctive features depending on the intensity of rain as experienced at Map Ta Phut area in the past. From the meteorological record provided by the Contract Specification, it is noted that site weather condition can be divided in three different phases based on rainfall precipitation, viz. Normal Rain, Heavy Rain and Dry condition.

Normal Rain Condition

In case of Normal rain condition, the flow path of waste water starting from gravity flow from Coal Yard to Coal Yard pond through the open channel, Coal Yard Pond to Outfall through the CWWTP can be continuously maintained. Since the Treated Water Tank reserves water storage for supply of spray water for coal dust suppression in the Coal Handling facility, water transfer from Treated Water Tank to Outfall will be made if the level increases beyond normal storage level. In this case one transfer pump operation in automatic made in both the Coal Yard Pond and Treated Water Tank might be adequate to cater for waste water handling.

Heavy Rain Condition

In case of Heavy rain, the accumulation rate in the combined area of coal yard and Coal Yard Pond will be too high and accordingly controlled from

flow coal yard to Coal Yard Pond is required. The Motorized gate in the open channel between coal yard and Coal Yard Pond will operate in on-off mode to maintain the level of the Coal Yard Pond below the maximum storage level. Depending on the pond level, one or two transfer pump(s) will operate to transfer the waste water to pH Control Tank which will be subsequently directed to Treated Water Tank through the CWWTP. As shown in Figure 2, this will be repeat of batch treatments.

Dry Condition

In dry condition, no rain is expected and hence that can be considered as appropriate timing for cleaning of all the pond and tanks. For removal of coal sludge from the Sedimentation Tank, one normally closed valve will be opened to direct the stored water above coal sludge from Sedimentation Tank to Coal Yard Pond. Afterwards, once the Sedimentation Tank gets dried-up, the coal sludge may be removed with the help of bulldozer. Coal sludge from Coal Yard Pond can also be removed utilizing bulldozers during the dry season. Also for inspection and maintenance of Motorized Gate and Transfer Pumps, dry season would be the best timing.

Based on the above operating philosophy, operation of each of the equipment is individually summarized below:

Motorized Gate

The Motorized gate has OPEN/CLOSE operation based on the signal received from the Coal Yard Pond level transmitter. Normally the gate is kept open as long as the water level of the Coal Yard Pond is low. When the water level goes high, the gate will be closed.

Coal Yard Pond Transfer Pumps

The pump operation (either single or double) will be in automatic mode based on the signal received from the Coal Yard Pond level transmitter.

Treated Water Transfer Pumps

The pump operation (either single or double) will be in automatic mode based on the signal received from the Treated Water Tank level transmitter. The level setting for pump start shall be made above the normal water reserve requirement for spray water use.

NaOH dosing system

NaOH dosing system covers NaOH Tank, NaOH Transfer Pump, NaOH Dilution Tank, NaOH Dilution Tank Agitator and NaOH Pump. NaOH Pump is controlled according to the measured pH value from pH transmitter in the pH Control Tank following a feedback control mechanism. NaOH solution preparation in the NaOH Dilution Tank shall be carried out through manual operation of NaOH Transfer Pump and Agitator.

H₂SO₄ dosing system

H₂SO₄ dosing system covers H₂SO₄ Tank, H₂SO₄ Transfer Pump, H₂SO₄ Dilution Tank, H₂SO₄ Dilution Tank Agitator and H₂SO₄ Pump. H₂SO₄ Pump is controlled according to the measured pH value from pH transmitter in the pH Control Tank following a feedback control mechanism. H₂SO₄ solution preparation in the H₂SO₄ Dilution Tank shall be carried out through manual operation of H₂SO₄ Transfer Pump and Agitator.

PAC dosing system

PAC dosing system covers PAC Tank and PAC Pump. PAC Pump operation is automatic operation and is interlocked with Coal Yard Pond Transfer Pump(s) operation. If any of the two Coal Yard Pond Transfer Pumps operates - the PAC Pump will start operation. For this chemical injection - the solution with a fixed concentration will be kept ready for use and the PAC Pump will vary the injection rate based on number of Coal Yard Transfer Pump operation.

Polymer dosing system

Polymer dosing system covers Polymer Tank, Sub Tank, Polymer Tank Agitator and Polymer Pump. Polymer Pump operation is automatic operation and is interlocked with Coal Yard Pond Transfer Pump(s) operation. If any of the two Coal Yard Pond Transfer Pumps operates - the Polymer Pump will start operation. For this chemical injection - the solution with a fixed concentration will be kept ready for use and the Polymer Pump will vary the injection rate based on number of Coal Yard Transfer Pump operation.

Agitation Blower

The Agitation Blower operation is automatic operation and is interlocked with Coal Yard Pond Transfer Pump operation. If any of the two Coal

Yard Pond Transfer Pumps operates - the Agitation Blower will start operation.

Interlocks

Suitable interlocks for safe operation of the pumps depending on the levels of the corresponding tanks on the suction side will be provided.

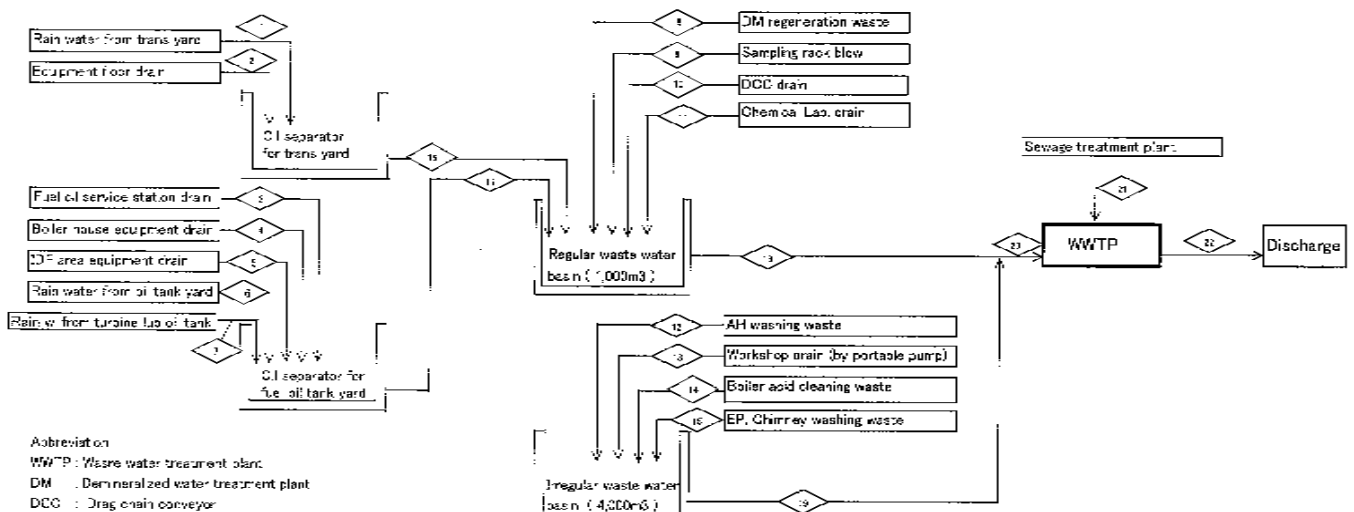
Alarms

Alarms required for monitoring of CWWTP are provided on the local panel in the Control Room in the Water Treatment Plant House. A common alarm is transmitted to DCS and indicated in the CCR.

6. References

1. Coal Yard Waste Water Treatment Plant Flow Diagram (Dwg. No. Later)
2. Contract Specification Vol. II, Sec. 1.7.2.2 Water Quality Standards
3. Contract Specification Vol. II, Appendix A Meteorological Data
3. Contract Specification Vol. III, Sec. 2.1.1 Meteorological Data

Figure 1. Waste Water Balance for Two units



Note: As No. 12, 14 and 15 are not processed simultaneously, No. 12 is used for design.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Design flow (m ³ /d) (Case-1)	0	0	0	0	0	0	0	180	40	576	10	3540m ³ /one operation	1	2000m ³ /one operation	2000m ³ /one operation	0	0	306	600	1406	105	1511
Design flow (m ³ /d) (Case-2)	151	0	37	50	49	322	11	180	40	1152	10	0	1	0	0	151	469	2002	0	2002	105	2107
Design flow (m ³ /d) (Case-3)	151	0	37	50	49	322	11	180	40	576	10	3540m ³ /one operation	1	2000m ³ /one operation	2000m ³ /one operation	151	469	1426	600	2026	105	2131

Case-1: Steady water + Air heater washing waste treatment. Case-2: Steady water + Rainy water treatment. Case-3: Steady water + Air heater washing waste + Rainy water treatment.

Figure 2. Estimated Rain Water Flow and Volume of the Rain Water

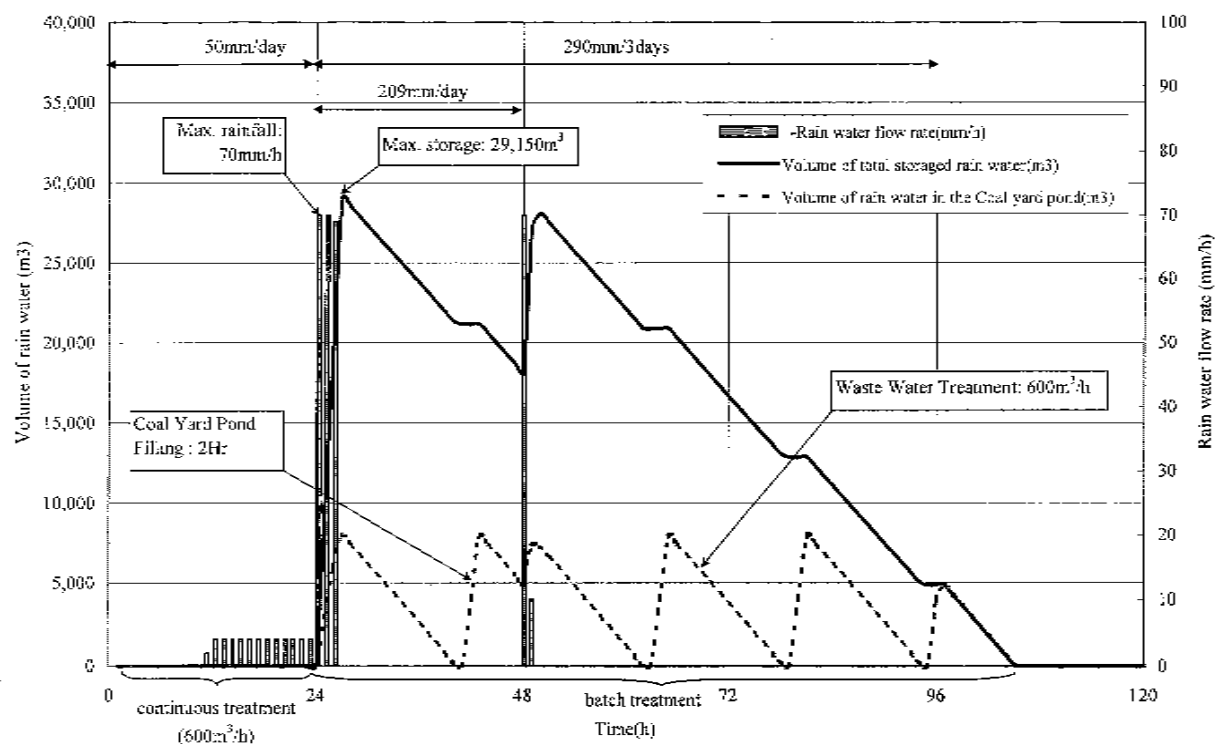



Table-1. Thai Water Quality Standard
(per Contract Specification Vol. II, Sec. 1.7.2.2)

Item	Unit	Standard Values
1. pH		5.5 – 9.0
2. Total Dissolved Solids (TDS)	mg/l	-not more than 3000 mg/l depending on receiving water or type of industry under consideration of PCC but not exceed 5000 mg/l -not more than 5000 mg/l exceed TDS of receiving water having salinity of more than 2000 mg/l or TDS of sea if discharge to sea
3. Suspended Solids (SS)	mg/l	-not more than 50 mg/l depending on receiving water or type of industry or type of wastewater treatment system under consideration of PCC but not exceed 150 mg/l
4. Temperature	°C	not more than 40
5. Colour and Odor		not objectionable
6. Sulfide (as H ₂ S)	mg/l	not more than 1.0
7. Cyanide (as HCN)	mg/l	not more than 0.2
8. Heavy Metals	mg/l	not more than:- -Zinc 5.0 -Chromium(Hexavalent) 0.25 -Chromium(Trivalent) 0.75 -Arsenic 0.25 -Copper 2.0 -Mercury 0.005 -Cadmium 0.03 -Barium 1.0 -Selenium 0.02 -Lead 0.2 -Nickel 1.0 -Manganese 5.0
9. Fat, Oil & Grease (FOG)	mg/l	-not more than 5 mg/l depending on receiving water or type of industry under consideration of PCC but not exceed 15 mg/l
10. Formaldehyde	mg/l	not more than 1.0
11. Phenol	mg/l	not more than 1.0
12. Free Chlorine	mg/l	not more than 1.0
13. Pesticides	mg/l	not detectable
14. Biochemical Oxygen Demand (BOD)	mg/l	not more than 20 mg/l depending on receiving water or type of industry under consideration of PCC but not exceed 60 mg/l
15. Total Kjeldahl Nitrogen (TKN)	mg/l	not more than 100 mg/l depending on receiving water or type of industry under consideration of PCC but not exceed 200 mg/l
16. Chemical Oxygen Demand (COD)	mg/l	not more than 120mg/l depending on receiving water or type of industry under consideration of PCC but not exceed 400 mg/l

ภาคผนวก จ-5

ความสามารถในการรองรับน้ำเสียของ Coal Yard Pond

BLCPP Drawing No. : M0-MN-GN-PP-01528 SUPPLIER DRAWING NO. / MITSUBISHI DRAWING NO. / SUPPLIER NAME 53117-1101	PLAN RECORD	REVISIONS		CHECKED	APPROVED
		Rev. No.	Description (Date)		
		5	Accroding to revised as PI# 692 Install additional emergency alarm system to the six existing shower eye wash stations (Refer to BLCPP-DCC-CN-0153)		
		6	Revised according to Plant Modification No. .976,977,978,979. Install permanence level indicator for calculate. (Refer Change request # BLCPP-DCC- CN-0260)		
		7	Revised according to Plant Modification No. 853 Install flow transmitter at raw water supply coal yard treatment. (Refer Change request # BLCPP-DCC- CN-0272)		
	8	Plant Modification No. 1577 Addition submersible pumps and control system for storm drainage system at Zone-D nearby the outfall of Canal discharge to Coal Yard gutter. BLCPP-DCC-CN-0429			
<div style="border: 1px solid black; padding: 10px; display: inline-block;"> AS BUILT </div> <p style="margin-top: 20px;"> A4 x A3 x Total </p> <p style="margin-top: 20px;">SHEETS WITH COVER</p>					
TITLE <div style="text-align: center; border: 1px solid black; padding: 5px;"> COAL YARD WASTE WATER TREATMENT PLANT FLOW DIAGRAM </div>					
BLCPP DRAWING NO.					REV. NO.
M0-MN-GN-PP-01528					8
SUPPLIER NAME/SUPPLIER DRAWING NO./ MITSUBISHI DRAWING NO.					
53117-1101					
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  </div> <div> BLCPP POWER PROJECT </div> </div>					

AMENDMENT RECORD			
REVISED	DESCRIPTION	AMENDMENT	REMARK
5	<p>Accroding to revised as PI# 692 Install additional emergency alarm system to the six existing shower eye wash stations (Refer to BLCP-DCC-CN-0153)</p> <p>Revised : 1. Drawing No. : DCY-003 sheet No.1</p>	16 June 2010	
6	<p>Revised according to Plant Modification No. .976,977,978,979. Install permanence level indicator for calculate. (Refer Change request # BLCP-DCC- CN-0260)</p> <p>Revised : 1. Drawing No. : DCY-003 sheet No. 1</p>	11 April 2013	
7	<p>Revised according to Plant Modification No. .845,851,853,854.. PI-845 Install flow transmitter at flow outlet discharge sewage waste water. PI-851 Install flow transmitter at portable water pump discharge header PI-853 Install flow transmitter at raw water supply coal yard treatment PI-854 Install flow transmitter at service water pump discharge header. (Refer Change request # BLCP-DCC- CN-0272)</p> <p>Revised : 1. Drawing No. : DCY-003 sheet No. 1</p>	01 August 2013	
8	<p>Plant Modification No. 1577 Addition submersible pumps and control system for storm drainage system at Zone-D nearby the outfall of Canal discharge to Coal Yard gutter.</p> <p>: Addition submersible pumps, check valves, valves and control system in P&ID for Coal Yard Waste Water Treatment Plant as below. BLCP-DCC-CN-0429</p>		

REVISIONS	
Rev. No.	DESCRIPTION (DATE)
1	1. Added the following items.
	1) Service water line for priming of self-priming pumps
	2) Air break valve in air line
	2. Modified motor rated power of the following items
	1) Agitator for H ₂ SO ₄ dilution tank : 0.37kw → 0.4kw
	2) Agitator for polymer tank : 0.37kw → 0.4kw
	3) Agitator for NaOH dilution tank : 1.1kw → 1.5kw
	3. Modified the type of level instrument into treated water tank : LS → LIT
2	4. Revised the cloud marked points as per design progress.
	(Feb. 1, 2005)
2	Added MNS No. (Equipment, Piping, Instrument and Valve number).
3	
	(Jun. 20, 2005)
3	Issued as AS BUILT DRAWING.
4	
	(Jun. 14, 2006)
	1. Following design change is incorporated.
	FCN-0-MHIN-RB4-GNA-0310
	DCN-0-MHIN-RB4-GN-0391
4	DCN-0-MHIN-RB1-GN-0474
	2. Issued as AS BUILT DRAWING.
	(Aug. 30, 2006)

PIPING SYMBOLS

	UNDICED (TYPE) VALVE		PROCESS LINE
	GATE VALVE		BLOWER LINE
	GLOBE VALVE		BLIND FLANGE
	CHECK VALVE		FLANGE
	NEEDLE VALVE		UNION
	BALL VALVE		SPADE BLIND
	3 WAY BALL VALVE		SPECTACLE BLIND
	BALL VALVE WITH JACKET		RESTRICTION ORIFICE
	Y-GLOBE VALVE		CAP (BUTT WELD TYPE)
	BUTTERFLY VALVE		CAP (SOCKET WELD OR SCREWED TYPE)
	REDUCING VALVE		HOSE CONNECTION
	DIAPHRAGM VALVE		Y TYPE STRAINER
	SAFETY VALVE		T TYPE STRAINER
	SLIDE VALVE		BUCKET TYPE STRAINER
	AIR FLOW CONTROL VALVE		STEAM TRAP
	PNEUMATIC OPERATED CONTROL VALVE		SIGHT GLASS
	SELF ACTUATED CONTROL VALVE		EXPANSION JOINT
	MOTOR OPERATED VALVE		FLEXIBLE JOINT
	SOLENOID OPERATED VALVE		OPEN FUNNEL
	PNEUMATIC OPERATED ON-OFF VALVE		PIT
WITH SUBSCRIPT			EJECTOR
FF : FAIL FIX			FLAME ARRESTER
FC : FAIL CLOSE			VENDOR SCOPE
	FOOT VALVE		SAMPLING POINT
	PRESSURE RELIEF VALVE		AIR CHAMBER
	BACK PRESSURE VALVE		
	EXHAUST VALVE		

INSTRUMENT SYMBOLS & IDENTIFICATION LETTERS

	LOCALLY MOUNTED INSTRUMENT
	DCS INSTRUMENT
	CONTROL PANEL
	LOCALLY MOUNTED TRANSMITTER
	ORIFICE
	VENTURI TUBE
	POSITIVE DISPLACEMENT FLOW METER
	PADDLE WHEEL FLOW METER
	MAGNETIC FLOW METER
	VORTEX METER
	AREA METER
	PITOT TUBE
	MASS FLOW METER
	FLAPPER SIGHT GLASS
	AIR REGULATOR-1 (AR-1)
	AIR REGULATOR-2 (AR-2)
	DRIFT FUNNEL-1 (DF-1)
	PRESSURE GAUGE WITH DIAPHRAGM SEAL
	AIR FILTER REGULATOR

EXAMPLE OF LETTERING

FC
123

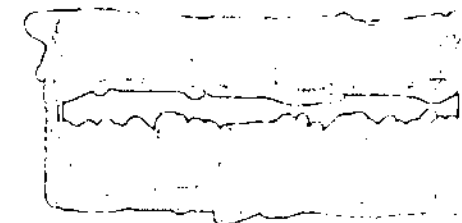
F : FIRST LETTER
C : SUCCEEDING LETTERS
123 : LOOP NUMBER

EXAMPLE OF LETTERING

A	ANALYZER (WITH CORRESPONDING UNIT AS A SUBSCRIPT e.g. A_{PH} , A_{EC})
C	CONDUCTIVITY
D	DENSITY OR SPECIFIC GRAVITY
E	VOLTAGE
F	FLOW RATE
H	HAND
L	LEVEL
M	MOISTURE OR HUMIDITY
P	PRESSURE
R	REMOTE (VALVE)
S	SPEED OR FREQUENCY
T	TEMPERATURE
TQ	TORQUE
U	MULTIVARIABLE
V	VISCOSITY
W	WEIGHT OR FORCE
X	ANOTHER

MEANINGS OF SUCCEEDING LETTERS

A	ALARM
C	CONTROL
E	ELEMENT
G	GAUGE
I	INDICATION
K	COMPUTER CONTROL
L	LOGGING
Q	QUANTITY
R	RECORDING
S	SWITCH
T	TRANSMISSION OR CONVERSION
U	MULTIFUNCTION
V	VALVE
W	WELL
X	ANOTHER
Y	CALCULATION
Z	EMERGENCY OR SAFETY



NOTE

A0 : CARBON STEEL
A1 : CARBON STEEL/HOT DIPT GALV
A2 : CARBON STEEL/INNER HRL
A3 : SUS-304
A4 : SUS-316L
A5 : PVC ASTM D1785
A6 : FRP DIN 1695 PN10
A7 : HDPE PN6
A8 : CARBON STEEL/INNER TEFLON LINING
(A9 : CPVC)

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2	Rev. as mark	09-07-04	752	1	1
1	Rev. as marks	17-05-04	EP	KW	KW
0	First issued	02-04-04	CH	KW	KW
Rev.	Description	Date	Draw	Checked	Approved

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Project Name :
BLCP POWER PROJECT

Messrs :
MITSUBISHI HEAVY INDUSTRIES LTD.

Title :
**COAL YARD WASTEWATER TREATMENT PLANT
SYMBOL & ABBREVIATION**

JOB NO.	PJ0311002	Drawing No.		Rev.	
Sheet :	1	Scale :	NONE	DCY-000	2
Sheet No :	1	Format :	A3		

REVISIONS	
Rev. No.	DESCRIPTION (DATE)
1	1. Added the following items.
	1) Service water line for priming of self-priming pumps
	2) Air break valve in air line
	2. Modified motor rated power of the following items
	1) Agitator for H ₂ SO ₄ dilution tank : 0.37kw → 0.4kw
	2) Agitator for polymer tank : 0.37kw → 0.4kw
	3) Agitator for NaOH dilution tank : 1.1kw → 1.5kw
	3. Modified the type of level instrument into treated water tank : LS → LIT
2	4. Revised the cloud marked points as per design progress.
	(Feb. 1, 2005)
2	Added MNS No. (Equipment, Piping, Instrument and Valve number).
3	
	(Jun. 20, 2005)
3	Issued as AS BUILT DRAWING.
4	
	(Jun. 14, 2006)
	1. Following design change is incorporated.
	FCN-0-MHIN-RB4-GNA-0310
	DCN-0-MHIN-RB4-GN-0391
4	DCN-0-MHIN-RB1-GN-0474
	2. Issued as AS BUILT DRAWING.
	(Aug. 30, 2006)

PIPING SYMBOLS

	UNDICED (TYPE) VALVE		PROCESS LINE
	GATE VALVE		BLOWER LINE
	GLOBE VALVE		BLIND FLANGE
	CHECK VALVE		FLANGE
	NEEDLE VALVE		UNION
	BALL VALVE		SPADE BLIND
	3 WAY BALL VALVE		SPECTACLE BLIND
	BALL VALVE WITH JACKET		RESTRICTION ORIFICE
	Y-GLOBE VALVE		CAP (BUTT WELD TYPE)
	BUTTERFLY VALVE		CAP (SOCKET WELD OR SCREWED TYPE)
	REDUCING VALVE		HOSE CONNECTION
	DIAPHRAGM VALVE		Y TYPE STRAINER
	SAFETY VALVE		T TYPE STRAINER
	SLIDE VALVE		BUCKET TYPE STRAINER
	AIR FLOW CONTROL VALVE		STEAM TRAP
	PNEUMATIC OPERATED CONTROL VALVE		SIGHT GLASS
	SELF ACTUATED CONTROL VALVE		EXPANSION JOINT
	MOTOR OPERATED VALVE		FLEXIBLE JOINT
	SOLENOID OPERATED VALVE		OPEN FUNNEL
	PNEUMATIC OPERATED ON-OFF VALVE		PIT
WITH SUBSCRIPT			EJECTOR
FF : FAIL FIX			FLAME ARRESTER
FC : FAIL CLOSE			VENDOR SCOPE
	FOOT VALVE		SAMPLING POINT
	PRESSURE RELIEF VALVE		AIR CHAMBER
	BACK PRESSURE VALVE		
	EXHAUST VALVE		

INSTRUMENT SYMBOLS & IDENTIFICATION LETTERS

	LOCALLY MOUNTED INSTRUMENT
	DCS INSTRUMENT
	CONTROL PANEL
	LOCALLY MOUNTED TRANSMITTER
	ORIFICE
	VENTURI TUBE
	POSITIVE DISPLACEMENT FLOW METER
	PADDLE WHEEL FLOW METER
	MAGNETIC FLOW METER
	VORTEX METER
	AREA METER
	PITOT TUBE
	MASS FLOW METER
	FLAPPER SIGHT GLASS
	AIR REGULATOR-1 (AR-1)
	AIR REGULATOR-2 (AR-2)
	DRIFT FUNNEL-1 (DF-1)
	PRESSURE GAUGE WITH DIAPHRAGM SEAL
	AIR FILTER REGULATOR

EXAMPLE OF LETTERING

FC
123

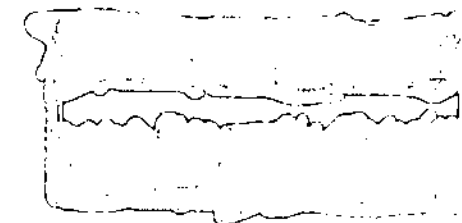
F : FIRST LETTER
C : SUCCEEDING LETTERS
123 : LOOP NUMBER

EXAMPLE OF LETTERING

A	ANALYZER (WITH CORRESPONDING UNIT AS A SUBSCRIPT e.g. A_{PH} , A_{EC})
C	CONDUCTIVITY
D	DENSITY OR SPECIFIC GRAVITY
E	VOLTAGE
F	FLOW RATE
H	HAND
L	LEVEL
M	MOISTURE OR HUMIDITY
P	PRESSURE
R	REMOTE (VALVE)
S	SPEED OR FREQUENCY
T	TEMPERATURE
TQ	TORQUE
U	MULTIVARIABLE
V	VISCOSITY
W	WEIGHT OR FORCE
X	ANOTHER

MEANINGS OF SUCCEEDING LETTERS

A	ALARM
C	CONTROL
E	ELEMENT
G	GAUGE
I	INDICATION
K	COMPUTER CONTROL
L	LOGGING
Q	QUANTITY
R	RECORDING
S	SWITCH
T	TRANSMISSION OR CONVERSION
U	MULTIFUNCTION
V	VALVE
W	WELL
X	ANOTHER
Y	CALCULATION
Z	EMERGENCY OR SAFETY



NOTE

A0 : CARBON STEEL
A1 : CARBON STEEL/HOT DIPT GALV
A2 : CARBON STEEL/INNER HRL
A3 : SUS-304
A4 : SUS-316L
A5 : PVC ASTM D1785
A6 : FRP DIN 1695 PN10
A7 : HDPE PN6
A8 : CARBON STEEL/INNER TEFLON LINING
(A9 : CPVC)

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2	Rev. as mark	09-07-04	752	1	1
1	Rev. as marks	17-05-04	EP	KW	KW
0	First issued	02-04-04	CH	KW	KW
Rev.	Description	Date	Draw	Checked	Approved

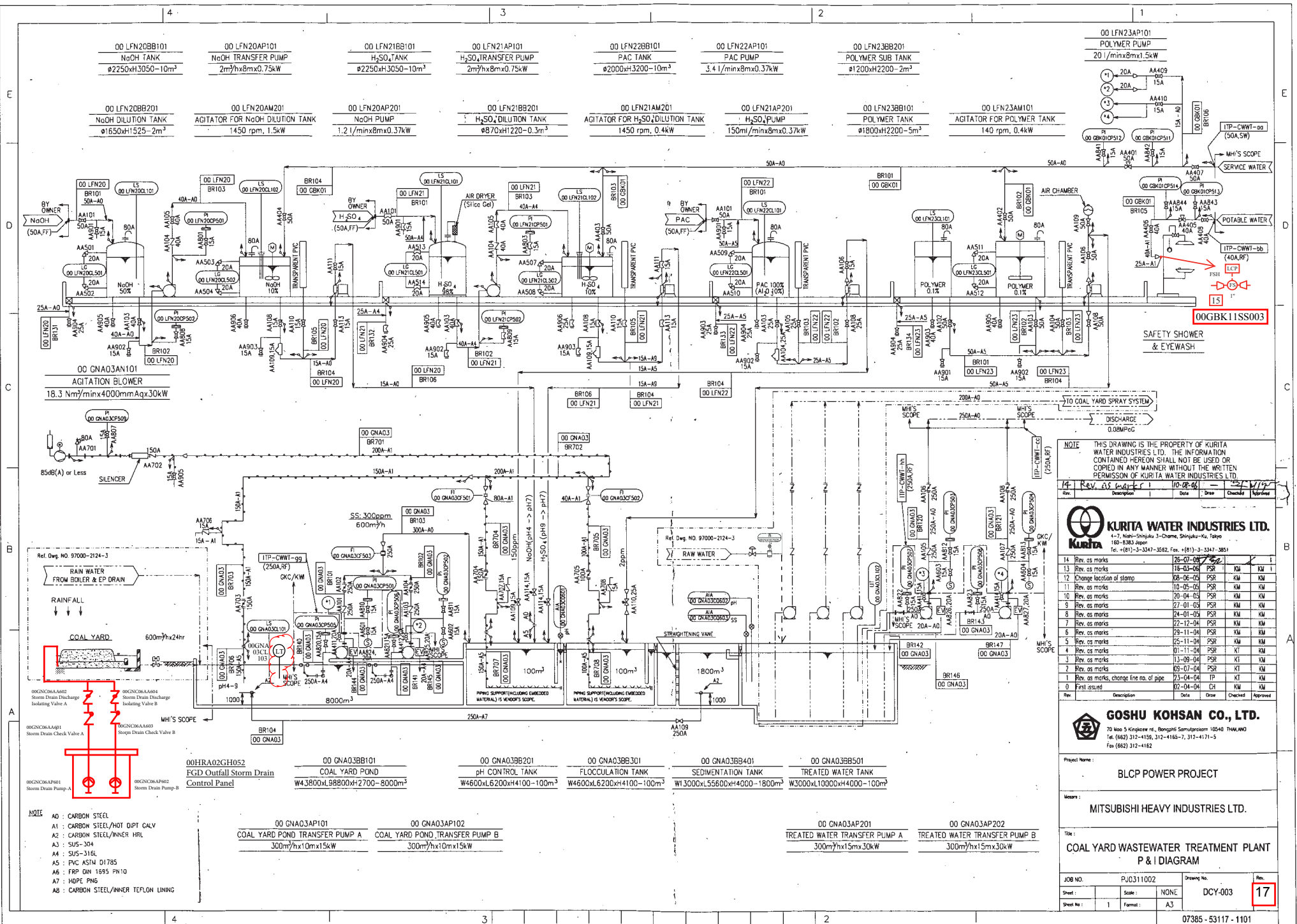
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Project Name :
BLCP POWER PROJECT

Messrs :
MITSUBISHI HEAVY INDUSTRIES LTD.

Title :
**COAL YARD WASTEWATER TREATMENT PLANT
SYMBOL & ABBREVIATION**

JOB NO.	PJ0311002	Drawing No.	Rev.
Sheet :	1	Scale :	NONE
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			DCY-000
			2



ภาคผนวก จ-6

การติดตั้งระบบเติมอากาศบริเวณ FGD Chamber

BLCP Drawing No. :
M1-MF-HR-PP-00082

SUPPLIER DRAWING NO./ MITSUBISHI DRAWING NO. / SUPPLIER NAME
97000-2262-18

PLAN RECORD	REVISIONS		CHECKED	APPROVED
	Rev. No.	Description (Date)		
	2	Revised according to Plant Modification No. 828 & 576. Installation FGD lower distributor inlet strainer system. (Refer Change request # BLCP-DCC-CN-0245)		

AS BUILT DRAWING


A4 x
A3 x
Total 9

SHEETS WITH COVER

TITLE
FLUE GAS DESULPHURIZATION (FGD) SYSTEM DESIGN MANUAL

BLCP DRAWING NO.
M1-MF-HR-PP-00082

SUPPLIER NAME/SUPPLIER DRAWING NO./ MITSUBISHI DRAWING NO.
97000-2262-18

BLCP POWER PROJECT

AMENDMENT RECORD			
REVISED	DESCRIPTION	AMENDMENT ISSUE DATE	REMARK
2	Revised according to PI#828 & 576. No. 828 & 576. Installation FGD lower distributor inlet strainer system. (Refer Change request # BLCP-DCC-CN-0245) Revised sheet : 1. 1. Dwg. No. D-1-005-01-B-F Attachment 4 sheet 2/4	10-Aug.-12	

BLCP Power Limited BLCP Power Plant Project		COMMENT RESOLUTION SHEET		BLCP Letter Ref No. TH041824MM182306IRN Date: 28 July 2004
BLCP Dwg. No. : M1-MF-HR-PP-00082	Rev. No. 0	MCP Dwg. Title : Flue Gas Desulfurization System Design Manual	MCP Transmittal No. : MAP-MHIN-BLCP-T-00749	Sheet No. (1/9)
MCP Dwg. No. : 97000-2262-18		Issue Date: : 25 June 2004		
NO.	BLCP COMMENT		MCP RESPONSE	
1.	Does the system are designed for operational within Boiler load range 25% to 105% BMCR at worst coal 0.95% Sulphur content, please confirm.		<p>The original MCP proposal, stated an overall design margin for the entire FGD package as 25% to 105% BMCR at worst coal 0.95% sulfur content, based on the Alstom design. However, with progress in detail design, the design margin in the FGD package is more accurately expressed in terms of actual margins on operating parameters applied to the individual major equipment within the FGD package. Thus, MCP clarifies that while stating that "the FGD system is rated for operation between the range TMCR 25% ~ BMCR 100% while firing the worst coal with 0.95%S", the actual design margins are explained below.</p> <p>While establishing the rated parameters for each major equipment, the MCP design incorporates margins on the individual operating parameters, as each equipment has its own criterion that imposes the most severe duty for that equipment within the FGD package. As explained in the FGD Boost Up Fan (BUF) Equipment Design Basis (Doc No. M1-MN-HR-ME-20026) this fan derives its design margins while operating at a maximum possible flue gas flow rate, similar to the Induced Draft Fans. The FGD Seawater Pump is designed similar to the Circulating Water Pumps, i.e., rated to operate at the lowest tide level, which represents its worst case. Design margins are applied to the frictional losses that decide the required differential head. This ensures that the pumped flow rate always exceeds the design requirement at all higher tidal levels, the flow rate being more with the actual differential head across the pump being lower than that rated for the pump. Similarly, the Aeration Blowers are rated to supply the air required for treatment of seawater while firing 0.95% sulfur coal. Accordingly, four aeration blowers (three working & one standby) are installed. During normal operation with performance coal,</p>	

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NO.	BLCP COMMENT	MCP RESPONSE
		<p>only one aeration blower can meet the service requirement. Thus, irrespective of the sulfur content of the coal, at least one blower always stays on standby, clarifying the ample design margin provided here. Similarly, the absorber blowers are also sized to ensure one standby blower; while other two blowers are in operation.</p> <p>In conclusion, MCP clarifies that individual equipment are sized with design margins applied on their individual, most severe, operating case. Thus, if one has to assess the total design margin for the FGD package for a particular case like firing with 0.95% sulfur coal, the design adopted by MCP ensures that individual equipment will have adequate margin under any such service condition.</p> <p>Please note that MCP has established the operating parameters for individual equipment based on extensive laboratory tests and design verification, as clarified in the No. 6 design review meeting.</p>
2.	<p><u>Equipment Specification, page 50</u> - Please provide the summary table of estimated power consumption for FGD system. The data shall identify;</p> <p>Rated power consumption.</p> <p>Estimated power consumption for "Blair Athol", "Valeria", Worst Case Coal at 0.95% Sulphur content and Performance Coal.</p>	<p>At this time, MCP, in conjunction with its equipment suppliers is estimating the power consumptions of each major equipment within the FGD package for various operating scenarios. MCP will therefore issue the estimated power consumption later, after it concludes this evaluation. MCP will provide power consumption information at the following conditions:</p> <ol style="list-style-type: none"> 1) Rated power consumption 2) Coal C with 0.95 wt % sulfur @ BMCR (Design condition) 3) Blair Athol and Valeria @ BMCR 4) Performance coal @ TMCR (Guaranteed condition of power plant power consumption)

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NO.	BLCP COMMENT	MCP RESPONSE
3.	<u>Equipment Specification, page 51</u> The proposed material for Seawater pump casing is FCHD/JIS SCS14/JIS SUS316L under this design manual while the Ni-resist Iron type D2 is utilized which identified in letter no. MAP-MHIN- BLCP-L-0093 Dated 19 December 2003, please clarify the different. In additional, due to the FGD Emergency Seawater Transfer Pump and Storage Pit Sump Pump will be drawn rich ash/trace element and low pH mixed seawater/raw water, please clarify the pump itself including piping material is carefully consider for this severe condition.	<p>The letter MAP-MHIN- BLCP-L-0093 dated 19 December 2003 indicated the proposed material to be used by a prospective pump supplier. However, the material of construction for the Sea Water Pump has been finalized to be FCHD/SCS14, as indicated in the system design manual. This material selection is based on the manufacturer's extensive experience in numerous successful installations for this pump type in similar service. This is based on the information provided by the pump manufacturer, and has been incorporated in the pump manufacturer's data.</p> <p>The FGD Emergency Sea Water Transfer Pump & associated piping will be placed in service only after an emergency like a plant blackout. The possibility of such an emergency mode of operation is extremely remote. In addition, the duration of operation of this pump and piping during such an emergency is not very long. The pump data sheet issued to the pump manufacturer did specify the presence of ash in the pumped fluid. But, the pump material of construction has been specified to withstand the low pH conditions. And also the piping material, FRP and HDPE, withstand the low pH. The abrasion resistance of these materials is however moderate, considering the very limited hours of operation of this pump during the entire plant service life.</p> <p>With design progress, the bottom level of emergency seawater storage pit has been elevated higher than that of the outfall. Therefore, the storm water of emergency seawater storage pit can be drained out by gravity and the emergency storage pit sump pump is deleted.</p>

NO.	BLCP COMMENT	MCP RESPONSE
4.	<u>P&ID Absorber area, page 41</u> – When in emergency situation e.g, plant blackout, when the water is released from emergency water tank, How the system will perfectly protect the rich ash/trace element seawater escape through the Relay Pit discharge line to Mixing Pit without any isolation device, please clarify.	<p>In emergency condition, e.g., black out, all BUFs and SWPs will trip. Relay pit has 736m³ capacity. This is equivalent to 2.1 minutes retention time assuming a maximum possible effluent flow with rich particulates at the normal operation rate of 20609m³/h from the absorber. In reality, the effluent flow rate will be lower than that of normal operation, as the water flows under gravity from the emergency water storage tank.</p> <p>The relay pit incorporates a weir, and there is no possibility that this effluent with rich particulates will overflow into the mixing pit.</p> <p>The effluent with rich particulates, stored in the emergency seawater storage pit, will be pumped out by the emergency sea water transfer pump.</p>
5.	<u>Lining Scope Drawing, page 54</u> – We understand that the lining material at piping downstream of butterfly valves of Seawater discharge pipe to the length of 2.5D is rubber – lined which should identify in number of 13 instead of 14, please consider. As well as why does the rubber – lined is selected for this location and at 2.5 D, please clarify.	<p>The fluid flow pattern downstream of a partially opened butterfly valve is characterized by a vortex formation. The turbulence in this vortex flow pattern can erode the tar epoxy lining on the pipe internal surface over prolonged periods of operation. Therefore, MCP has rubber-lined the pipe internal surface for a length of 2.5 D downstream of the butterfly valve.</p> <p>Experience suggests that the effects of this vortex are more pronounced up to a distance of 1.5 D downstream of the butterfly valve. Accordingly, MHI standards recommend internal rubber-lining for at least 1.5D length of pipe downstream of the valve. This effectively protects the pipe from flow assisted erosion.</p> <p>However, on the BLCP Power Project, the rubber lining is longer - 2.5D based on the agreement reached in #3 design review meeting.</p> <p>The lining identification number shown on the lining scope drawing will be corrected in the next revision.</p>
6.	Corrosion protection, please provide the technical specification of Lining/Coating material for our information. E.g. Hastelloy, Flake, Rubber, Tar Epoxy, PE and FRP.	Please refer to the drawing No. M1-MN-HR-ZZ- 01033 (FGD SYSTEM LINING MATERIAL SPECIFICATION).

NO.	BLCP COMMENT	MCP RESPONSE
7.	For the all carbon steel buried pipe of FGD system, what is your design for corrosion protection of the outside of the pipe? Refer to drawing no. M1-MN-PU-PP-00083 Rev.0 (Cathodic Protection System Design Manual), page 24 and this FGD System Design Manual, page 41. We understand that SW suction line will wrapping + Sacrificial Anode while the SW outlet line from relay pit to outfall don't have any protection, please clarify for this inconsistency.	<p>Similar to the corrosion protection on the outer surface of the buried absorber inlet seawater pipe, the outer surface of the buried seawater effluent pipe from the relay pit is effectively protected from external corrosion by the use of lapping tape and sacrificial anode.</p> <p>The acidic nature of the seawater effluent from the relay pit requires lining the pipe with a Flake lining. A pipe internally coated with flake lining does not require any cathodic protection for protection against corrosion due to exposure by the fluid handled, as described in the drawing M1-MN-PU-PP-00083 rev.1 (Cathodic Protection System Design Manual) P8.</p>
8.	How could you protect the fouling along the seawater supply line and the equipment e.g. Air Cooler, please clarify.	Bar screens installed upstream of the SWP and strainers installed upstream of the air cooler seawater line protect the heat transfer surfaces from fouling. In addition, please note that the circulating water used in the FGD system has been already treated by chlorination and filtration in the intake area. These factors greatly limit fouling of equipment handling this seawater.
9.	What is the maximum permissible operating temperature for Glass Flake Lining which lined in the Absorber. Are there potential the high temperature flue gas damage the lining and what is your protection?	<p>Design temperature for glass flake lining of the absorber is 150°C and maximum operating temperature of the flue gas is 140°C (Carrington Coal @ BMCR). Therefore, there is 10°C margin between design and maximum operating temperature.</p> <p>Moreover, the high absorber inlet temperature alarm is set at 150°C, considering this design condition.</p>
10.	Please verify the design criteria and calculation of the Emergency water storage tank capacity of 60m ³ will release the raw water within 10 minutes	Required emergency water splay flow to maintain the mist eliminator inlet temperature lower than the design condition, in the absence of sorbent seawater supply, is 6m ³ /min. Based on this requirement, the emergency water storage tank capacity is designed for 10 min. The gravity drain line is sized to ensure that this tank will be effectively drained in 10 minutes.

NO.	BLCP COMMENT	MCP RESPONSE
11.	The Performance Test Procedure of the FGD is not appearing in "Drawing Submittal List" and "Method Statement and Procedure List". We understand that such kind of performance testing procedure complying with the Appendix 4 of Item 6.1.30 of EPC Contract Vol. IV will be submitted to us for review.	Performance test procedure will be issued later.
12.	<u>Flue Gas Composition, page 48</u> – What is the different between two groups of data of flue gas composition, please clarify.	One is expressed in dry %, and the other set of data are expressed in wet %.
13.	At the aeration pit area, how could we monitor the diffuser performance / condition to ensure that the diffuser will not be clog from the accumulation of fouling at diffuser nozzle, please advice. We consider a variation of pressure indication may not enough to confirm the diffuser working conditions. In additional, please provide the General arrangement of the Diffuser for our information.	<p>Prevention of clogging at the diffusers has several aspects, which will be emphasized in the operation manual:</p> <p>Functional aspects:</p> <p><u>Aeration Air Filtration:</u> The aeration system is designed to prevent fouling of the diffusers. A set of duplex fine air filters ensures supply of dust free aeration air to the diffusers and the diffusers should not clog by this prevention of dust entering into the aeration system.</p> <p><u>Circulating Water Treatment:</u> Effective and appropriate circulating water treatment can prevent external bio fouling of the diffusers.</p> <p>Operational aspects:</p> <p><u>Cycling of diffuser headers:</u> The number of operating aeration blowers depends on the sulfur content of the coal fired in the boiler. With the design margin and wide operating range of the seawater treatment plant, a more likely scenario will involve operation of only one (1) aeration blower with its group of five (5) aeration headers in service. This will require isolation of the remaining aeration headers. Isolation of any given set of diffusers for extended periods can contribute to external fouling. Therefore, proper operation of the seawater treatment plant involves periodic cycling of the system of aeration headers in operation. This exercises the diffusers. Experience suggests that this method is very effective in preventing external fouling & ensuring the durability of the diffusers. Typically, a set of diffusers should be cycled every two to three months – the actual period will be finalized based on actual experience at site.</p>

NO.	BLCP COMMENT	MCP RESPONSE
		<p><u>Monitoring Aeration Pressure:</u> The aeration pressure can be effectively monitored at the blower discharge and at the inlet of individual aeration headers. The aeration pressure has two components: a non-varying component that depends on the frictional loss in the downstream aeration pipes, and a varying component that depends on the seawater level in the treatment plant & the condition of the diffuser itself. In the as-new condition, the aeration pressure should be monitored at all the measurement points (blower discharge & aeration header inlets) for its variation with the seawater level in the outfall, which varies with the tides. This forms the benchmark for further monitoring and trending. Monitoring the aeration pressure, based on this benchmark can provide a reliable indication of the condition and performance of the diffusers installed in the various headers.</p> <p><u>Monitoring the treated seawater pH:</u> For a given sulfur content in the coal fired in the boiler, monitoring the variation in the seawater pH over a period, at the outlet of the seawater treatment plant is also an indicator of the degree of aeration, and thus the condition of the diffusers.</p> <p>The general arrangement of the diffuser will be issued later.</p>
14.	<p><u>Empty the Discharge Cannel, page 14 & 24</u> — "A portable outfall dewatering sump pump" is being supply to empty the outfall cannal. Please verify that is it the same pump to empty the CW intake? And also please verify the dewatering process as well as required time at 24 hrs dewatering with appropriate calculation.</p>	<p>FGD system outfall dewatering pump will be supplied separate from CW intake sump pump.</p> <p>Considering the dewatering efficiency, stop log is inserted when the sea level is lower than that of outfall dam. Therefore, dewatering capacity is considered as the capacity required to empty the seawater below the outfall dam and approx. 8150m³ for 1 unit. A dewatering time of 24 hours yields the pump capacity as follows:</p> <p>Calculated pump capacity = $8150\text{m}^3 \div 24\text{hrs} = 340\text{m}^3/\text{h}$</p> <p>→ rounded off to <u>350 m³/h</u></p> <p>Accordingly, a pump with 350 m³/h capacity is selected.</p>

NO.	BLCP COMMENT	MCP RESPONSE
15.	<p><u>P&ID, page 43</u></p> <p>We understand that the monitoring instrument for pH, Temperature and residual Chloride will be installed at outfall outlet location individually for Unit 1 and 2 due to the completely separated of the CW system, please confirm.</p> <p>Due to the width of outfall is 10m.(each side) approximately, we consider the installation of one analytical instrument AT may not enough to cover the entire amount of discharge seawater conditions, please verify.</p> <p>As you are aware this seawater monitoring data is sensitive environmental issue and must be continuous and reliable data, we consider redundancy instrument might essential, please consider.</p>	<p>Monitoring instrument for pH, temperature and residual chloride will be installed individually for unit 1 and unit 2.</p> <p>Seawater condition will be uniform by the homogenous mixing in the mixing pit and by downstream aeration. Therefore, one measurement point will be adequate for sensing the discharge seawater condition for one unit total two.</p> <p>Consistent with the philosophy adopted for all instruments installed for monitoring environmentally sensitive parameters, only one (1) instrument is supplied for one unit total two.</p>

NO.	BLCP COMMENT	MCP RESPONSE
16.	<p>Under the Contract Document item 6.1.30-15 of Vol, IV, MCP shall provide the additional data as following</p> <p>1. FGD guarantee compliance to be determined by correction curves;</p> <p>SO₂ emission at stack</p> <p>Total FGD power consumption</p> <p>pH at SWTP discharge</p> <p>Temperature increase between absorber inlet and SWTP outlet</p> <p>2. Correction Curve of;</p> <p>Flue gas flow (Nm³/h) at ID Fan outlet as function of relevant fuel and boiler parameters</p> <p>SO₂ concentration (vppm, dry 6% O₂) at ID fan outlet as function of relevant fuel and boiler parameters</p> <p>Flue gas temperature (Deg. C) at ID fan outlet as function of relevant fuel and boiler parameters</p> <p>SO₂ emission (vppm, dry 6% O₂) through stack as function of flue gas flow (Nm³/h) and SO₂ concentration (vppm, dry 6% O₂) at ID fan outlet</p> <p>Total FGD power consumption (kW) as function flue gas flow (Nm³/h) at ID fan outlet</p> <p>pH at SWTP discharge as function flue gas flow(Nm³/h), SO₂ concentration(vppm, dry 6% O₂) at ID fan outlet and salinity of CW</p> <p>Temperature increase (Deg. C) between absorber inlet and SWTP outlet as function flue gas flow (Nm³/h) and temperature(Deg,C) at ID fan outlet and CW total flow (m³/h) and temperature(Deg,C)</p>	<p>Total FGD power consumption and temperature increase between absorber inlet and SWTS outlet is not guarantee item to BLCP.</p> <p>MCP will submit the correction curve and kind of correction curve later.</p>

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BLCP Power Limited BLCP Power Plant Project		COMMENT RESOLUTION SHEET		BLCP Letter Ref No. TH041841MM182306IRN Date: 4 August, 2004
BLCP Dwg. : M1-MF-HR-PP-00082 No.	Rev. No. 0	MCP Dwg. Title : Flue Gas Desulfurization System Design Manual	Sheet No. (1/2)	
MCP Dwg. No. : 97000-2262-18		MCP Transmittal No. : MAP-MHIN-BLCP-T-00749		
		Issue Date: : 25 June, 2004		
NO.	BLCP COMMENT		MCP RESPONSE	
1.	Refer to Company's specification item 7.3 – FGD Plant Operation Requirements, page 89, when the flue gas by-passes the FGD plant, or individual flows are taken out of service, for routine or breakdown maintenance, with the unit on load, does the FGD plant as a whole the inoperative streams shall be capable of being safely isolated and does the sufficient mechanical and electrical isolation are provided to accommodate this, please verify.		<p>The FGD plant is provided with single isolation dampers in each of the two inlet flue gas ducts leading to the two boost up fans and in the absorber outlet duct leading to the stack. These dampers are required for isolation and bypass of the FGD unit under the following conditions:</p> <p>(i) While firing fuel oil (as done during Unit startup / shutdown) the flue gas bypasses the FGD to avoid excessive cooling. The SOx emissions while firing only fuel oil meet the environmental limit. The FGD is bypassed to prevent the formation of any visible plume at the stack outlet; and</p> <p>(ii) An ESP trip releases dust-laden gas into the downstream ducts, and the FGD is immediately bypassed. Such gas cannot be led to the FGD absorber in order to protect the absorber trays from fouling, and to prevent release of particulates in effluent seawater.</p> <p>These operating scenarios do not require double isolation dampers, and the single isolation dampers meet the service requirement.</p> <p>In addition, please note that any major maintenance on the FGD plant requires bypassing all the flue gas from the unit directly to the stack, without any treatment for SOx removal. Such operation will grossly exceed the environmental emission limit of 280 ppmv of SOx, and therefore cannot be tolerated. Accordingly, isolation of the FGD for maintenance entails shutting down the Unit itself. Therefore, on-load maintenance is not considered for the FGD plant, although the dampers do allow bypassing the FGD unit under special operating scenarios explained above.</p> <p>Major FGD maintenance should therefore be carried out after the Unit is shutdown. Please note that MCP has supplied single isolation dampers for</p>	

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		the FGDs on similar plants in Japan (e.g., 1000 MW Misumi Power Plant, 600 MW Hirono Power Plant), and based on this experience, assures BLCP that this design does not affect the maintainability of the FGD plant.
2.	Are there potential to get foaming at the outfall affected from the absorber and SWTP, what the facilities and equipment to counteract the foaming are provided.	Foaming is a possibility downstream of seawater treatment plants involving aeration diffusers; although the extent of foaming is unpredictable. Moreover, the degree of foaming cannot be effectively determined and remains open to judgment. However, foaming has only a visual impact. Accordingly, this need not be objectionable, and usually local environmental regulators hold the discretion to accept this or not. The outfall ends in a box culvert. The design of the culvert has features that enable the collection of foam formed on the surface of the seawater (See Dwg. No. M0-MN-XXX-CV-15991 C/W Discharge Outfall Outline & Section). Thus, foam if formed will mostly collect within the plant boundary, and will not be treated. If any foam should escape below the culvert into the open seas, and if the local environmental authority considers it objectionable, a seawater spray shower can be installed downstream of the seawater treatment plant in an effort to mitigate such foam formation.
3.	<u>4.2 FGD Bypass Damper Control, page 24</u> – "A differential pressure transmitter measures.....will be function of MW demand" please give more explanation for this clause.	As shown in the control diagram attachment - 10 - (6/6), [FGD bypass damper opening demand] = [demand based on MW demand] — [bias based on differential pressure across the FGD bypass damper] When the differential pressure across the FGD bypass damper is positive, FGD bypass damper opening demand is equal to the demand based on MW demand. However, only when the differential pressure turns negative pressure, secondary PI controller generates the bias which is subtracted from the demand based on MW demand so that differential pressure across the FGD bypass damper is positive.

BLCP Power Limited BLCP Power Plant Project		COMMENT RESOLUTION SHEET		BLCP Letter Ref No. TH042133MM182306IRN Date: 30 November 2004
BLCP Dwg. No. : M1-MF-HR-PP-00082		Rev. No. 0	MCP Dwg. Title : Flue Gas Desulfurization System Design Manual	Sheet No. (1/1)
			MCP Transmittal No. : MAP-MHIN-BLCP-T-00749	
MCP Dwg. No. : 97000-2262-18		Issue Date: : 25 June, 2004		
NO.	BLCP COMMENT		MCP RESPONSE	
1.	Regarding to our comment on letter no. TH041824MM182306IRN dated 28 July 2004 and TH041841MM182306IRN dated 4 August 2004 concerning to the FGD design, up to now we don't have any reply from your side. We are still waiting for such reply, please consider.		Please refer to MCP letter No. MAP-MHIN-BLCP-L-0543 and No. MAP-MHIN-BLCP-L-0546 respectively.	
2.	According to truck loading connection at FGD Emergency Seawater Storage Pit, we learnt that the discharge line of uncontaminated seawater from FGD Emergency Seawater Storage Pit to outfall will be pumped by Emergency Seawater Pit Sump Pump as original design. Currently, the discharged seawater will be drained by gravity to outfall by manual operated value. It is therefore please consider utilizing this pump for pumping the water to the truck connection.		As the result of study of the level difference between FGD emergency seawater storage pit and outfall, the level of emergency seawater storage pit is decided to GL-300 and storm water in FGD emergency seawater storage pit can be drained out by gravity. Therefore, FGD emergency seawater storage pit sump pump is canceled before purchasing and the valve is supplied between FGD emergency seawater storage pit and outfall. This valve is normally closed to prevent the effluent from going to outfall without any check. Pumping the effluent from FGD emergency seawater storage has been planned by the pump of truck supplied by BLCP. Therefore, please provide the truck with pump.	
3.	Page 21 - "as long as the sample tests verify that the quality of the effluent meets the applicable environmental regulations." Please confirm MCP shall provide the sampling port of the FGD Emergency Seawater Storage Pit drain line at ground level to serve the requirement mentioned above.		Emergency seawater storage pit drain will be sampled through piping for the truck unloading which is located at GL+500. In case that it is sure that the drain is residual storm water or non-reacted seawater in FGD emergency seawater storage pit, such drain can be drained out by opening FGD emergency seawater storage pit drain valve without sample test. However, in case that it is not sure that the drain in FGD emergency seawater storage pit meet the applicable environmental regulations, the drain should be sampled and tested from the above sampling point and it is decided whether the drain can be drained out to outfall or not.	

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Revision Control

Page Number	Description of Amendment	Amendment Revision	Date Amended Pages Inserted
Various	Correcting terminology and description as per latest P&ID	1	2006/10/24
Various	Incorporated available set point values	1	2006/10/24
23 -	Updated the Process Control as per design progress	1	2006/10/24
Attachment-3, 4, 8, 9 & 10	Attached latest Material & Heat Balance, FGD System P&I Diagram, Lining Scope, Single Line Diagram and DCS drawings	1	2006/10/24
Attachment-11	Attached estimated power consumption of the FGD system attached	1	2006/10/24
Attachment-12	Attached submitted comment resolution sheets	1	2006/10/24
Various	Changed parts are marked with vertical bar (" ") at right margin	1	2006/10/24

1. Function

The function of the Flue Gas Desulfurization (FGD) System is to remove the sulfur dioxide from the flue gas produced by the power plant, and to do so to the degree required to meet the emission levels guaranteed in Appendix 10 to the EPC contract.

The FGD system described here is for Unit 1; that for Unit 2 being identical.

2. System Description

Refer to the General Flow Diagram, the General Arrangement, the Material & Heat Balance and the P&I Diagram provided as Attachment – 1, 2, 3 and 4.

The FGD system is based on once-through, wet, seawater scrubbing process specified in the contract documents.

The FGD system consists of the following equipment specifications of which are summarized in Attachment - 7:

- One 100 percent absorber
- Two 50 percent boost up fans (BUFs)
- Three 50 percent absorber blowers
- Three 50 percent seawater pumps
- Four 33 percent aeration blowers
- One 100 percent aeration air cooler
- Two 100 percent aeration air filters
- Three seawater pump pits with bar screen for seawater pumps' suction
- One stop log for seawater pumps' suction (common for Units 1 & 2)
- One Relay pit
- One 100 percent emergency seawater transfer pump
- Emergency seawater storage pit with one 100 percent sump pump (common for Units 1 & 2)

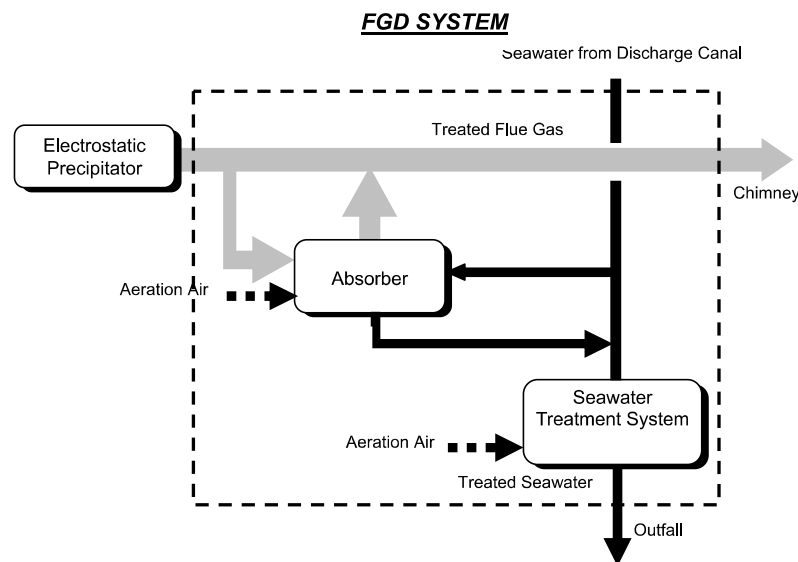
- One seawater treatment system
- One 100 percent portable outfall dewatering pump (common for Units 1 & 2)
- One Stop log for insertion at the discharge canal inlet (common for Units 1 & 2)
- One Stop log for insertion at the discharge canal outlet (common for Units 1 & 2)
- Interconnecting ducts and dampers

Refer to the Key Single Line Diagram provided as attachment – 9. The FGD electrical system consists of the following main components:

- 11 kV Switchgear
- 11 kV / 400 V Auxiliary transformer
- 400 V MCC
- 400 V Emergency MCC
- 380 / 220 V Control Distribution Panel (common for Units 1 & 2)
- 380 / 220 V Lighting Distribution Panel (common for Units 1 & 2)
- 110 V DC Distribution Board

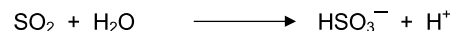
The following subsections describe the operating principle, and the project specific system description.

2.1. Operating Principle

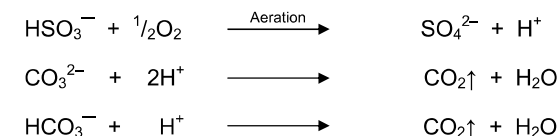


The selected FGD process is a once-through, wet, seawater scrubbing process. Flue gas to be treated passes through an absorber. The process utilizes a portion of the circulating seawater downstream of the condenser as the sorbent to absorb the SO₂ in the flue gas. The availability of seawater in large quantities within the power plant allows its effective use in the process. Seawater is alkaline in nature, and has a large neutralizing capacity with respect to SO₂. This natural alkalinity of seawater neutralizes the SO₂ in the flue gas.

The absorption of SO₂ takes place in the absorber where seawater and flue gas are brought in close contact in a countercurrent flow for effective scrubbing. Absorption of SO₂ in seawater creates bisulfite, and reduces its pH by the formation of hydrogen ions. Bisulfite can also be converted to sulfite. The following reaction statement explains the basic chemistry of SO₂ absorption in seawater:



The sorbent collected in the absorber undergoes primary aeration within the vessel to oxidize some of the absorbed SO₂ (as bisulfite and sulfite) into sulfate. Following this, the absorber effluent mixes with the condenser outlet circulating seawater in a dedicated mixing pit, and then flows to the seawater treatment system where it is air-sparged to complete the oxidation of absorbed SO₂ (as bisulfite and sulfite) into sulfate. The alkalinity in seawater, present as carbonates and bicarbonates, neutralizes the hydrogen ions to increase the seawater pH. The following reactions explain the basic chemistry representing the seawater treatment part of the process



The sulfate completely dissolves in seawater, so as a result there is no waste product to dispose of. Sulfate is a natural ingredient in seawater, and typically, there is only a slight increase of sulfate in the discharge. This increase is within variations naturally occurring in seawater.

Note: The FGD process differs slightly from that specified in the contract. The MCP design improves over the design specified in the contract. Of significance is MCP's provision of absorber blowers promoting primary aeration in the absorber itself and a dedicated mixing pit that increases the pH of the absorber effluent by mixing alone, before the effluent reaches the seawater treatment system. Provision of absorber blowers reduces the total air required for aeration to achieve the same degree of treatment. In addition, treatment of the effluent as diluted by circulating water in the mixing pit, reduces release of fugitive SO₂ emissions in the atmosphere over the seawater treatment system.

Experience in operation of seawater treatment systems on seawater FGDs has revealed nuisance of odor caused by fugitive SO₂ released during aeration. FKK's research confirms that this release of fugitive SO₂ depends on the pH of the seawater entering the aeration area. Maintaining a seawater pH above 6 at the inlet to the aeration area successfully abates any possibility of SO₂ release in the atmosphere around the seawater treatment system. Thus, the design with aeration within the absorber increases the pH of the diluted seawater, after mixing with circulating water, to a value greater than 6. Designs without aeration in the absorber cannot achieve a pH of 6 after mixing with circulating water, and subsequent aeration in these designs releases fugitive SO₂ with a foul odor in the environment around the seawater treatment system.

2.2. SO₂ Absorption system

Refer to Attachment – 4(2/4). The FGD system treats a relatively dust-free flue gas, discharged by the induced draft fans (IDFs), installed downstream of the electrostatic precipitators (EPs). Of the total flue gas released, approximately 70 percent flow passes through the FGD system, while the remaining flow bypasses to the chimney. The treated flue gas cools due to the treatment by seawater, and remixes with the bypassed hot flue gas. Treating only 70 percent of the flow is sufficient to meet the permissible SO₂ levels. In addition, the untreated bypassed flue gas flow has sufficient heat content that achieves a flue gas temperature exceeding the minimum temperature required to avoid a visible plume at the chimney outlet, after mixing with the cooler treated flue gas from the absorber. Pneumatically actuated isolation dampers located in the bypass duct and the FGD system inlet and outlet ducts enable bypassing 100 percent flue gas flow, as would be required when the FGD system is shutdown. The FGD system inlet and outlet dampers are shutoff dampers, while the bypass damper modulates to maintain the required pressure drop in the bypass duct, preventing any backflow of flue gas from the FGD system outlet and consequent unstable operation.

The two boost up fans, installed in FGD system inlet duct, increase the pressure of the flue gas for overcoming the pressure drops in the flue gas path of the FGD system. The boost up fans are single-stage axial fans, each driven by a single-speed motor. Variation in the pitch of the fan blades can vary the flow and the pressure ratio during operation. A hydraulic mechanism is used to adjust blade pitch. Pneumatically actuated inlet and discharge dampers provided on each boost up fan.

Refer to Attachment –5. Flue gas from the boost up fans enters the absorber. The absorber is a vertical cylindrical vessel designed to facilitate close contact between the sorbent (seawater) and the flue gas in the countercurrent direction. Seawater flows vertically downwards, while flue gas rises upwards through the absorbing section of the vessel. Along the height of the absorber, the vessel has subsections performing certain specific functions. The lowest section of the absorber collects the seawater rich in sulfates and sulfites formed during the absorption process. Preliminary treatment of this seawater by aeration using absorber blowers is possible in this section. The flue gas duct connects the absorber above the seawater collected in the absorber. The duct arrangement is inclined downwards as it enters the absorber, which reduces sorbent spray-back into the inlet duct. Here, seawater flowing down from the absorption section, and additionally sprayed over the entire vessel cross-section, quenches the hot flue gas in order to protect the absorber internals from exposure to high temperatures. The flue gas, thus cooled, enters the absorption section of the absorber.

The absorption section of the absorber consists of three stages of perforated plates patented as MORETANA®. These sieve plates do not require any downcomers. This design offers good capacity, excellent efficiency, good turndown characteristics, and are ideally suited for fouling services. A central columnar pipe in the absorber leads seawater supplied by the seawater pumps to a system of headers and nozzles installed above the MORETANA® plates. The fluid flow across the MORETANA® plates is countercurrent, and the bubbling upward flow of flue gas through the seawater leaking downwards provides sufficient interfacial area for enhanced mass transfer.

Treated flue gas leaves the absorber plates and enters the final section in the absorber comprising of a mist eliminator. This device traps any entrained seawater in the flue gas leaving the absorbing section. Flue gas thus treated leaves the absorber through the isolation damper in the FGD system discharge line.

An emergency water storage tank externally formed on the top of the absorber stores quenching water for emergency use, as would be required during a blackout, when the seawater supply to the absorber stops.

The effluent thus created during such an emergency is rich in particulates that pass through the non-energized electrostatic precipitator, and cannot be discharged to the outfall. Therefore, a horizontal centrifugal pump installed adjacent to the relay pit at the absorber outlet, pumps the effluent during a blackout from the absorber to a separate emergency seawater storage pit. This pit is common to both units, and has a storage capacity of 1500 m³. The collected effluent is suitable for trucking for final disposal outside the power plant premises. A sump pump permanently installed in the emergency seawater storage pit can pump storm water or non-reacted seawater to the outfall, as long as the sample tests verify that the quality of the effluent meets the applicable environmental regulations.

The flue gas duct leading to the absorber and the bypass duct are insulated for personnel protection. Expansion joints provided at suitable locations accommodate thermal expansion.

2.3. Seawater supply system

Refer to Attachment – 4 (3/4). Circulating water pipes, leaving the condenser, release seawater into the discharge canal. A wall separates the discharge canals for the two Units. A portion of this seawater is diverted for use as sorbent in the flue gas desulfurization process. Three vertical centrifugal pumps (2 working + 1 standby) per Unit supply seawater from the discharge canal to the absorber for use as sorbent and as a quenching medium. Independent intake pits, arranged at an angle of 60 degrees to the normal direction of flow in the discharge canal, direct the seawater towards the individual pumps. The angular orientation of the intake pits with respect to the discharge canal, enables smooth flow of seawater with minimal pressure drop to the pump suction.

Each intake pit is a concrete structure equipped with a stop log guide frame and a bar screen. The bar screen protects the pump from any entering debris that could possibly fall in the open discharge canal. The stop log guide frame enables insertion of a stop log for maintenance isolation and cleaning of the intake pit.

The seawater pump motor is air-cooled. A motor operated discharge valve provided on the pump discharge line, enables individual pump isolation. Buried carbon steel piping, with tar epoxy coating, supplies the seawater from the seawater pumps to the absorber.

Refer to Attachment – 4 (2/4). A portion of the seawater, sprayed below the absorption section, quenches the incoming flue gas, while the rest enters the absorption section as the sorbent in the absorber. Manually adjustable and lockable butterfly valves ensure proper flow distribution of seawater between the quenching and absorbing sections. The valve opening will be locked based on the test results conducted while commissioning the system.

The arrangement and layout of spray nozzles in the quenching and absorption zones optimizes seawater consumption and ensures maximum coverage.

The aeration air cooler, installed at the seawater treatment system aeration blowers' discharge, sources its seawater-cooling medium from the seawater pumps' discharge header.

2.4. Absorber aeration and seawater treatment system

See Attachment – 4 (2/4) and (4/4). After absorption of SO₂ in the flue gas, effective aeration treats the seawater, as described in item 2.1. Seawater treatment performed in three stages effectively treats the effluent seawater produced in the absorption process. An aeration section within the absorber is the first stage of seawater treatment. Mixing of the absorber effluent with the circulating water in the discharge canal is the second stage. Following this, the final stage of treatment takes place in the seawater treatment system.

Note: The contract does not describe the provision of aeration in the absorber. However, laboratory model tests conducted by MCP, with aeration under different conditions, confirmed its design philosophy that aeration under conditions of low pH (at acidic concentrations prevalent inside the absorber) was more effective than that done at increased pH (at conditions prevalent in the seawater treatment system, after dilution with circulating water flowing in the discharge canal). Thus, it was established that in order to achieve a given target increase in seawater pH, the design with aeration in the absorber, required significantly lower quantity of total aeration air, as compared to designs that aerated only in the discharge canal (as in the design specified in the contract).

The first stage of aeration takes place at low pH, immediately after absorption, and is more effective in oxidizing by aeration than the aeration performed only in the seawater discharge canal. The provision of this first stage of aeration contributes to a reduction in the total air quantity required for aeration as compared to a design based only on aeration performed in the seawater discharge canal. Thus, this first stage aeration contributes to a reduction in the specific power consumption of the FGD system. Absorber blowers aerate the seawater collected inside the absorber. These absorber blowers supply filtered atmospheric air into the absorber, and air diffusers installed near the bottom of the absorber distribute this air in the seawater collected in the absorber. The diffuser comprises of 2 mm diameter circular openings on a system of headers arranged near the absorber bottom. The blowers are root type positive displacement blowers. Silencers on the blower discharge attenuate noise. Pressure relief valves provided with the blowers prevent over pressurization. The air released in the absorber combines with the flue gas and passes through the absorption section before release in the chimney.

Seawater collected in the absorber continuously drains into a relay pit located adjacent to the absorber vessel. A weir in the relay pit prevents the absorber from completely draining out. The presence of minimum water level in the absorber is essential to maintain the water-seal. A concrete slab covers the relay pit, and adequately sized vent openings avoid any pressure fluctuations.

The absorber effluent seawater flows under gravity from the relay pit, through a carbon steel pipe with glass flake lining, to the discharge canal, at a point downstream of the seawater pump intake pits. Here, the effluent seawater enters the mixing pit through the effluent seawater distribution box, where it mixes with the seawater released by the condenser, and then flows to the downstream seawater treatment system in the same discharge canal. FRP lining protects the mixing pit from exposure to the low pH absorber effluent, until the seawater released by the condenser dilutes the effluent. This dilution increases the pH of the seawater above 6 before the seawater reaches the aeration section of the seawater treatment system. In addition, the provision of the mixing pit prior to aeration in the seawater treatment system eliminates any fugitive sulfur dioxide in the seawater, preventing any foul odor in the vicinity of the aeration pit, where such fugitive dissolved gases may be released.

Note: Experience in operation of seawater treatment systems on seawater FGDs has revealed nuisance of odor caused by fugitive SO_2 released during aeration. FKK's research confirms that this release of fugitive SO_2 depends on the pH of the seawater entering the aeration area. Maintaining a seawater pH above 6 at the inlet to the aeration area successfully abates any possibility of SO_2 release in the atmosphere around the seawater treatment system. Thus, the design with aeration within the absorber increases the pH of the diluted seawater, after mixing with circulating water, to a value greater than 6. Designs without aeration in the absorber cannot achieve a pH of 6 after mixing with circulating water, and subsequent aeration in these designs releases fugitive SO_2 with a foul odor in the environment around the seawater treatment system.

The seawater treatment system comprises of an aeration pit arranged along the length of the discharge canal. Fine bubble aeration in the discharged seawater transfers atmospheric oxygen to the effluent, reducing its chemical oxygen demand. The width of the discharge canal increases at the aeration pit, which reduces the seawater velocity for effective treatment. The seawater treatment system also utilizes a greater depth and a lower face velocity (flow rate of air released per unit area) as compared to the design specified in the contract. Utilizing a greater depth increases the contact time between the air and the seawater. Utilizing a lower face velocity produces finer air bubbles in the aeration system, which increases the contact surface area between the air and the seawater. These factors greatly influence the treatment efficiency, besides increasing the treatment time.

Four aeration blowers (3 working + 1 standby) per Unit, aerate the seawater flowing in the aeration pit. 3 working aeration blowers are designed based on FGD performance while firing coal with 0.95% sulfur content. The actual maximum sulfur content in the coals proposed for use on the project is $\leq 0.7\%$; and this fact will directly contribute to a reduction in the number of working aeration blowers significantly during actual operation. The blowers are root type positive displacement blowers. Silencers on the blower discharge attenuate noise. Pressure relief valves provided with the blowers prevent over pressurization.

Heat of compression added in the blower increase the air temperature. A finned-tube air cooler, utilizing a portion of the seawater from the seawater pumps, cools the aeration air. A set of duplex fine air filters ensure supply of dust-free aeration air to the diffusers. Considering the frequency of cleaning the filter elements, the provision of the upstream air cooler is particularly beneficial in reducing the air temperature to 60 degree C maximum. This allows prompt and safe access to the filter elements of the air filter taken out of service. In addition, it obviates the need to clad the aeration air supply pipe, leading to the various diffusers, for personnel protection. The air cooler, itself, is a maintenance-free device. On rare occasions, when the air cooler is required to be maintained, it can be bypassed, with due precautions taken by maintenance personnel, in accordance to the maintenance instructions to be provided later on the project.

Note: Unlike the aeration air discharged by the aeration blower in the seawater treatment system, the aeration air at the absorber blower discharge does not require any filtration. The filtration of aeration air at the absorber blower suction filter is more than adequate, because this suction filter even eliminates fine dust particles that are significantly smaller than the absorber diffuser nozzle openings of 2 mm diameter. Further, in the absence of an air filter in the absorber blower discharge, there is no functional need to provide an air cooler.

A piping grid arranged at the bottom of the entire extents of the aeration pit distributes the cooled and filtered air to various diffuser units arranged in the aeration pit. The air from the aeration blowers enters the aeration air supply pipe running along the entire length of the aeration pit. Fifteen independent (15) headers branch off from the aeration air supply pipe, and supply air to the downstream diffusers. A manual valve on each header facilitates isolation of the entire array of downstream diffusers. Each header is sized such that a system of five (5) headers can handle the capacity of one aeration blower. Functionally, the operator designates a group of five (5) headers for operation with each aeration blower. Thus, variation in the number of operating aeration blowers requires isolation or opening of corresponding groups of aeration headers.

Each header supplies aeration air to about 930 diffuser units. Each diffuser unit is a fine pore, flexible membrane diffuser capable of providing a high level of oxygen transfer efficiency with maximum operating flexibility. The diffuser, manufactured in high-grade corrosion resistant plastic, utilizes an EPDM rubber membrane sleeve, specially perforated for high volumetric capacity. Air enters the diffuser pipe and disperses into the seawater through a perforated pattern in the membrane. This pattern comprises of very fine die cut apertures, which release the air into the seawater. Manually adjustable and lockable butterfly valves, installed at the inlet to each air distribution header, ensure proper flow distribution of air to all the diffusers. The valve opening will be locked according to the test results conducted while commissioning.

During a major overhaul of the seawater treatment system, it would be essential to empty the discharge canal for the Unit taken under shutdown. Accordingly, stop log guides provided on the either end of the discharge canal enable effective isolation of the discharge canal. A portable outfall dewatering sump pump then facilitates the emptying of the discharge canal.

2.5. Electrical

Refer to Attachment – 9. The FGD electrical system supplies power to FGD loads such as motors, heaters, lighting, receptacles, space heaters etc. This dedicated electrical system also provides AC and DC control power to the FGD switchgear and control panels. The system configuration allows all FGD loads to receive power for normal operation, while enabling only the essential FGD loads to run on emergency power in the event of plant blackout. The utilization voltages are 11kV, 400V, and 220V AC, and 110V DC.

2.5.1. 11kV Switchgear

11kV switchgear supplies to the 11kV/400V FGD system dry type auxiliary transformers and to the FGD system motors, rated higher than 250kW. Two 11kV switchgears, one for each unit, are provided. Each 11kV FGD switchgear has two incomers – one normal and the other standby – for receiving power supplies from the respective unit's main 11kV unit switchgear.

2.5.2. 11kV/400V Auxiliary Transformer

11kV/400V dry type auxiliary transformers feed the 400V distribution panels of the FGD system. Two such transformers, one for each unit, are provided. Transformer primaries receive power supply from the 11kV FGD switchgear. The capacity of the transformer is so selected that one transformer can meet the full load requirement of the two unit FGD systems, in case the other transformer is unavailable.

2.5.3. 400V Motor Control Center

400V Normal MCC supplies power to low voltage FGD loads such as motors rated up to 75kW, motor operated valves, etc. Two such MCCs are provided – one for each unit FGD system. Each MCC receives incoming power supply from the respective unit's dry type auxiliary transformer. An interconnecting tie line feeder is additionally provided between the two MCCs. In case one dry type transformer is unavailable, the interconnecting tie feeder can be closed to allow feeding of the two MCC loads from the surviving auxiliary transformer. Apart from the normal MCC, each unit FGD system has a 400V emergency MCC that feeds power to the essential loads of the FGD system. The emergency MCC receives power supply from the respective unit's emergency MCC, to be fed by the emergency diesel generator during total power failure (blackout).

2.5.4. Distribution Panel

380/220V lighting distribution panel supplies lighting and space heating power of the FGD system. Unlike the individual, unitized 11kV and 400V FGD systems, the 380/220V system use a common distribution panel for the two FGD units. This distribution panel receives incoming power from the main lighting MCC.

A separate 220V control distribution panel is used to provide AC control power to the FGD system panels. The distribution panel is equipped with a 400/220V dry type transformer, which steps down the main supply voltage from 400V to 220V for feeding to loads. Two alternate incoming supply feeders are provided for the distribution panel: one each from the two 400 V FGD Normal MCCs. The incoming circuit breakers are so interlocked that one breaker can be closed at a time.

To meet the DC control power requirement of the FGD system, each unit FGD is provided with one 110V DC distribution board. The DC distribution board receives incoming power supply from the respective unit's main DC distribution panel and battery systems.

3. Design Criteria

3.1. Operating Conditions

3.1.1. Refer to the Design Condition as attachment – 6. The FGD system is designed to ensure the following:

- Total SO₂ emission at chimney, corrected to 6% O₂ dry/dry at NTP conditions do not exceed 280 ppmv (800 mg/Nm³) under all operating conditions.
- Seawater temperature increase across the FGD package (including the seawater treatment system) does not exceed 1.0°C.
- The following limits apply to the seawater discharged from the seawater treatment system
 - a) pH value greater than or equal to 7.0
 - b) Increase in COD between absorber inlet and the seawater treatment system outlet does not exceed 2.5 mg/l.
 - c) Minimum dissolved oxygen in discharge water from the seawater treatment system is 75% of saturation of discharged water.
- Noise levels measured not more than 1 m from the surface of any individual item of plant or equipment do not exceed 85 dB(A).

The FGD system is capable of achieving the emission requirement when the boiler is operating at BMCR load condition and firing coal with a mean sulfur level of 0.95 wt% (as received basis).

The FGD system bypass duct routes 100 percent flow of the flue gas when the FGD system is shutdown. During normal operation, the flue gas flow through the absorber is optimized to ensure a maximum SO₂ emission level of 280 ppmv dry 6% excess O₂ from the chimney based on burning 0.95% sulfur coal. The FGD system treats approximately 70 percent of the total flue gas, while the remaining flows through the bypass duct.

The emergency water storage tank storage capacity is equivalent to ten (10) minutes of water supply to the absorber.

Estimated power consumption of the FGD system is summarized in the Attachment-11.

3.1.2. Electrical component design

The basic design of FGD electrical system such as for 11kV switchgear, motor control center and distribution board accords the system design manual of electrical system for power station.

The FGD electrical system is designed to withstand short circuit currents and voltage drops determined through separate studies.

FGD electrical system is adequately protected by appropriate protective devices.

The following types of protective functions are generally considered:

- 11kV switchgear incomer: Instantaneous and time delayed overcurrent protection
- 11kV switchgear bus: Undervoltage protection (time delayed)
- 11kV motors: Thermal overload, short circuit, unbalanced current ground fault protection
- 400V MCC incomer: Instantaneous and time delayed overcurrent protection.
- 400V MCC bus: Undervoltage protection
- 400V motors: Thermal overload and ground fault protection
- Built-in short circuit and ground fault protection for incoming breaker feeders in 400V MCC
- Thermal magnetic release for circuit breakers in 220V AC and 110V DC distribution panels
- Temperature switch for dry transformer windings

3.1.3. Materials of construction

Materials of construction are a significant design consideration for seawater FGD systems. Seawater released into the absorber quickly turns acidic, and becomes very corrosive in nature. In addition, flue gas at temperatures below the acid dew point is also very corrosive. Accordingly, the design incorporates the following corrosion prevention measures, which are also illustrated in Attachment – 8:

- Gas inlet duct: Carbon steel flue gas ducts leading to the absorber do not face any detrimental corrosive effects. However, the portion of the flue gas inlet duct connected to the absorber, with an increased cross-sectional area at the absorber inlet, requires protection from corrosion caused by exposure to seawater spray-back along with the dry hot flue gas. The corrosive condition at this location is therefore the most formidable with acidic environment at high temperature. Accordingly, this portion of the carbon steel duct is lined with Nickel-Alloy, which has very good resistance to pitting and crevice corrosion.
- Absorber vessel: The absorption process in the absorber exposes its internals to very severe conditions. The absorber inlet and quenching zones are subjected to a wide change in operating temperatures. The absorption process decreases the pH of the sorbent seawater. The seawater spray nozzles are located in the quenching zone and above the absorber plates. Spray impingement against the absorber shell does therefore occur, although the design positions the spray nozzles to minimize spray impingement force, without sacrificing spray coverage. High temperature and acid resistant glass-flake lining offers the best solution for withstanding the incoming hot flue gas, very acidic environment and spray impingement. Accordingly, the absorber vessel is manufactured in carbon steel, and the entire shell is internally lined using glass flake lining.
- Absorber bottom: In addition to the glass flake lining, the absorber bottom is also rubber lined. The 3 mm thick rubber lining protects the glass flake lining from mechanical damage caused by outage inspection and maintenance activities.
- Absorber outlet ducts: Corrosive attack by sulfurous acid caused by the presence of moisture and residual sulfur dioxide is the main problem. Here too, glass flake lining has demonstrated effective corrosion resistance ensuring prolonged service. Besides the absorber outlet duct, the bypass duct (downstream of the bypass damper), and the flue gas duct up to the chimney are also lined with glass flake lining for effective protection against sulfurous acid attack.

- Absorber mist eliminator: The mist eliminator is fabricated from polypropylene, which has effective acid resistance.
- Other absorber internals: Other absorber internals, such as the spray pipes, MORETANA ® plates, aeration pipes, supports, etc. are manufactured in duplex stainless steel (JIS SUS 329J4L). This stainless steel is an austenitic ferritic grade (25Cr-6.5Ni-3Mo-0.2N-Cu-W) alloy steel with superior corrosion resistance in an acidic environment.
- Seawater pump discharge pipes: The main seawater pump discharge piping is constructed in carbon steel lined with tar epoxy. The smaller size lines are also in carbon steel, but with PE lining. Similarly, the portion of raw water line (from the emergency water storage tank), which exposed to seawater downstream of the shutoff valve and up to the absorber is in carbon steel with PE lining. Piping downstream of butterfly valves is rubber-lined to a length of 2.5 pipe diameters.
- Seawater return pipe: The seawater return pipe is lined with acid resistant glass flake lining.
- Relay pit: The relay pit, being in concrete, is lined with 1.5 mm thick acid resistant FRP lining.
- Emergency seawater storage pit: The emergency seawater storage pit, also being in concrete, is lined with 1.5 mm thick acid resistant FRP lining.
- Discharge canal – Mixing Pit: The mixing pit, being in concrete, is lined with 0.6 mm thick acid resistant FRP lining; the thickness being thinner than that for the relay pit and emergency seawater storage pit, considering the exposure to diluted seawater with higher pH.
- Aeration Nozzles: The aeration nozzles are manufactured in ABS for corrosion resistance and strength, and the rubber membranes are manufactured in EPDM.

3.2. Functional Constraints

The seawater process quenches the flue gas before treatment, and this flow distribution ensures minimum flue gas temperature required at the chimney outlet for plume prevention, while meeting the SO₂ limitation in the total flue gas released into the chimney.

An emergency water storage tank externally formed on the top of the absorber stores quenching water for emergency use, as would be required during mist eliminator temperature high when the seawater supply to the absorber stops. During such an emergency, a pneumatically actuated on-off valve opens to release the stored raw water under gravity to the quenching zone of the absorber. Besides being controlled from the DCS, this valve opens on instrument air failure, ensuring operation of the system during a blackout. While quenching the flue gas led to the absorber vessel by the coasting boost up fans and induced draft fans & forced draft fans in the drafting system, this emergency supply of raw water scrubs entrained dust in the flue gas released by the now-de-energized upstream electrostatic precipitators. Unlike the effluent from the absorber during normal operation, the quench water released during a blackout is rich in ash and trace elements normally trapped in the electrostatic precipitators. Moreover, the temperature of this quench water could exceed the permissible limits. Therefore, a horizontal centrifugal pump installed adjacent to the relay pit at the absorber outlet, pumps the effluent during a blackout from the absorber to a separate emergency seawater storage pit. This pit is common to both units, and has a storage capacity of 1500 m³. The collected effluent is suitable for trucking for final disposal outside the power plant premises. A sump pump permanently installed in the emergency seawater storage pit can pump any residual stormwater or non-reacted seawater to the outfall, as long as the sample tests verify that the quality of the effluent meets the applicable environment regulations.

Each seawater supply pump is equipped with an air release valve on the discharge elbow. This valve releases air in the pump column at startup.

The aeration process in the seawater treatment system increases the pressure drop in the seawater discharge canal. Accordingly, the circulating water system design ensures satisfactory operation of the circulating water pumps and seawater pumps with varying number of aeration nozzles placed in service. The design allows for stable operation despite any changes in the pressure drop across the aeration pit.

Proper selection of the capacity of the portable outfall dewatering sump pump ensures dewatering of the entire outfall for that unit in 24 hours.

As a safety feature, keys are provided for switchgear and motor control centers so that only authorized personnel can open and access the electrical panels.

3.3. Physical Constraints

Manholes provided in the seawater supply and effluent discharge pipes allow access for maintenance and inspection of the glass flake lining.

The absorber blowers' discharge piping leads to a ring header around the absorber vessel. This arrangement provides uniform distribution of air to the sparger pipes installed inside the absorber. Installing this ring header well above the maximum possible effluent level collected in the absorber vessel ensures that there is no effluent flow into the air supply pipes upon blower trip.

The emergency seawater transfer pump is an end-suction top discharge centrifugal pump with the centerline of the pump being below the effluent level in the relay pit. This eliminates the need to prime the pump.

The R-PIO cabinets of DCS are located in a dedicated building – the FGD electrical room – provided for the FGD units. This building is located near the FGD units. The majority of the electrical equipment belonging to the FGD system are also located in the FGD electrical room, although a few lighting distribution panels are to be installed outdoors.

4. Process Control

Refer to the DCS drawing provided as Attachment - 10 (6/6). The DCS controls the FGD System automatically. The description of the major control loops follows:

4.1. FGD Boost up Fan Blade Control

The DCS controls the startup, shutdown and capacity control of the FGD Boost up Fan. The APS can automatically start / stop the FGD system, with these two (2) Boost up Fans A & B. The capacity of the individual fans can be effectively controlled using individual blade pitch control. The FGD boost up fans together can handle 70 percent of the flue gases generated at 100 percent MCR condition. The load (for circulation of this flue gases) can be distributed between the two Boost up Fans, by manipulating the control bias for individual Fan Blade Control Drive.

Two redundant flow transmitters are provided to measure the flue gas flow through each boost up fan (total 4 transmitters for 2 boost up fans), which enable the computation of the total flue gas flow as summation of these two flow signals.

The set point of the total flue gas flow through the Boost up Fans is determined by a function of the megawatt demand signal. The difference between the set point and the flue gas flow is controlled by the PI controller modulating the fan blade pitch adjustment.

An interlock inhibits above controller's service and drives the boost up fan blades closer, if the following condition occurs:

- Mist eliminator inlet temperature > 65 deg. C

4.2. FGD Bypass Damper Control

A MWD function, and a secondary PI controller based on the differential pressure across the FGD bypass damper control the FGD bypass damper opening.

A differential pressure transmitter measures the differential pressure across the FGD system Bypass damper. A secondary PI controller controls the differential pressure to be positive only when the differential pressure turns negative by modulating the FGD Bypass Damper drive. Thus, a portion of the flue gas mainstream will be diverted into the FGD system. The set point will be a function of MW demand.

An interlock fully opens the Bypass Damper, if any of the following conditions occurs:

- Both FGD Boost up Fans tripped or stopped

5. System Operation

5.1. Normal Operation

5.1.1. DCS

In normal operation, the DCS controls the three seawater pumps (each 50 percent capacity) with two in duty, and another in standby mode, to supply the seawater into the Unit Absorber.

In normal operation, the DCS controls the three Absorber Blowers (each 50% capacity) with two in duty, and other in standby mode.

In normal operation, the DCS controls the four Aeration Blowers (each 33% capacity) with three in duty, and other in standby mode.

In normal operation, the DCS controls two Boost up Fans (each 50% capacity) in duty mode.

In normal operation, the DCS controls following electrical switchgear and MCC.

- 11 kV Switchgear
Incoming circuit breaker
Each feeder circuit breaker.
- 400 V MCC
Incoming circuit breaker
Tie line circuit breaker

5.1.2. Electrical system

The 11kV FGD Switchgear is energized from the upstream unit 11kV Switchgear A or B.

Each 400V MCC (Normal) is energized from its associated 11kV/400V dry type transformer. The interconnecting tie line circuit breaker at 400V Unit-1 FGD MCC is closed and the tie line circuit breaker at 400V Unit-2 FGD MCC is open.

Each 400V emergency MCC is energized from respective unit's main 400V emergency MCC.

The 380V/220V Lighting distribution panel energized from the upstream 380V/220V lighting MCC.

The 220V AC control distribution panel can be energized from 400V MCC (normal) by closing either of the incomer circuit breakers.

The 110V DC Distribution Board is energized from the upstream DC 110V unit Distribution board.

5.2. Power Supply Changeover

FGD 11kV switchgear, 400V normal MCC and 220V control distribution panel are provided with dual incoming sources. For normal operation, each panel receives power from one selected source designated as the normal supply source. In case the normal source is unavailable, power supply to the switchboard can be maintained from the alternate source.

5.2.1. 11kV Switchgear

If one of the incoming power supply is interrupted, 11kV bus voltage will drop to zero. Also, the 11 kV motors, such as BUF, SWP, absorber blower and aeration blower will be tripped by the under voltage relay, absorber bypass duct damper opens and absorber outlet duct damper, BUF inlet damper and BUF outlet damper closes and FGD system will be automatically bypassed.

In such an event, power supply to the 11kV panel can be restored manually by closing the other incoming power supply line. This changeover is to be done by the operator after ensuring that there are no other abnormalities in the electrical system.

After the bus voltage recovers to normal following this changeover, the 11kV motors, such as aeration blower, SWP, BUF and absorber blower can be restarted and the FGD system can be back in-service.

5.2.2. 400V MCC

If the incoming power supply is interrupted, power supply to the MCC is restored from the 100% back up source through automatic closing of the 400V interconnecting tie circuit breaker at Unit 2 FGD system MCC.

5.2.3. 220V Distribution Panel

If the distribution panel cannot receive incoming power supply from Unit 1, it can be supplied from Unit 2 as an alternative. Power supply to the distribution panel can be manually transferred from one feeding source to the other by switching the appropriate incoming circuit breaker.

5.3. Startup / Shutdown

The Automatic Plant Startup/Shutdown Control (APS) System performs the various startup and shutdown functions associated with the FGD System automatically. Alternatively, the operator can initiate the startup / shutdown of these systems through any one – GROUP level, SUB GROUP level or DRIVE level.

The entire startup / shutdown operation can be monitored in the CRT OPS at the central control room.

The field and the central control room communicate the data for monitoring, data logging & operation of the FGD system through the remote I/O device (R-PIO), located in the FGD electrical room.

The DCS drawing provided as Attachment – 10 (2/6) ~ (5/6) schematically indicates the APS structure applicable to the FGD System.

5.3.1. Startup

The FGD System GROUP Level or SUB GROUP Level can start operation after the flowing condition is established:

- Emergency water storage tank level is normal

Refer to the DCS drawing provided as Attachment – 10 – (2/6) ~ (5/6). The GROUP Level FGD System receives FGD start command from APS to initiate the drive selection in Duty & Standby modes from the SUB GROUP Level: (1) Aeration Blower Selector – 3 running & 1 standby, (2) Absorber Blower Selector – 2 running & 1 standby, (3) Seawater pump group Selector – 2 running & 1 standby, (4) Boost up Fan Selectors for Seal Air Fan – 1 running & 1 standby and (5) Boost up Fan Selectors for Oil Pump – 1 running & 1 standby.

When above 'Duty' modes are selected, the following startup commands are issued:

- Step 1: Seawater Pump start command.

The seawater Pumps will start when the following condition is established.

- Absorber Level not high.

The Seawater Pump discharge isolating valve (motorized valves) will reach at full closed positions and then the corresponding Seawater pumps will start. To ensure a smooth startup of each pump, corresponding discharge isolating valve will gradually open over a time interval, before fully opening the valve.

The satisfactory operation of above Seawater Pumps will establish the normal seawater flow into the Absorber.

- Step 2: Boost up Fan-A group start command and Absorber Blower group start command.

The Absorber Blowers will start, whereas the Boost up Fan-A group will initiate the following commands to its associated equipment:

- Oil Pump – A1 or A2 start command
- Seal Air Fan – A1 or A2 start command
- Boost up Fan-A Blade zero percent (full close) command,
- Inlet Damper open command,
- Outlet Damper close command,

At the end state of above commands, the Boost up Fan-A will start. Outlet damper and Absorber outlet damper will open after the Boost up Fan-A starts.

- Step 3: The Boost up Fan-B start command

Both the Boost up Fans will run in automatic mode. The Boost up Fan Blade control loop and the Bypass Damper differential pressure control loop will operate in 'Automatic' mode. The details of control loops are described in item 4.0 for Process Control.

5.3.2. Shutdown

The FGD System GROUP Level or SUB GROUP Level will shutdown if the following conditions are established:

- Unit Load drops below a preset value

The GROUP FGD System will issue a shutdown command to the drives selected in Duty mode through the SUB GROUP Level. In response, the SUB GROUP Level issues the following shutdown commands:

- Step 1: Boost up Fan-B group stop command

The Boost up Fan-B group stop end state is achieved.

- Step 2: Boost up Fan-A group stop command and Absorber Blower group stop command

The Boost up Fan-A group stop end state is achieved. All Absorber Blowers are stopped.

- Step3: Absorber Outlet Damper close command

The Absorber Outlet Damper is closed

- Step 4: The Aeration Blowers stop command

The Aeration Blowers stop.

- Step 5: Seawater Pump stop command

The Seawater Pump stop

The emergency seawater transfer pump will be operated by local control panel for removal of the effluent with rich particulates in the relay pit after FGD isolation.

5.4. Interlocks

The FGD system incorporates the following interlocks:

5.4.1. EP abnormal

When EPs are abnormal, FGD system will be isolated as follows to prevent the effluent with rich particulates that pass through the non-energized EP from being discharged to the outfall.

- Both Boost up Fans trip,
- Accordingly, Absorber Bypass Duct fully opens, Boost up Fan Inlet and outlet Dampers close,
- Absorber Outlet Duct Damper closes,
- All Absorber Blowers trip,
- All Seawater Pumps trip.

5.4.2. Absorber

The Mist Eliminator inlet temperature is measured at appropriate location in the Absorber. During normal operation, if this temperature becomes high (44 deg. C), an alarm is generated for operator's attention. If the temperature exceeds a preset high-high value (75 deg. C), emergency cooling water shutoff valve will open to spray the cooling water in the absorber and the Boost up Fan Blades will be tripped.

When the mist eliminator inlet temperature returns back to normal, the FGD system will be ready to resume its operation.

5.4.3. Seawater Pump trip

Any of the following conditions will trip the working seawater pump:

- Seawater Pump Pit level is low-low (CD +3,140 mm)
- Discharge isolating valve remains closed for more than 15 seconds
- EP abnormal

5.4.4. Back up Seawater Pump Start

A trip of the operating seawater pump will automatically start the standby seawater pump.

5.4.5. Seawater Pump Discharge isolating valve

The seawater pump discharge isolating valve opens / closes when the associated seawater pump starts / stops.

5.4.6. Backup Aeration Blower start

A trip of the operating aeration blower will automatically start the standby aeration blower.

5.4.7. Backup Absorber Blower start

A trip of the operating absorber blower will automatically start the standby absorber blower.

5.4.8. Emergency Water Storage Tank Supply Shutoff Valve

The emergency water storage tank supply shutoff valve (in the raw water supply line) will open at low level (Top Plate of Tank -150 mm) of the Emergency Water Storage Tank. The valve will close at high level (Top Plate of Tank -30 mm) of the Emergency Water Storage Tank.

5.4.9. Emergency Cooling Water Shutoff Valve

The emergency cooling water shutoff valve will open above high high mist eliminator inlet temperature (75 deg. C) and close below a preset value of mist eliminator inlet temperature (40 deg. C).

5.4.10. FGD Boost up Fan trip

The following conditions will trip the working FGD boost up fan:

- All IDF trip,
- All Seawater Pump stop,
- Mist Eliminator inlet Temperature high-high (75 deg. C),
- Absorber Outlet Damper closed for some period (10 seconds),
- Boost up Fan Outlet Damper closed for some period (10 seconds),
- Boost up Fan control oil pressure low-low (30 bar),
- Boost up Fan lubricant oil pressure low-low (0.9 bar),
- All Boost up Fan control oil pumps stopped,
- All Boost up Fan seal air fans stopped,
- Boost up Fan bearing temperature high high (110 deg. C).

5.4.11. Absorber bypass duct damper full open interlock

- All Boost up Fans stop,

5.4.12. Backup Boost up Fan control oil pump start

Detection of low control oil pressure (50 bar), low lubricating oil pressure (1.2 bar) or a trip of the operating Boost up Fan control oil pump automatically starts the standby oil pump. Refer to the drawing "FGD Boost up Fan Piping and Instrument Diagram, M1-MN-HR-PP-20021".

5.4.13. Backup FGD Boost up Fan seal air fan start

Detection of high bearing temperature (100 deg. C) or a trip of the operating Boost up Fan seal air fan automatically starts the standby seal air fan. Refer to the drawing "FGD Boost up Fan Piping and Instrument Diagram, M1-MN-HR-PP-20021".

5.4.14. Absorber outlet duct damper close interlock

Upon stopping of both BUFs, the absorber outlet duct damper is automatically closed.

5.4.15. Absorber Blower trip

- The absorber outlet duct damper is closed
- EP abnormal

5.4.16. Electrical safety interlocks

The two incoming circuit breakers of the 11 kV FGD Switchgear are electrically interlocked so that only one circuit breaker can be closed at a time.

The incoming and the interconnecting circuit breakers of the 400 V Motor control centers (Normal) are electrically interlocked so that a maximum of three breakers can be closed at a time; this prevents paralleling of the 11kV/400V dry type transformers.

The two incoming circuit breakers of the 220V control distribution panels are mechanically interlocked so that only one circuit breaker can be closed at a time.

5.5. Alarms

The FGD System annunciates the following alarm conditions:

- Boost up Fan tripped
- Boost up Fan bearing temperature High
- Boost up Fan bearing temperature High-High
- Boost up Fan Control Oil Pressure Low
- Boost up Fan Control Oil Pressure Low-Low
- Boost up Fan Lubricant Oil Pressure Low
- Boost up Fan Lubricant Oil Pressure Low-Low
- Boost up Fan Control Oil Pump tripped
- Boost up Fan Seal Air Fan tripped
- Seawater Pump Pit Level low
- Seawater Pump Pit Level low-low
- Seawater Pump tripped
- Seawater Flow low
- Absorber Blower tripped
- Aeration Blower tripped
- Mist Eliminator inlet Temperature High
- Mist Eliminator inlet Temperature High-High
- Mist Eliminator inlet Temperature High-High-High
- Absorber Level High
- Emergency water storage tank level low
- 11 kV Incoming switchgear failure
- 11 kV Incoming switchgear trip

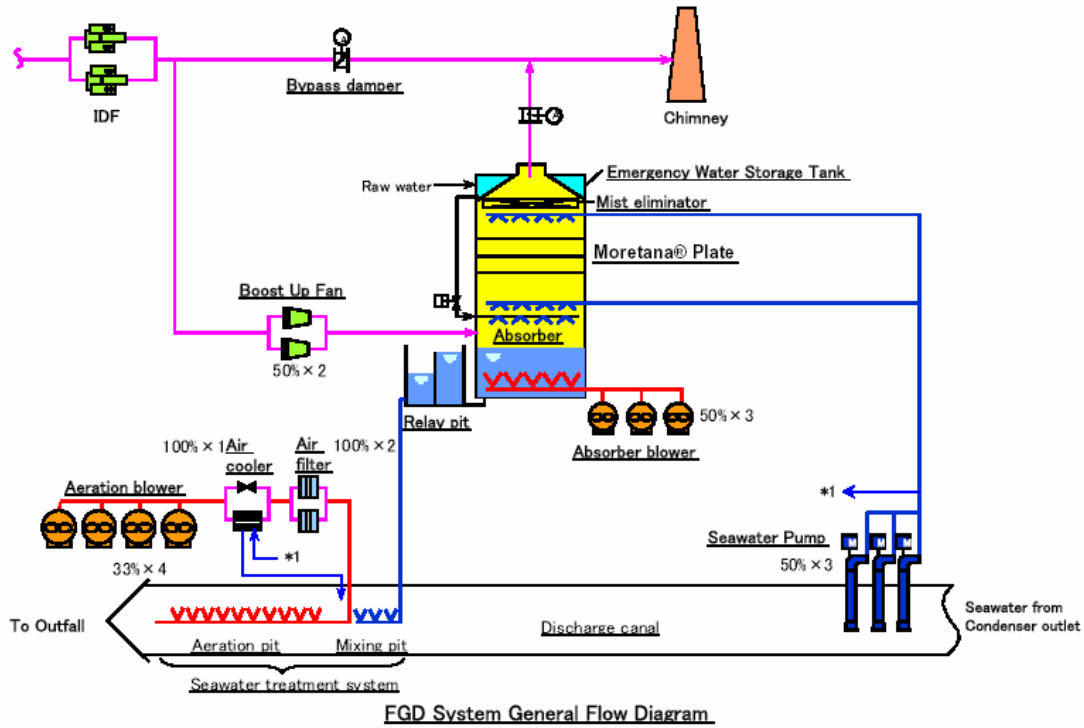
- 11 kV Bus tie switchgear failure
- 11 kV Bus tie switchgear trip
- 11 kV Switchgear power feeder failure
- 11 kV Switchgear power feeder trip
- 11 kV Switchgear motor feeder trip
- 11 kV Switchgear motor feeder failure
- 400 V MCC incomer trip
- 400 V MCC power feeder trip
- 400 V MCC feeder trip
- DC MC Motor feeder trip
- 11 kV / 400 V auxiliary transformer high temperature

6. References

- 6.1. Dwg. No. M1-MN-HR-PP-00105: FGD System Flow Diagram
- 6.2. Dwg. No. M1-MN-HR-EL-00290: FGD System Sequence Diagram
- 6.3. Dwg. No. M1-MN-HR-OM-00291: FGD System Operation & Maintenance Manual
- 6.4. Dwg. No. M1-MN-HR-PP-20021: FGD Boost up Fan Piping and Instrument Diagram
- 6.5. Dwg. No. MO-MN-HR-EL-06300: FGD System Key Single Line Diagram
- 6.6. Dwg. No. MO-MN-HR-EL-06301: Single Line Diagram for 11 kV Switchgear
- 6.7. Dwg. No. MO-MN-HR-EL-06302: Single Line Diagram for 400 V MCC (FGD)
- 6.8. Dwg. No. MO-MN-HR-EL-06334: Single Line Diagram for 400 V Emergency MCC (FGD)
- 6.9. Dwg. No. MO-ME-AB-EL-70076: Electrical System Design Manual for Power Station

7. Related Systems

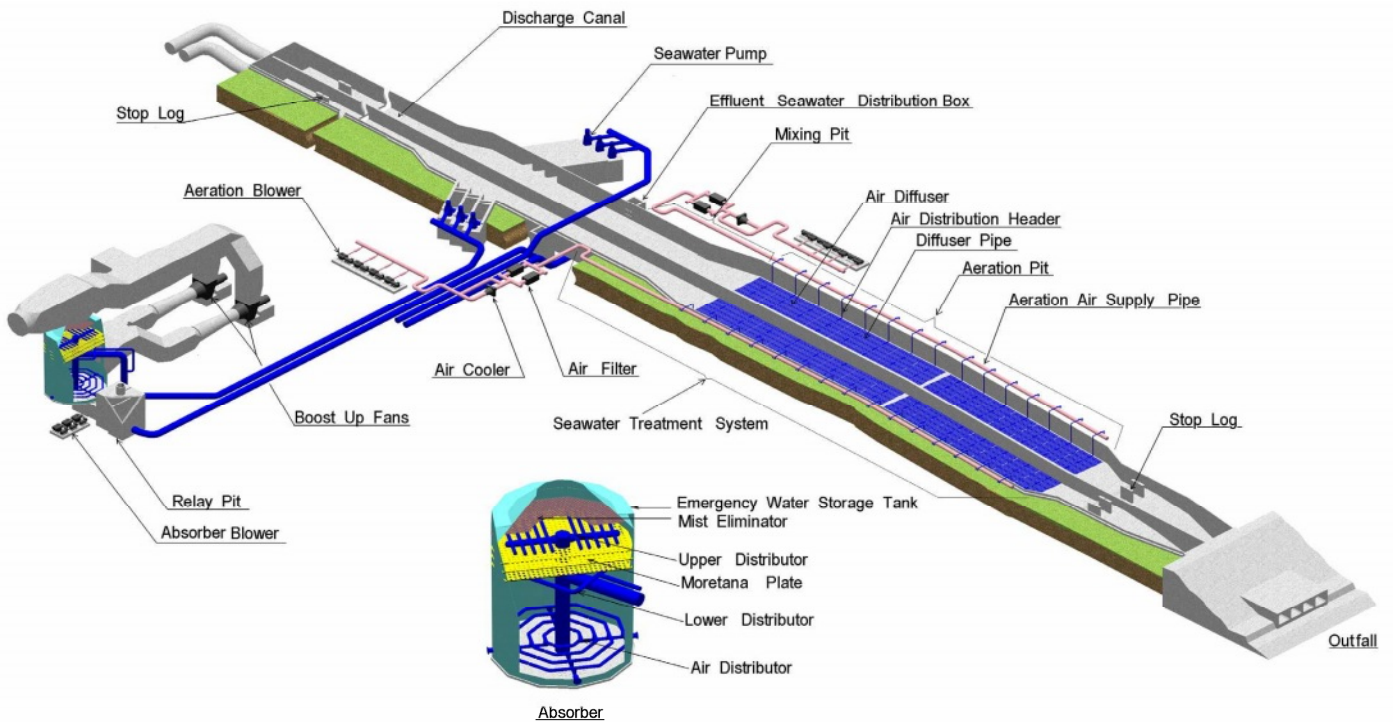
- 7.1. Circulating water System
- 7.2. Air and Flue gas system



FGD System General Flow Diagram

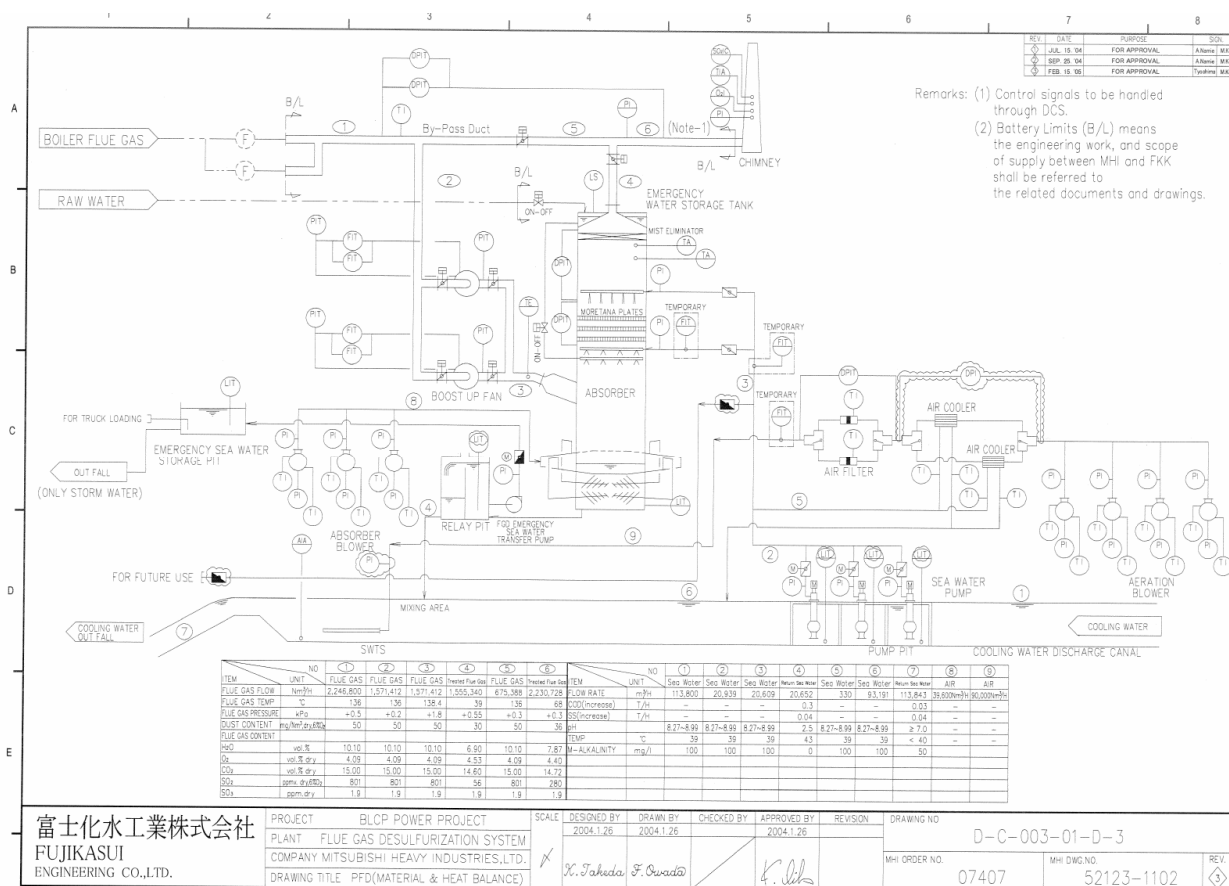
Attachment-1

Attachment - 1 (Sheet 1 of 1)

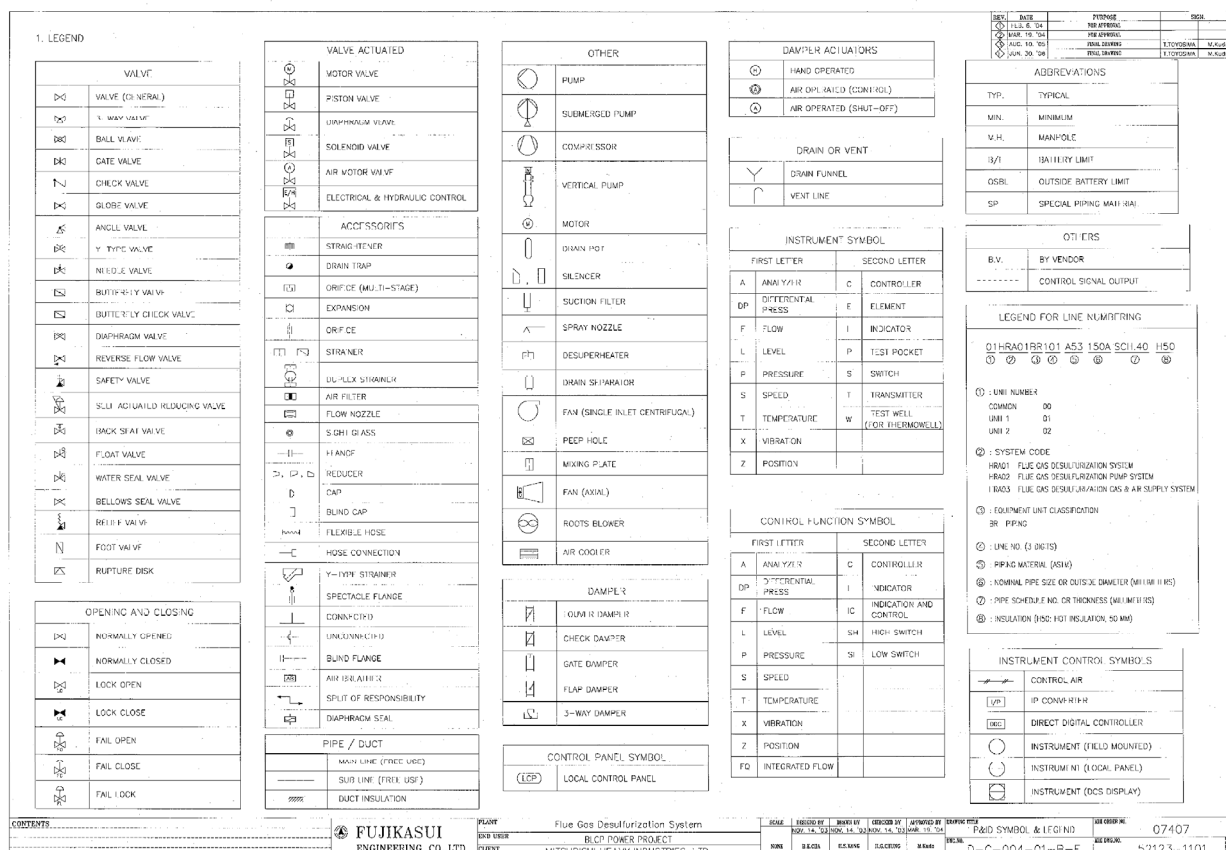


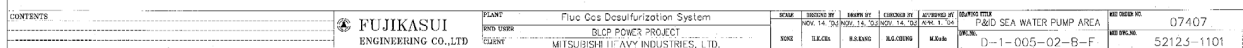
FGD SYSTEM GENERAL ARRANGEMENT

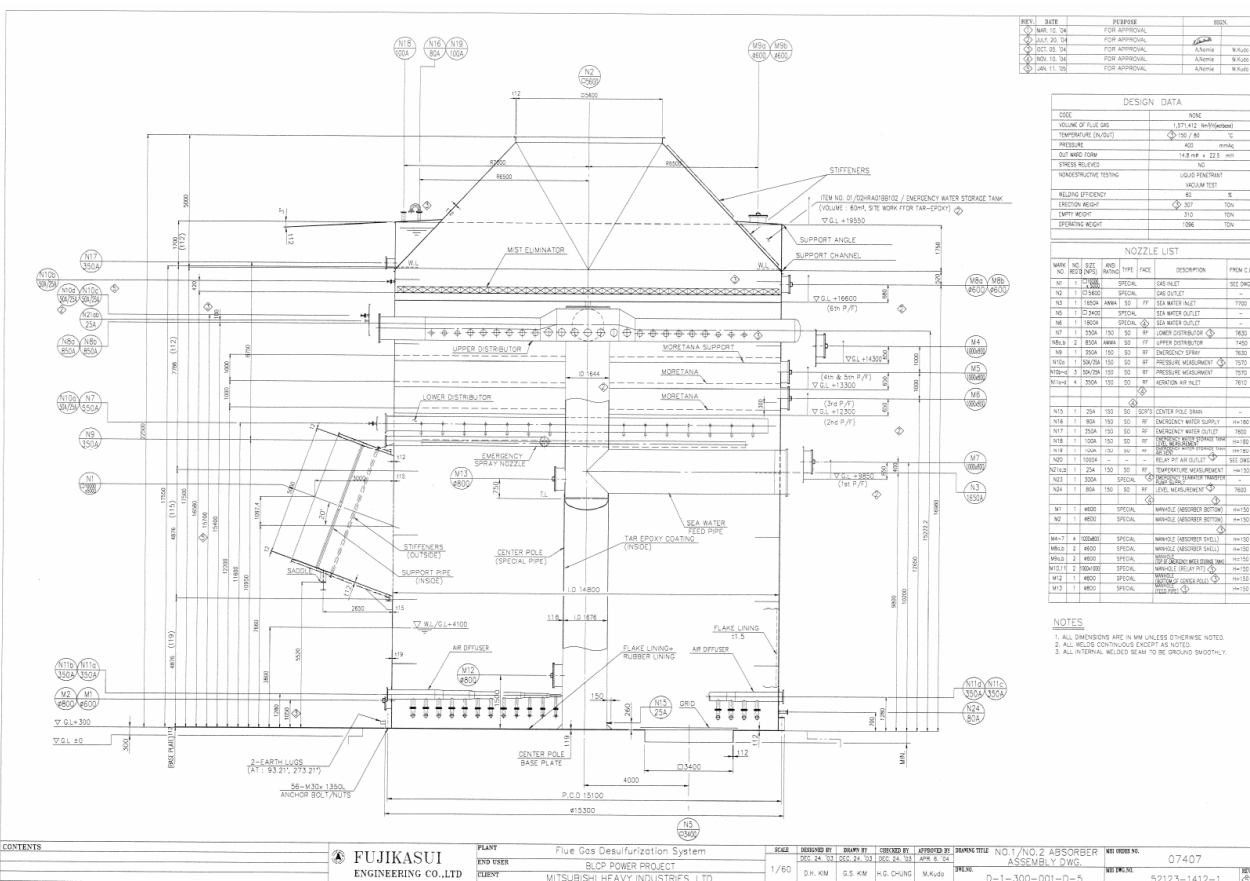
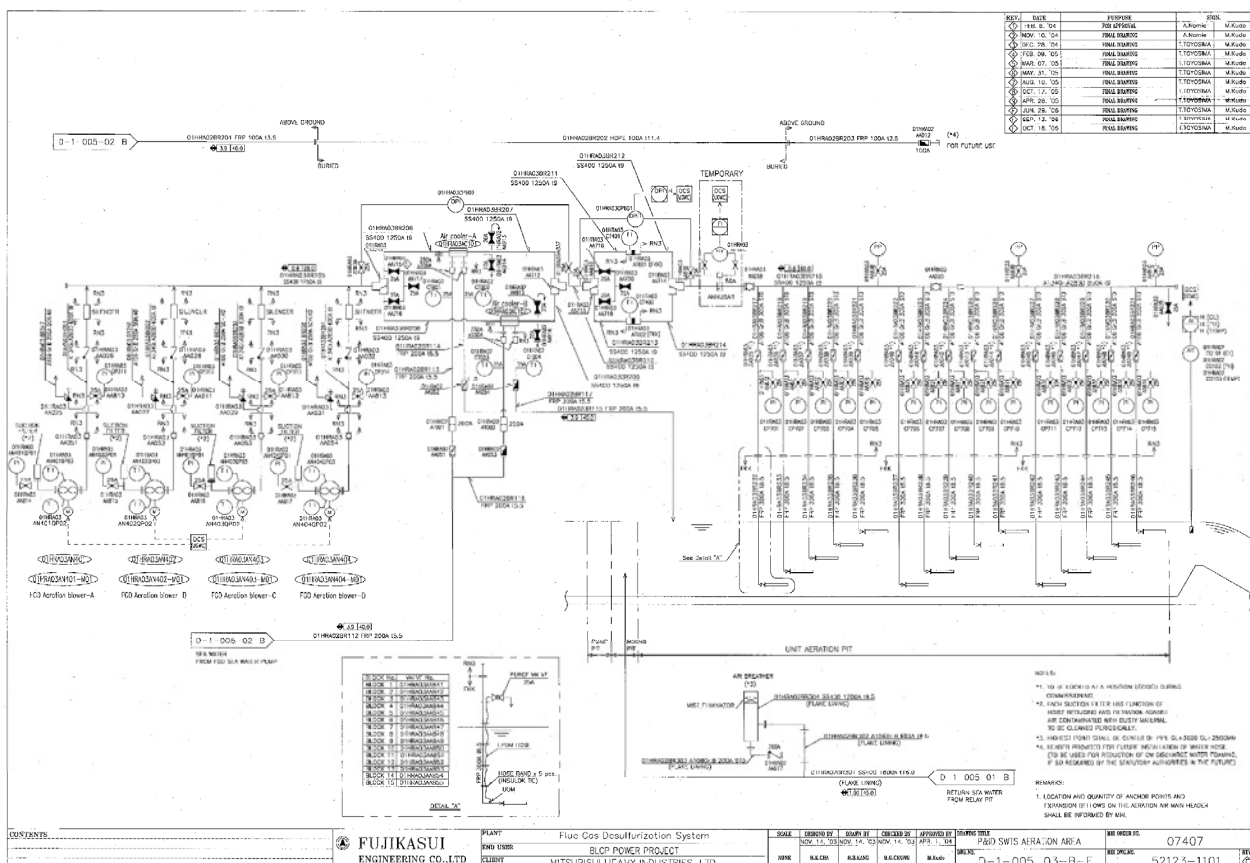
Attachment – 3 (Sheet 1 of 1)



Attachment – 4 (Sheet 1 of 4)



System Design Manual



Attachment – 6 (Sheet 1 of 2)**Design Condition****1. Inlet Condition****1) Boiler**

Size of boiler	MW	717
No. of boiler		2
Design fuel	“Coal C” (SO ₂ removal)	
	“Blair Athol” (BUF Design)	

Sulfur content in coal design	%	0.95
operation, max	%	0.7
	“Valelia”	

2) Flue gas

Flue gas flow, SO ₂ removal	Nm ³ /h	2,246,800 “Coal C”
Flue gas flow, BUF design	Nm ³ /h	2,267,600 “Blair Athol”

Flue gas inlet temperature Design	°C	150
operation, max	°C	140

Flue gas composition		
CO ₂	Vol%-wet	13.48
H ₂ O	Vol%-wet	10.10
N ₂	Vol%-wet	72.71
O ₂	Vol%-wet	3.67
SO ₂	Vol%-wet	—
Total	Vol%-wet	100.00

CO ₂	Vol%-dry	15.48
H ₂ O	Vol%-dry	0.00
N ₂	Vol%-dry	80.87
O ₂	Vol%-dry	4.09
SO ₂	Vol%-dry	—
Total	Vol%-dry	100.00

SO ₂	ppmv(actual)-dry	903
	ppmv(6%O ₂)-dry	801

(Note) This SO₂ value is based on 0.95% sulfur content in coal

SO ₃	ppmv(actual)-dry	1.9
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Particles	mg/Nm ³ (6%O ₂)-dry	50
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Attachment – 6 (Sheet 2 of 2)**3) Seawater**

Total water flow form condensers	m ³ /h	113,800
Temperature condenser outlet, min-max	°C	29.8 – 39
pH		8.27 – 8.99
M-Alkalinity	mg/l	100

2. Outlet condition**1) Flue gas**

SO ₂	ppmv(6%O ₂)-dry mg/Nm ³ (6%O ₂)-dry	280 800
Particles	mg/Nm ³ (6% O ₂)-dry	50
Temperature ^(See Note)	°C	65

2) Seawater

Flow rate	m ³ /h	113,843
pH		≥ 7
Temperature, max (increase)	°C	1.0
DO, min at saturation of discharge seawater	%	75
COD, max (increase)	mg/l	2.5
SS, max (increase)	t/h	0.04

(Note) This temperature is based on the following conditions

- 100% BMCR unit gross output
- Maximum CW inlet temperature 32.2°C and CW outlet temperature 39.0°C
- Sulfur content 0.95%
- Boiler design ambient temperature 30°C

As clarified in the 7th design review meeting, 77°C can be achieved with SO₂ concentration at chimney inlet equal to or lower than 280 ppmv (6% O₂)-dry by increasing the gas bypass flow under the following conditions.

- 85% TMCR unit gross rate
- Minimum CW inlet temperature 23°C and CW outlet temperature 28.9°C
- Sulfur content of worst coal “Valeria” 0.7%
- Boiler design ambient temperature 30°C

Attachment – 7 (Sheet 1 of 4)**Equipment Specification**

NO	Description	Q'ty (*1)	Specification and Component	Material	Remarks
1	Absorber	2 (2+0)	Flue gas Inlet nozzle(10m³×5m^h×3m^L)		
			Nozzle	ASTM A36	
			Internal support	Nickel Alloy Steel (Mitsubishi Alloy)	
			Lining Material	Nickel Alloy Steel (Mitsubishi Alloy)	
			Vessel(14.8m ϕ ×22.5m^h)		
			Side wall , Bottom Plate	ASTM A36	
			MORETANA® Plate	Duplex Stainless Steel	
			Upper Distributor	Duplex Stainless Steel	
			Mist Eliminator®	Polypropylene	
			MORETANA® Plate support with setbolt	Duplex Stainless Steel	
			Lower Distributor and spray Nozzle	Duplex Stainless Steel	
			Emergency Distributor and spray Nozzle	Duplex Stainless Steel	
			Feed Pipe	ASTM A36	
			Aeration Piping (inside)	Duplex Stainless Steel	
			Air Diffuser Pipe	Duplex Stainless Steel	
			Safety Grid for Relay Pit	FRP	
			Lining , Coating	Side wall : Flake lining (*2)	
				Bottom plate : Flake lining + Rubber lining (*2)	
				Feed pipe inner : Tar epoxy coating	
				Feed pipe outer : Flake lining (*2)	
			Emergency water storage tank (Hold up capacity : 60m³)		
			Side wall , Roof plate	ASTM A36	
			Inner surface coating	Tar Epoxy coating	
2	Boost up fan	4 (4+0)	220Nm ³ /s×1.853kPa(*3) Axial type	Casing : General carbon & welded Impeller : Cast steel Shaft : Forged steel	1220kW (*2)

Attachment – 7 (Sheet 2 of 4)

NO	Description	Q'ty (*1)	Specification and Component	Material	Remarks
3	Absorber blower	6 (4+2)	330Nm ³ /min×5000 mmAq with accessory (Silencer, Safety valve, Expansion joint, Suction filter)	Casing : JIS FC250 Rotor : JIS FCD450 Shaft : JIS S48C·N	450kW (*2)
4	Seawater pump	6 (4+2)	10,750m ³ /h×22m Vertical , Mix flow type	Casing : FCHD Impeller : JIS SCS14 Shaft : JIS SUS316L	850kW (*2)
5	Emergency Seawater pump	2 (0+2)	400m ³ /h×15m Horizontal type	Casing : JIS SCS14 Impeller : JIS SCS14	55kw (*2)
6	Pump pit (approx 650m ³)	2	Pit proper	RC	
7	Relay pit (approx 536m ³)	2	Pit proper Lining	RC FRP lining 1.5t(*2)	
8	SWTS (Sea Water Treatment System) (approx 15200m ³)	2	Aeration pit proper Air piping : Main header Sub header Air diffuser connection header Air diffuser	RC Carbon steel FRP C-PVC Membrane : EPDM Saddle : ABS Wedge : ABS	7000 duplex
9	Mixing pit (approx 1950m ³)	2	Pit proper Lining	RC FRP lining 0.6t (50%Area) (*2)	
10	Aeration blower	8 (6+2)	500Nm ³ /min×50kPa with accessory (Silencer, Safety valve, Expansion joint, Suction filter thermometer(Bearing & Unbearing Side))	Casing : JIS FC250 Rotor : JIS FCD450 Shaft : JIS S48C·N	700kw (*2)

Attachment – 7 (Sheet 3 of 4)

NO	Description	Q'ty (*1)	Specification and Component	Material	Remarks
11	Emergency Sea Water Pit Sump Pump	1 (1+0)	10 m ³ /hr×10 m	Casing : JIS SCS14 Impeller : JIS SCS14	0.75kw (*2)
12	Duct	1lot	Main duct from tie-in point (7.5m×7.5m)		
			Duct panel	ASTM A36	
			BUF inlet duct (6.55m×6.5m(Common)~4.72m×4.5m)		
			Duct panel	ASTM A36	
			BUF outlet duct (4.64m×4.64m~10.0m×5.0m(Common))		
			Duct panel	ASTM A36	
			Absorber outlet (5.6m×5.6m)		
			Duct panel	ASTM A36	
			Flake lining	Flake lining 1.5t(*2)	
			By-pass duct (7.5m×7.5m)		
			Duct panel	ASTM A36	
			Flake lining	Flake lining 1.5t (*2) (till by-pass damper)	
13	Duct damper (Boost up fan inlet)	4	Single louver type 4.72m×4.5m	JIS SS400	Air operation
14	Duct damper (Boost up fan outlet)	4	Single louver type 4.64m×4.64m	JIS SS400	Air operation
15	Duct damper (Absorber outlet)	2	Single louver type 5.6m×5.6m	JIS SUS316L	Air operation
16	Duct damper (By-pass)	2	Single louver type 7.5m×7.5m	JIS SUS316L	Air operation
17	Motor valve	6	1100 φ (OD)	ASTM A536+Tar epoxy coating	0.75kw (*2)
		2	300A	ASTM A536+Tar epoxy coating	0.75kw (*2)
18	FGD Emergency Seawater storage pit	1	1500m³ (Common for two units)		
			Pit proper	RC	
			Lining	FRP lining 1.5t (*2)	

Attachment – 7 (Sheet 4 of 4)

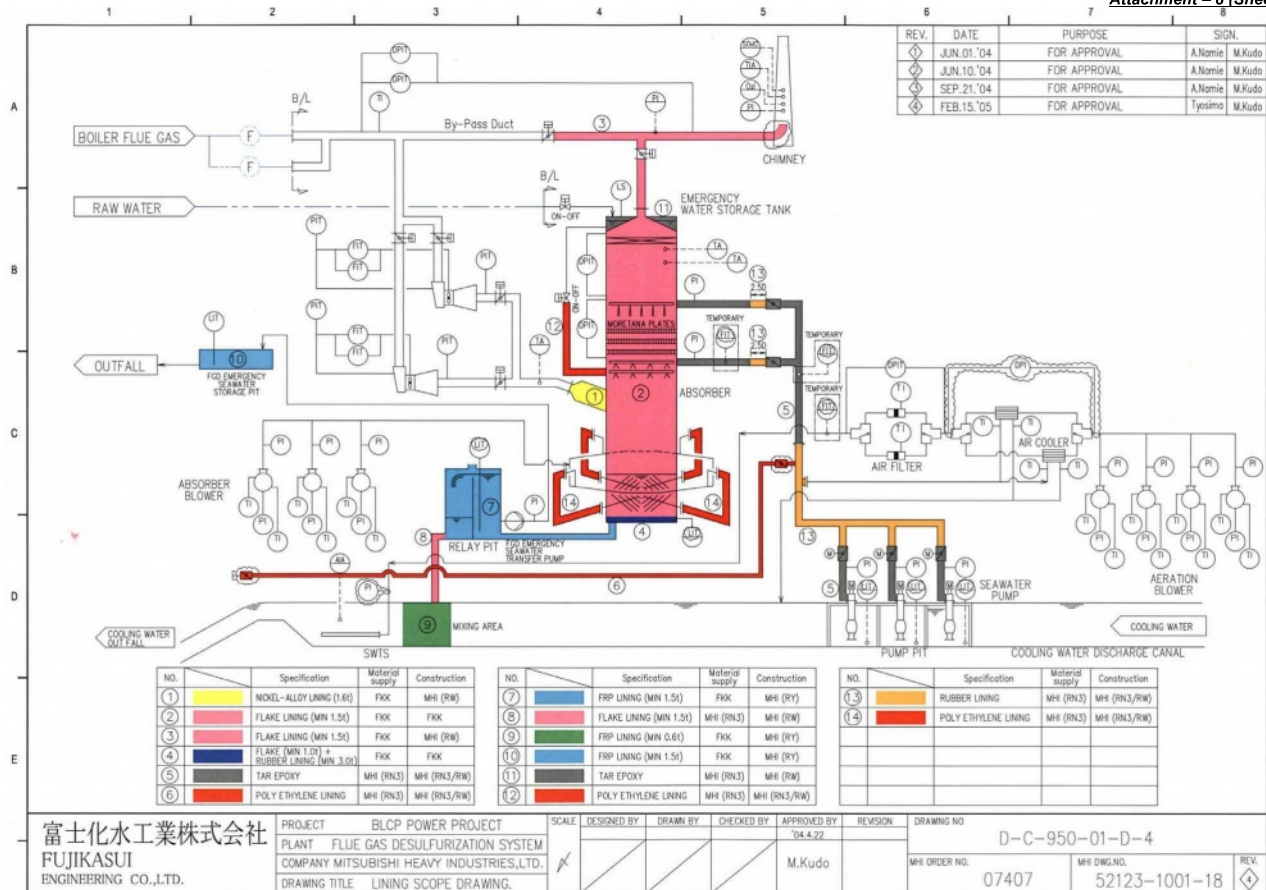
NO	Description	Q'ty (*1)	Specification and Component	Material	Remarks
19	Air filter	4 (2+2)	90,000Nm ³ /hr	Casing : JIS SS400 Prefilter : Glass fiber	
20	Inlet 3-way valve of air filter and air cooler for air diffusers	4	3-way valve	Casing : JIS SS400	
21	Outlet 3-way valve of air filter and air cooler for air diffusers	4	3-way valve	Casing : JIS SS400	
22	Air cooler	2 (2+0)	Tube type heat exchanger Heating surface : 1100m ²	Casing : JIS SS400 Tube : Titanium	
23	Outfall dewatering Pump	1	350m ³ /h×6.5m Submerge	Casing : JIS FC250 + lining Impeller : JIS SCS14 Shaft : JIS SUS316L	
24	Stop log for insertion at the discharge canal inlet	1	Common for Unit-1&2	Stop log : Carbon Steel + epoxy	
25	Stop log for insertion at the discharge canal inlet	1	Common for Unit-1&2	Stop log : Carbon Steel + epoxy	
26	Stop log for seawater pump's suction	1	Common for Unit-1&2	Stop log : Carbon Steel + epoxy	

Note (*1) Above quantities are shown 2(two) units.

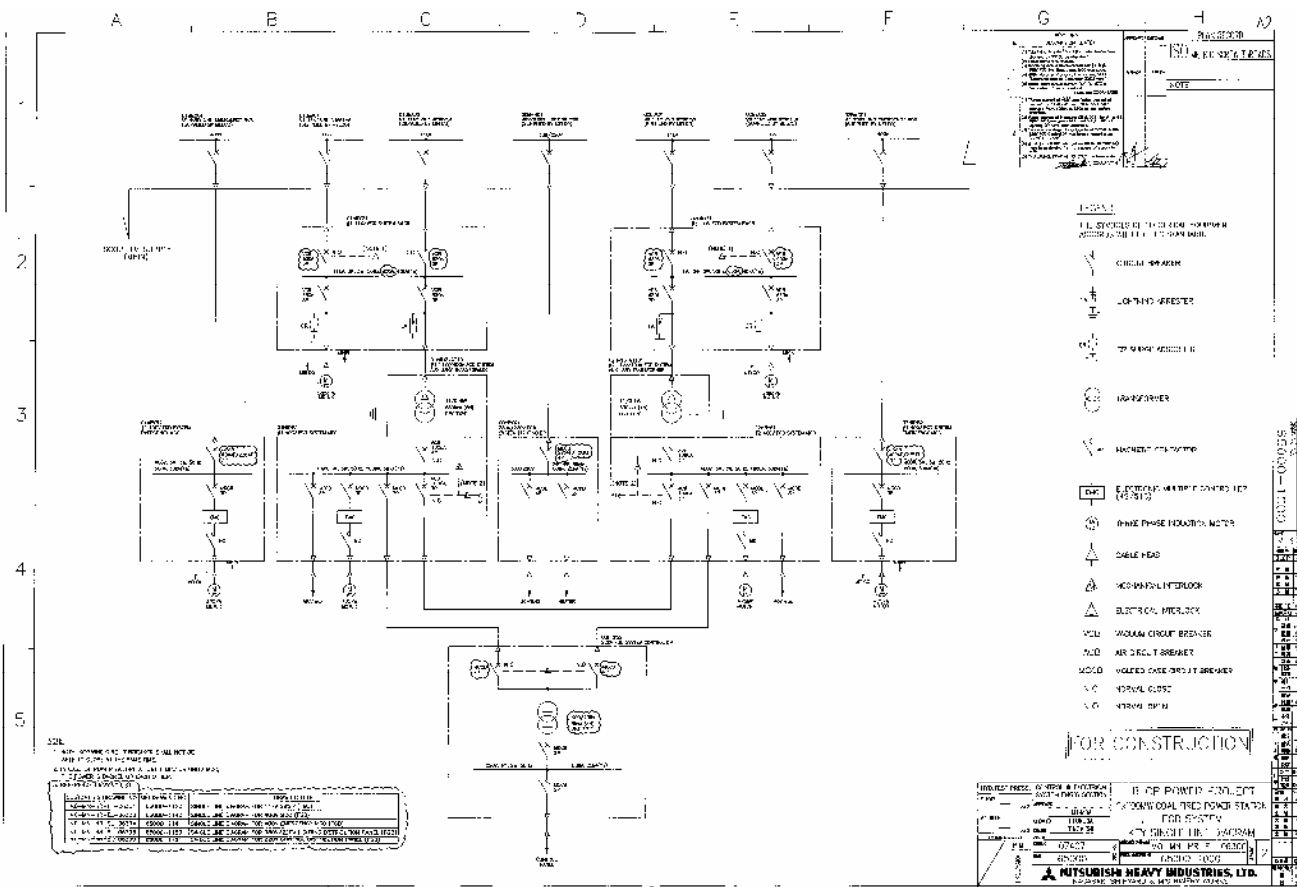
The figure in () shows the number of working and stand-by equipment.

(*2) Motor rated output

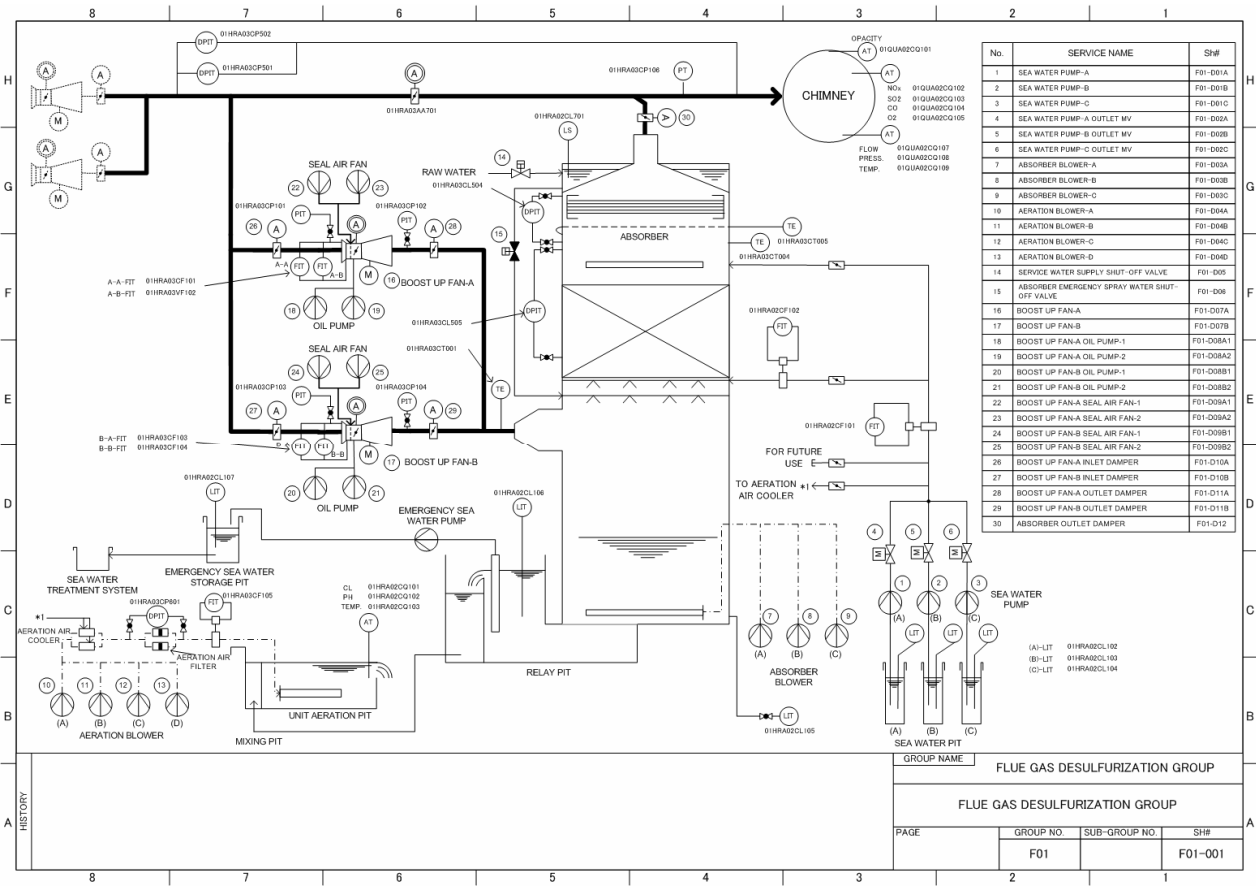
Attachment - 8 (Sheet 1 of 1)



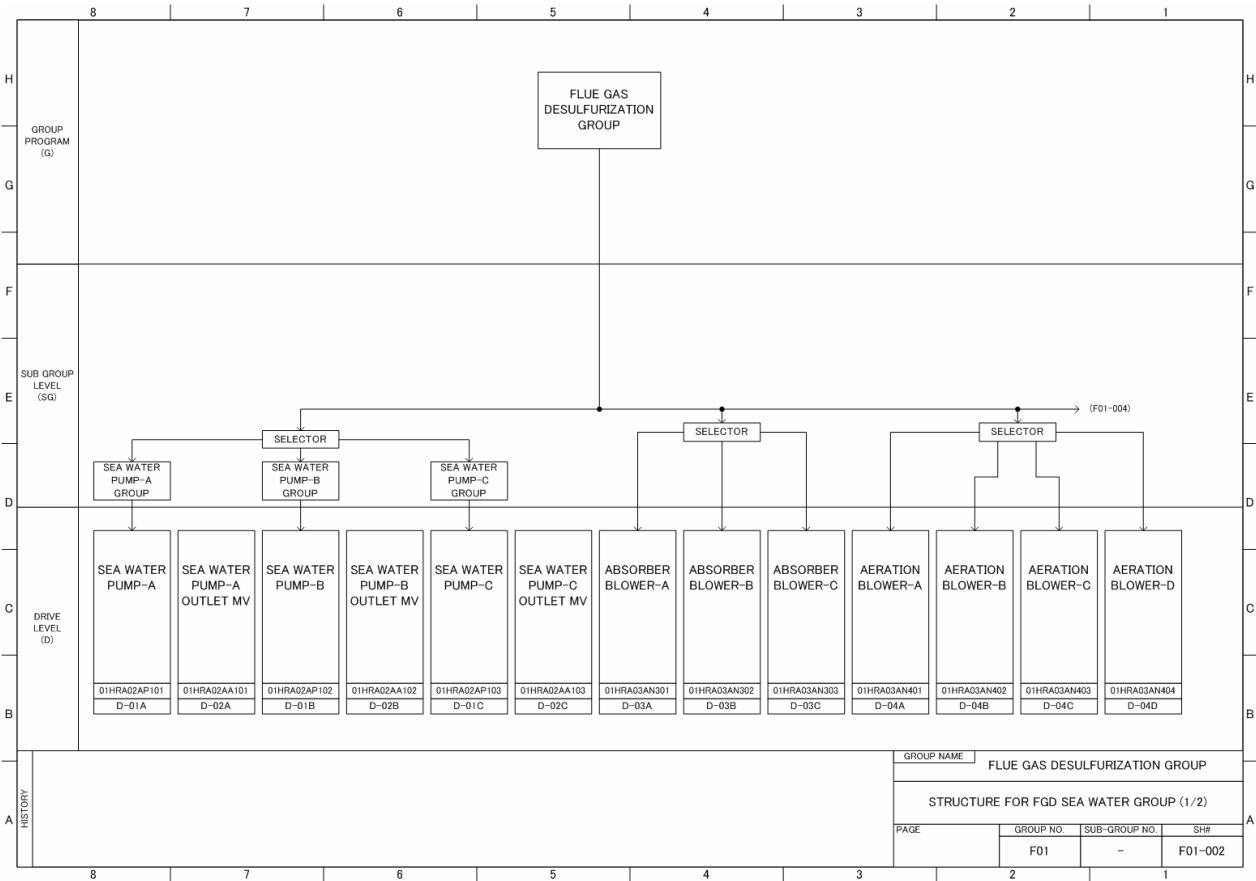
Attachment - 9 (Sheet 1 of 1)

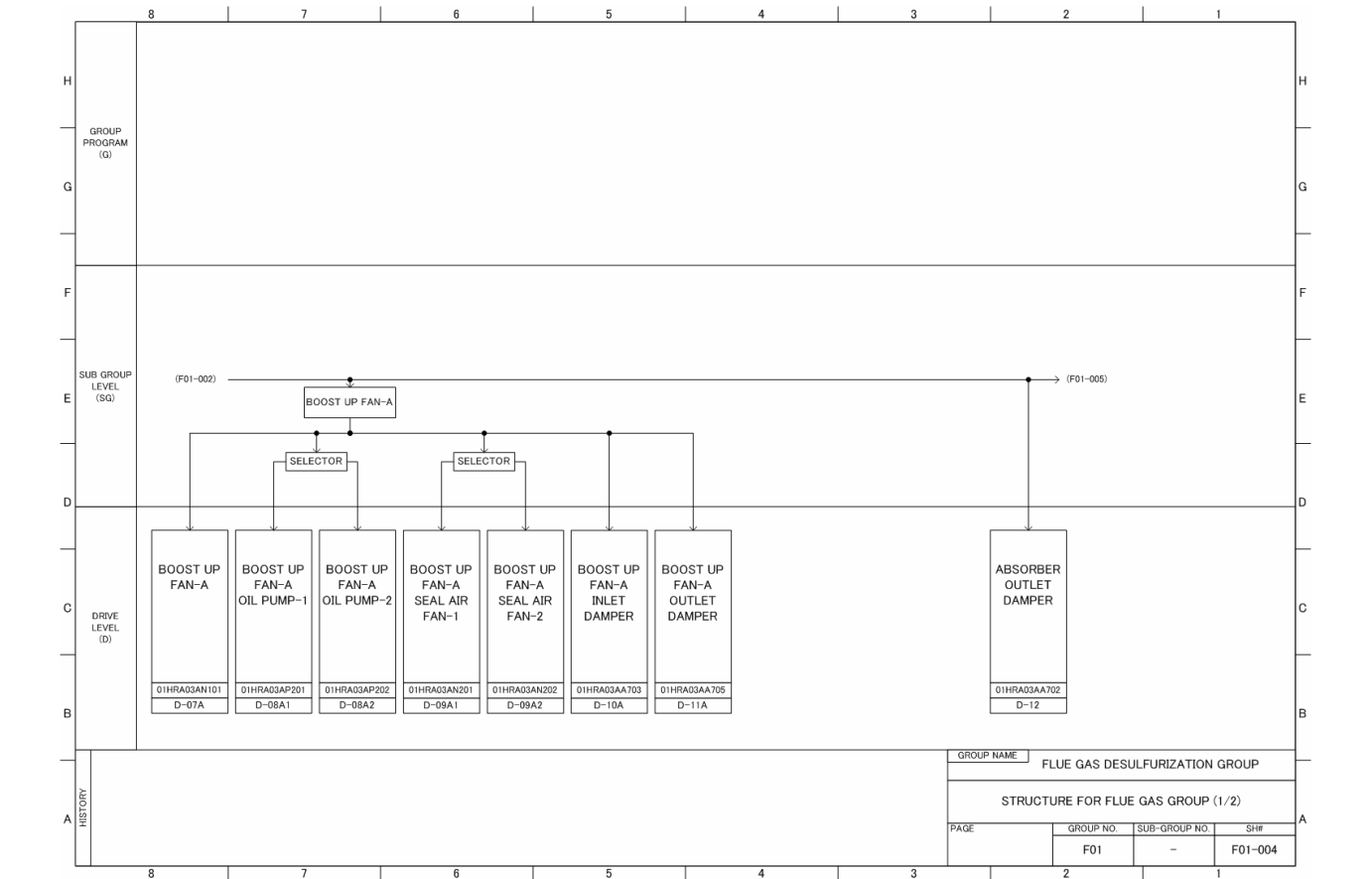
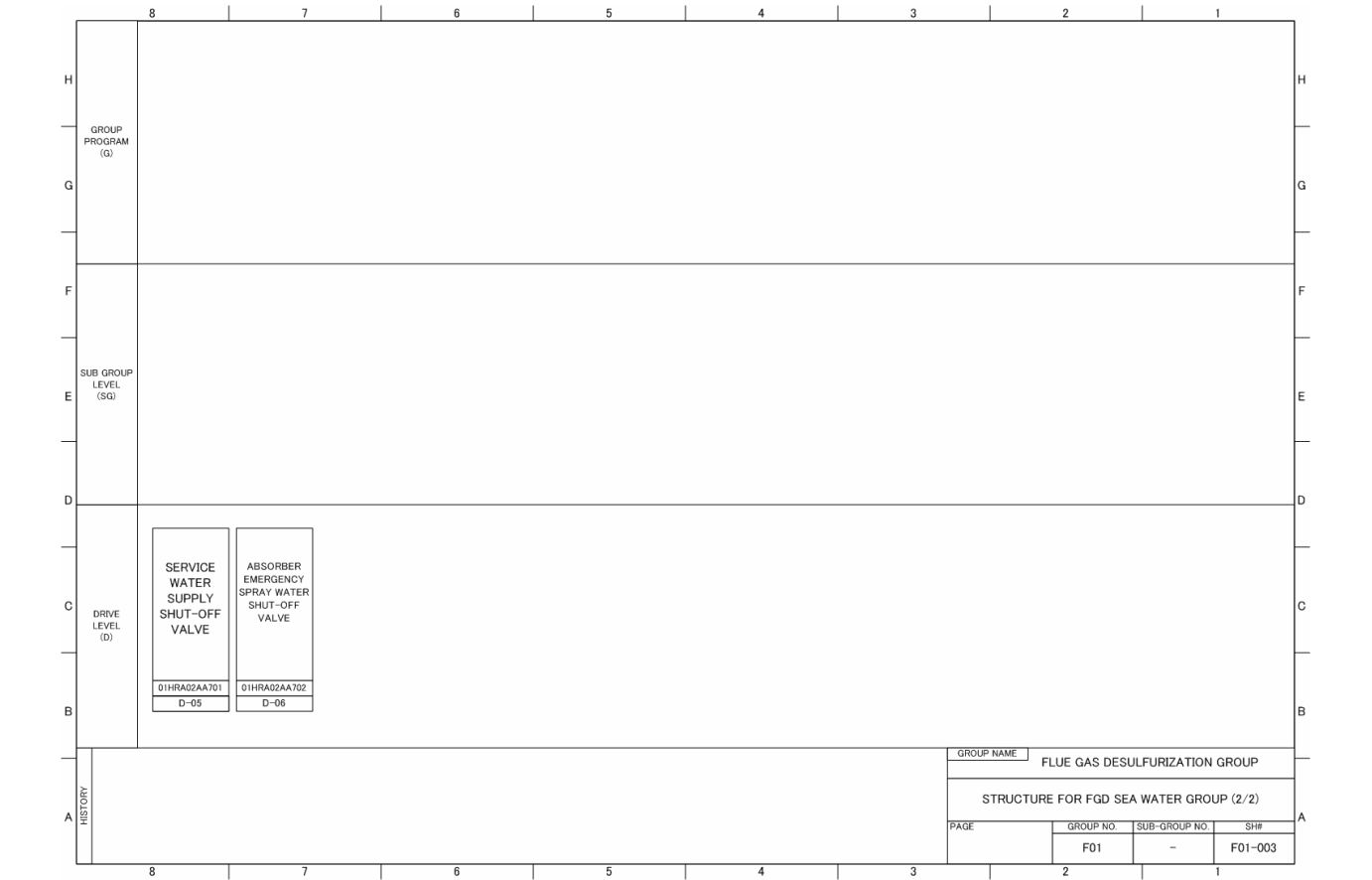


Attachment – 10 (Sheet 1 of 6)

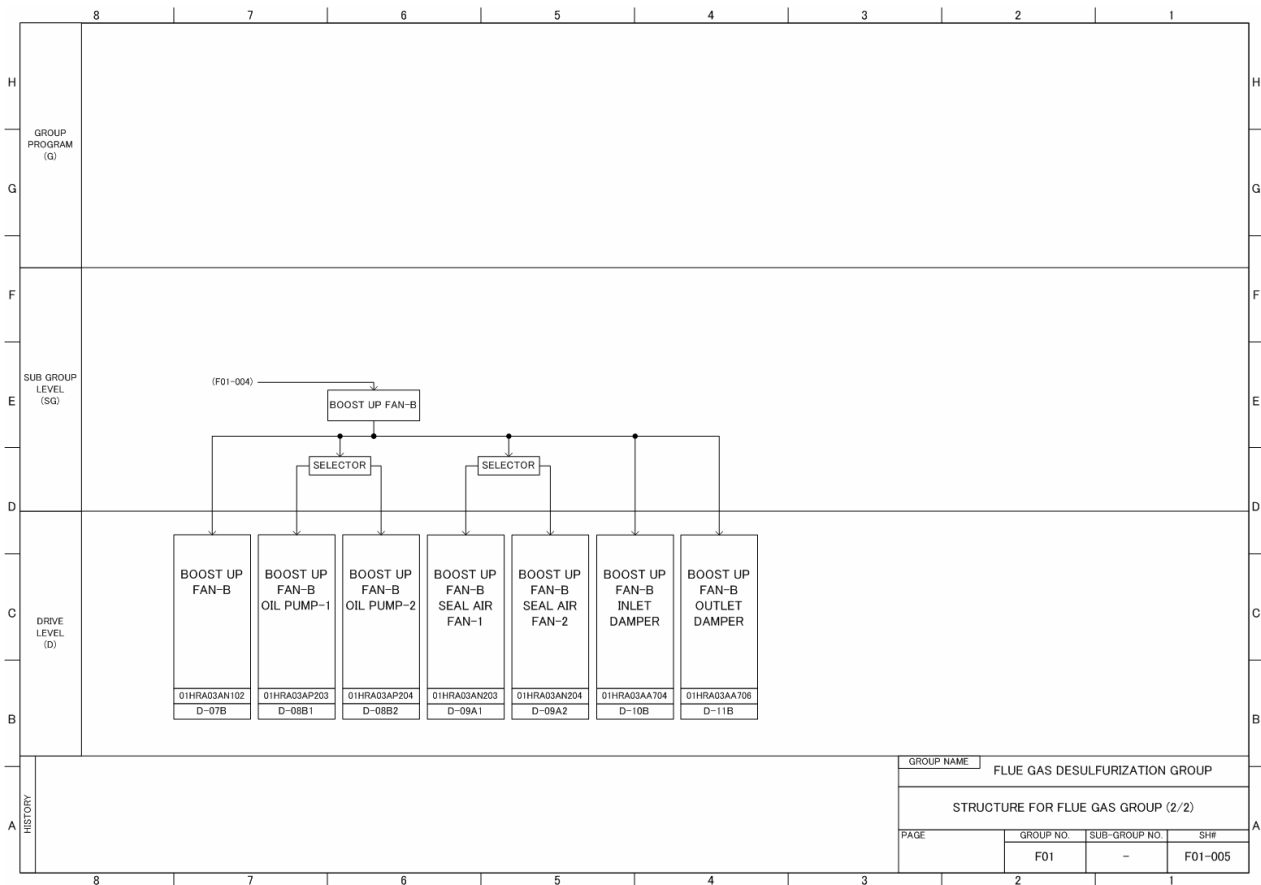


Attachment – 10 (Sheet 2 of 6)

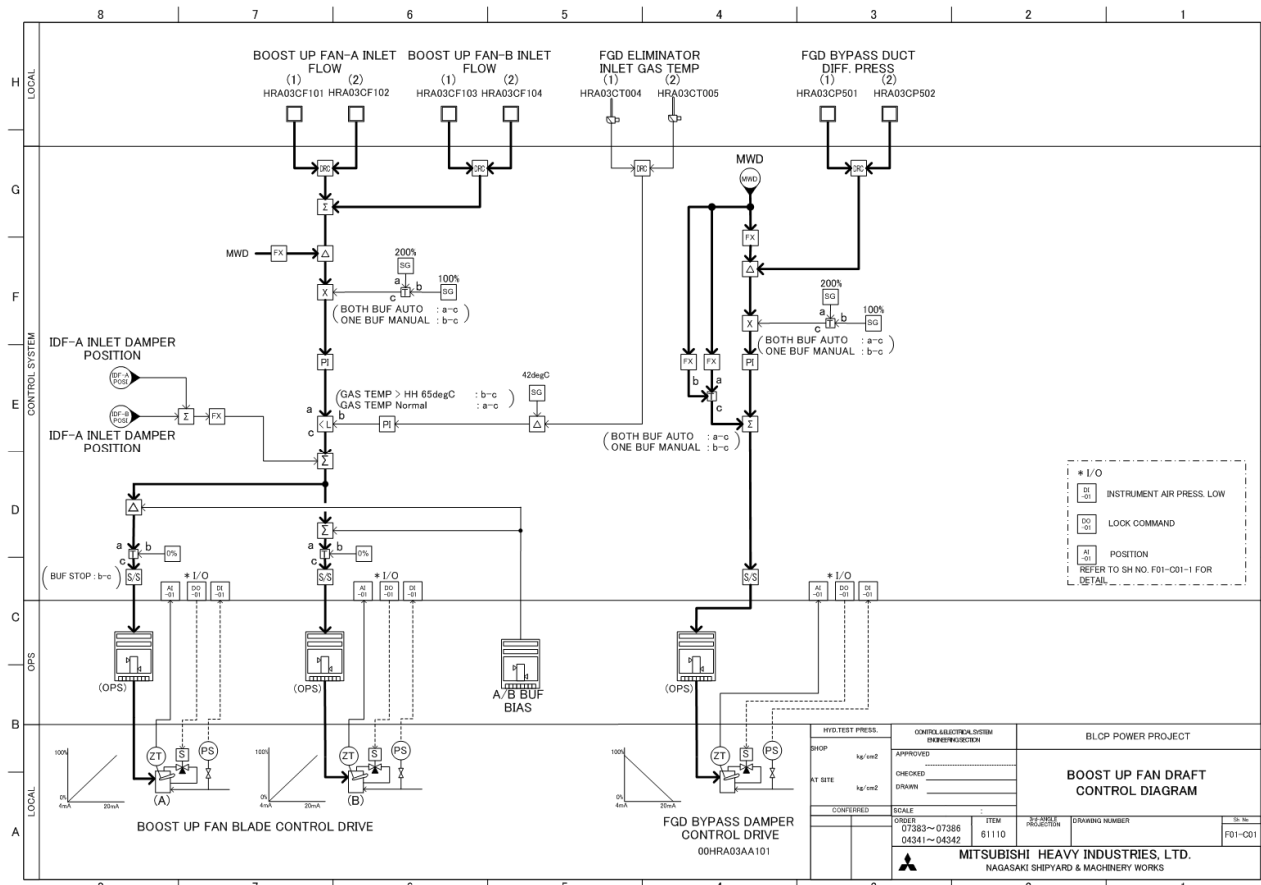




Attachment – 10 (Sheet 5 of 6)



Attachment – 10 (Sheet 6 of 6)



Attachment – 11 (Sheet 1 of 1)**Estimated Power Consumption of FGD System**

Coal		Rated Capacity	Coal C with 0.95 wt% sulfur	Blair Athol	Valeria	Performance Coal
Load			BMCR	BMCR	BMCR	TMCR
1. Boost Up Fan						
FGD inlet gas flow	Nm ³ /h-wet	-	2,246,800	2,273,570	2,238,670	2,173,370
BUF inlet gas flow (30% bypass)	Nm ³ /h-wet	-	1,572,760	1,591,499	1,567,069	1,521,359
FGD inlet gas temp.	deg. C	-	136	130	133	134
Power per 1 fan	kW	1,220	583	582	577	562
In Operation	set	2	2	2	2	2
Power for 1 Unit	kW	2,440	1,167	1,163	1,154	1,123
2. Seawater Pump						
Power per 1 fan	kW	850	850	850	850	850
In Operation	set	2	2	2	2	2
Power for 1 Unit	kW	1,700	1,700	1,700	1,700	1,700
3. Absorber Blower						
Power per 1 fan	kW	450	380	380	380	380
In Operation	set	2	2	2	2	2
Power for 1 Unit	kW	900	760	760	760	760
4. Aeration Blower						
Power per 1 fan	kW	700	600	-	-	-
In Operation	set	3	3	0	0	0
Power for 1 Unit	kW	2,100	1,800	0	0	0
TOTAL	kW	7,140	5,427	3,623	3,614	3,583

Attachment – 12 (Sheet 1 of 4)**Coversheet of Letters Submitting Comment Resolution Sheet**

The Comment Resolution Sheets for this document were submitted the following letter:

MCP letter #MAP-MHIN-BLCP-L-0543 dated 2004/12/28
MCP letter #MAP-MHIN-BLCP-L-0546 dated 2004/12/28
MCP letter #MAP-MHIN-BLCP-L-0904 dated 2005/02/24

Attachment – 12 (Sheet 2 of 4)

M.C. Machinery, Inc.

20th Floor, Shinagawa Mitsubishi Building 16-3, Konan 2-chome, Minato-ku Tokyo 108-0075, Japan

Total pages (Including this page): 10 Pages.
Please advise us quoting the above Ref. No. if any part of
this transmission failed or was misdirected.

Project: BLCP POWER PROJECT

Subject: Comment resolution sheet (Flue Gas Desulfurization System Design Manual)

References: 1. CLP Letter #TH04182MM182306IRN dated 2004/7/28

Dear Sirs,

With reference to the above subject, MCP is pleased to furnish the attached sheet for BLCP review.

Best Regards,

Action Required: **NO**

Due Date: **N/A.**

Complete Response to: **CLP Letter #TH04182MM182306IRN**

Enclosures: **1. Comment Resolution Sheets (Flue Gas Desulfurization System Design Manual)**

(FOR INTERNAL USE) Originator: M. Michioka

CC: FTK 室 (高原 PM)、プ一 (計機)、プニ (装)、原輸二

File : A-1

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BLCP Power Project

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Attachment – 12 (Sheet 3 of 4)

M.C. Machinery, Inc.

Total pages (including this page): 3 Pages.
Please advise us quoting the above Ref. No. if any part of
this transmission failed or was misdirected.

Project: BLCPP POWER PROJECT

Subject: Comment resolution sheet (Flue Gas Desulfurization System Design Manual)

References: 1. CLP Letter #TH041841MM182306IRN dated 2004/8/4

Dear Sirs,

With reference to the above subject, MCP is pleased to furnish the attached sheet for BLCP review.

Best Regards,

Action Required: **NO**

Due Date: N/A

Complete Response to: **CLP Letter #TH041841MM182306IRN**

Enclosures: 1. Comment Resolution Sheets (Flue Gas Desulfurization System Design Manual)

(FOR INTERNAL USE) Originator: M. Michioka

CC: FTK 室 (高原 PM)、プー (計機)、プニ (装)、原輸二

File : A-1

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Admin. (owner)				
Admin. (contractor)				
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CONDS				
LOGISTICS				
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SCOTTE				
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