

POWER STATION: \_\_\_\_\_ UNIT NO. \_\_\_\_\_

DEAERATOR, EJECTOR, GLAND STEAM CONDENSER

\* Inspection Items

o Deaerator

Bending, abnormal part of spot welding of tray - visual/dimensional inspection

Spray valve erosion, foreign matter, spring crack - visual/dimensional inspection/thickness measure

Shell inside erosion - visual inspection

Storage tank inside erosion - visual inspection

o Ejector

Cooling tube leakage, drain/ $\text{NH}_3$  attack - eddy current/pressure test

Inter/after cooler sealing - pressure test

Ejector erosion - visual inspection/dimensional inspection

Waterbox inner bypass valve erosion, spring - visual inspection/colour check

o Gland steam condenser

Cooling tube leakage,  $\text{NH}_3$  attack, drain attack - eddy current/pressure test

Waterbox inner bypass valve erosion, spring - visual inspection/colour check

Gland steam exhaustor/motor bearing - visual inspection/dimensional inspection



POWER STATION: \_\_\_\_\_ UNIT NO. \_\_\_\_\_

OIL COOLER, ACWC, STRAINER

\* Inspection Items

o Oil cooler

Cooling tube & tube expanding fix part leakage - pressure test

Abnormal corrosion/erosion tube inside - eddy current test

o Auxiliary cooling water cooler

Corrosion/erosion of tube plate & inside the water box - pin-hole  
check/visual inspection/dimension measure

Tube inside deposit attack, abnormal erosion/corrosion, inlet attack  
- eddy current test

Tube outside corrosion - visual inspection/dimensional inspection

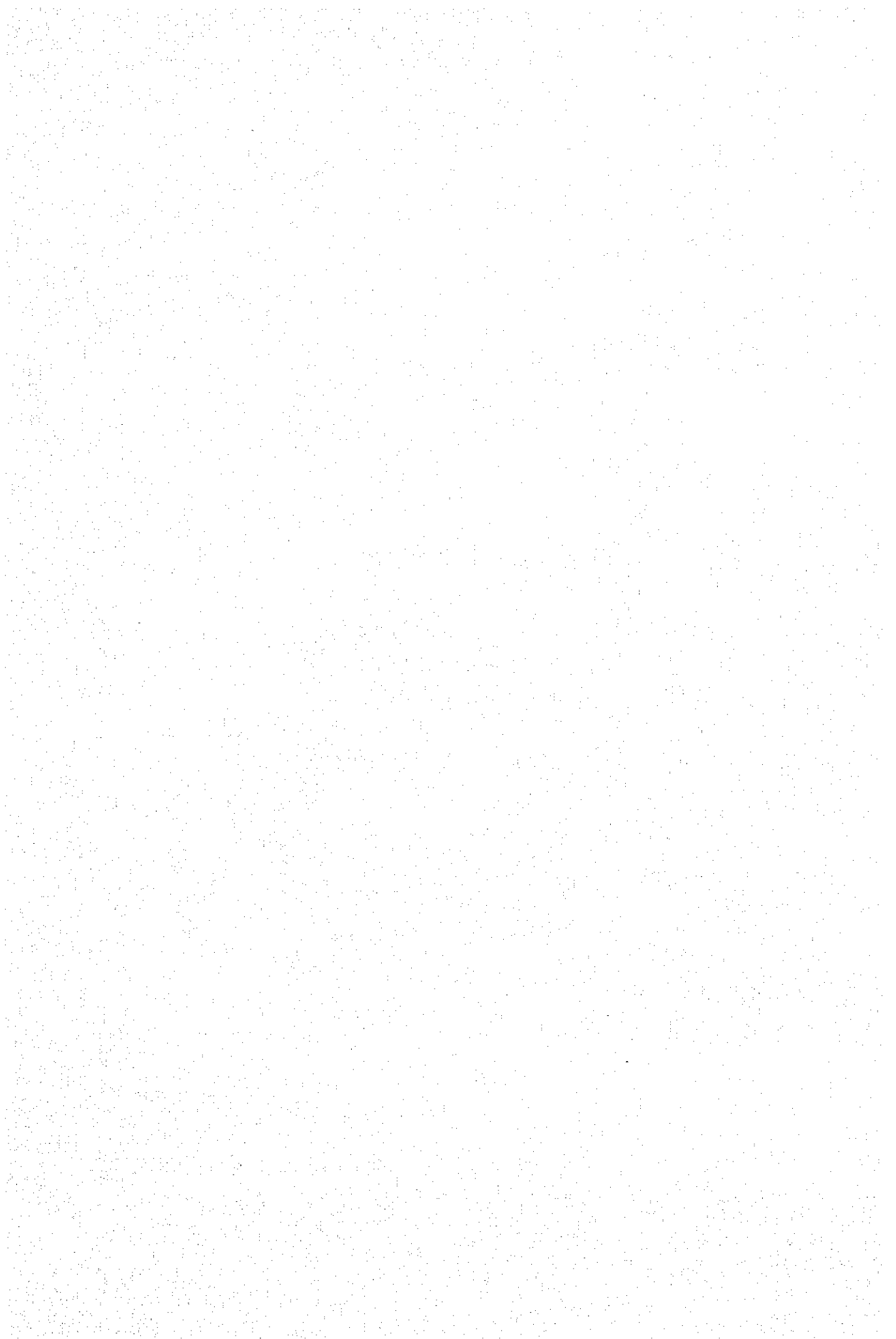
Tube leak - pressure test

o Cooling water strainer

Body inside corrosion - visual/dimensional inspection

Strainer corrosion - visual inspection

Driving parts e.g. bearing, slipping part - visual inspection

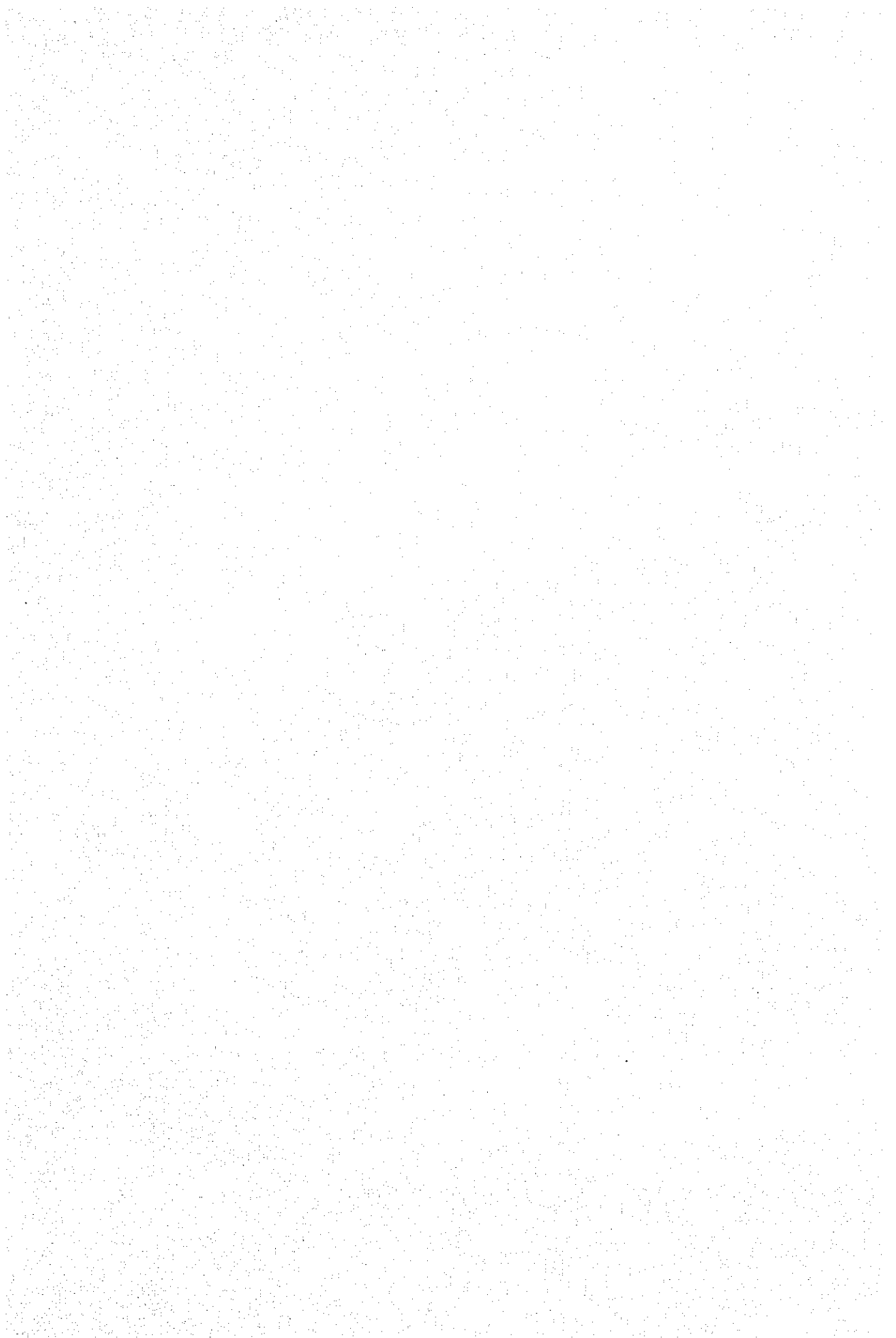


POWER STATION: \_\_\_\_\_ UNIT NO. \_\_\_\_\_

INSTRUMENT, MONITORING, CONTROL CONDENSATE DEMINERALIZER

\* Test & Inspection Items

- o Instrument, monitoring, control
  - Loop check of open/close control loop
  - Control interlock test
  - Protection interlock test
  - Calibration and operation test of monitoring system
  - Calibration of detectors, indicators and switches
  
- o Condensate demineralizer
  - Equipments check & inspection
  - Instrument check & inspection e.g. conductivity meter, flow meter, flow integrator, differential pressure meter, Na meter
  - Chemicals analysis
  - Resin analysis
  - Water quality analysis
  - Resin replacement (Rate: \_\_\_\_\_ %)
  - Reverse washing and demineralized water washing during out of service \_\_\_\_\_ times/\_\_\_\_\_ weeks or not executed these washing operation



POWER STATION: \_\_\_\_\_ UNIT NO. \_\_\_\_\_

AUXILIARY EQUIPMENT

\* Check, Inspection Items

Transformers

Items:

Unit & station service switchgears

Items:

Water pumps

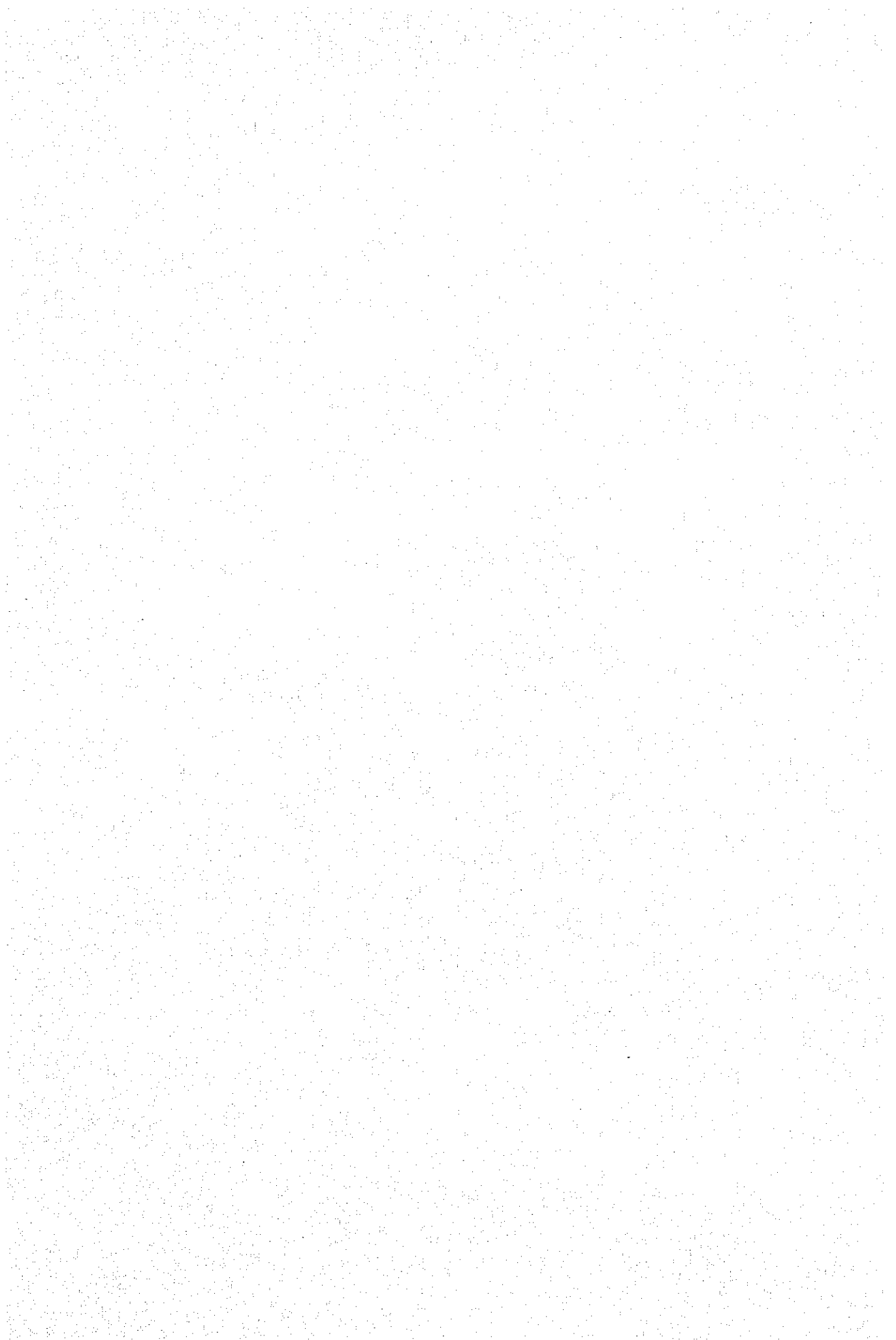
Items:

Oil storage/transfer system

Items

Raw water sedimentation, filtering, storage, make up water  
demineralizer

Items:





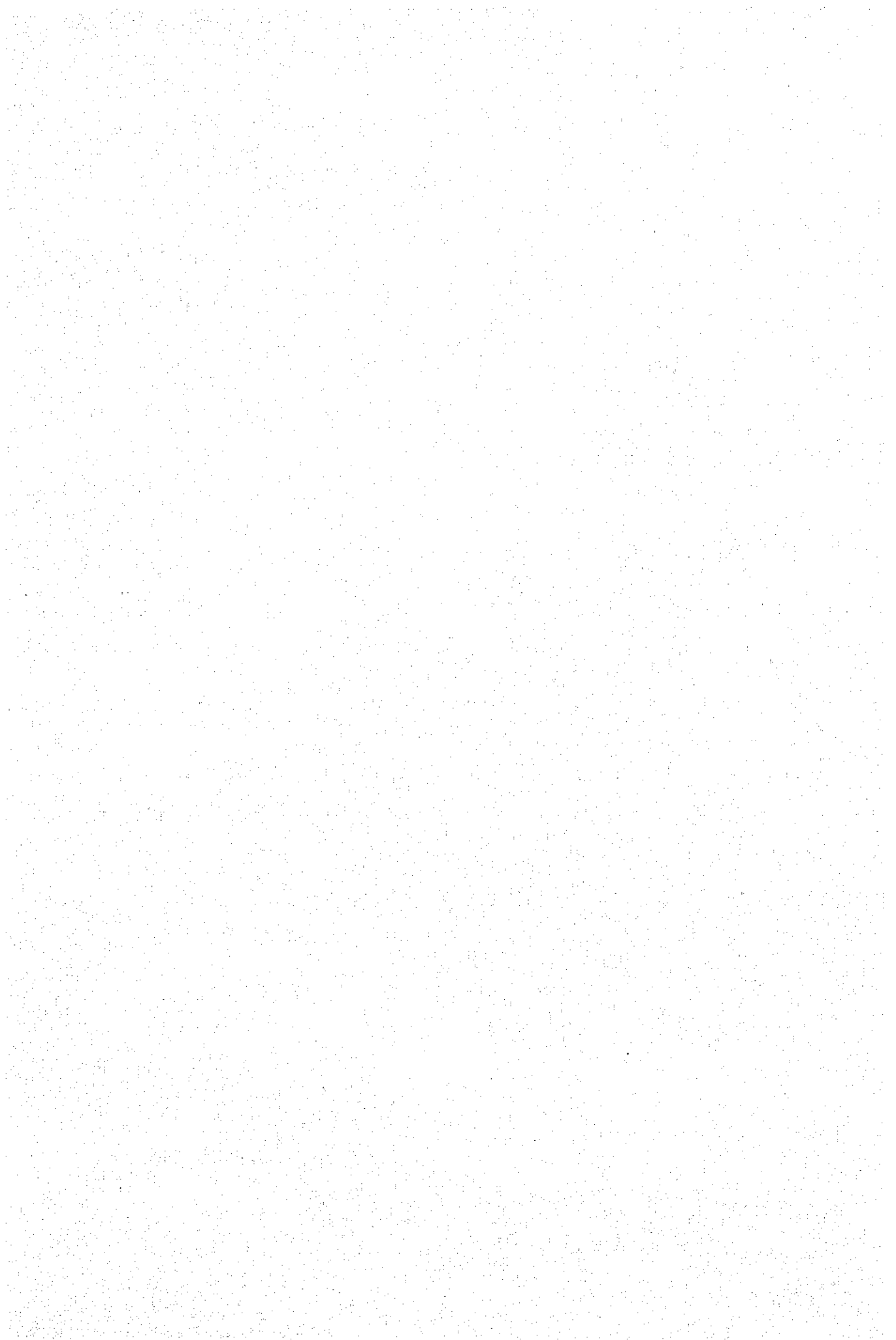
APPENDIX III

LIST OF DATA PREPARED BY NAPOCOR

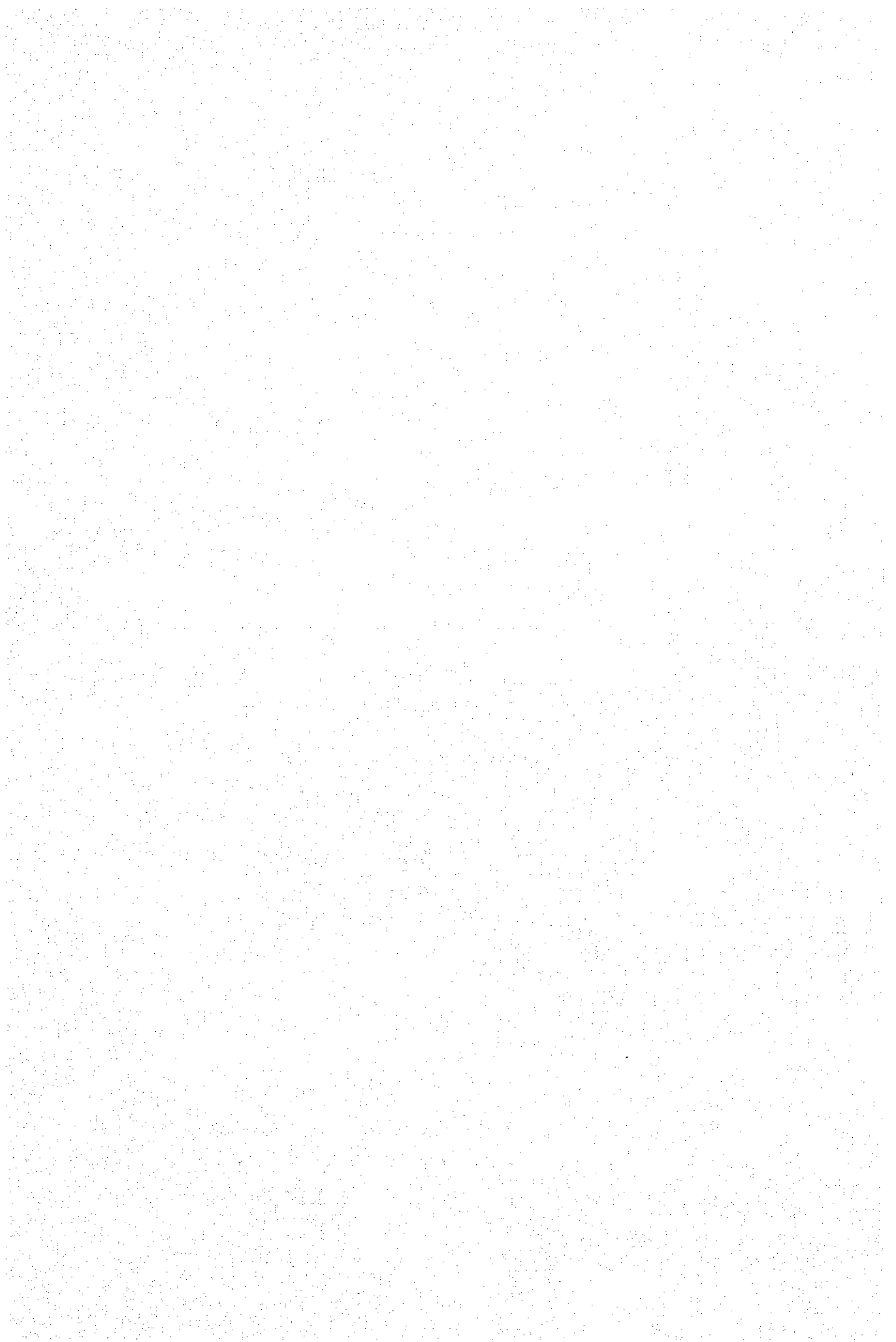
1. STANDARD OPERATING PROCEDURES  
(A Guide for GSTP Unit Operation)
2. G-1 STEAM TURBINE STANDARD OPERATING PROCEDURE  
(A Guide for GSTP Operation)
3. OPERATING PROCEDURE  
MALAYA UNIT NO.
4. S-2 STEAM BOILER STANDARD OPERATING PROCEDURE  
(A Guide for GSTP Operation)
5. MALAYA 2 STANDARD OPERATING PROCEDURE
6. DESIGN STANDARD OF MERALCO
7. POWER OUTLOOK - LUZON - VISAYAS - MINDANAO
8. HISTORICAL DATA - MMRC
9. OPERATING INSTRUCTION S-2
10. ENGINEERING DATA
11. THE ELECTRIC POWER SITUATION IN LUZON (1979 - 1982)  
MOE EPSL COM
12. QUALIFICATION STANDARD FOR POSITIONS UNDER THE UTILITY  
OPERATING GROUP
13. EMERGENCY SYSTEMS - STANDARD OPERATING PROCEDURES
14. PRELIMINARY REPORT ON THE STUDY OF THE OPERATION AND  
MAINTENANCE OF TEGEN, GARDNER/SNYDER AND MALAYA POWER  
STATIONS
15. MALAYA UNIT NO. I EMERGENCY WIRING DIAGRAM
16. TEGEN UNIT NO. I
17. TEGEN-I OUTAGE/TROUBLE REPORT
18. TEGEN - 2
19. GARDNER - I ELEMENTARY WIRING DIAGRAM
20. SNYDER UNIT NO. I ELEMENTARY WIRING DIAGRAM



21. GARDNER THERMAL POWER - 2 ELEMENTARY WIRING DIAGRAM
22. POWER EXPANSION PROGRAM 1981 - 1980
23. LUZON GRID SURVEY MISSION (by JICA)
24. TEGEN STATION UNIT NO. 2 ONE LINE AND RELAY DIAGRAM
25. TEGEN STATION UNIT NO. 1 ONE LINE AND RELAY DIAGRAM
26. SPECIFICATIONS FOR MOTOR ELECTRICAL EQUIPMENT
27. GARDNER STATION UNIT NO. 1 ONE LINE AND RELAY DIAGRAM
28. GARDNER STATION UNIT NO. 2 ONE LINE AND RELAY DIAGRAM
29. MALAYA STATION UNIT NO. 1 ONE LINE AND RELAY DIAGRAM
30. SNYDER STATION UNIT NO. 1 ONE LINE AND RELAY DIAGRAM
31. SNYDER STATION UNIT NO. 2 ONE LINE AND RELAY DIAGRAM
32. MALAYA STATION UNIT NO. 2 ONE LINE AND RELAY DIAGRAM
33. A CATALOG OF TRAINING PROGRAMS
34. S-2 OUTAGE/TROUBLE REPORT
35. S-1 OUTAGE/TROUBLE REPORT
36. G-2 OUTAGE/TROUBLE REPORT
37. G-1 OUTAGE/TROUBLE REPORT
38. QUALITY ASSURANCE GROUP REPORT ON G-1 ANNUAL OVERHAULING 1982
39. QUALITY ASSURANCE GROUP REPORT ON S-2 ANNUAL OVERHAULING 1981  
Vol. I & II
40. GUIDELINES & PROCEDURES ON PROPERTY MANAGEMENT AND FOREIGN  
PURCHASING SYSTEM
41. RECORD OF OUTAGES AND TURBO-SET SHUTDOWN SNYDER UNIT NO. 1
42. SNYDER UNIT NO. 2 OUTAGE/TROUBLE REPORT
43. MALAYA UNIT NO. 1 OUTAGE/TROUBLE REPORT
44. MALAYA UNIT NO. 2 OUTAGE/TROUBLE REPORT
45. TEGEN UNIT NO. 1 OUTAGE AND SHUTDOWN
46. TEGEN UNIT NO. 2 OUTAGE AND SHUTDOWN
47. MALAYA UNIT NO. 1 OUTAGE AND SHUTDOWN



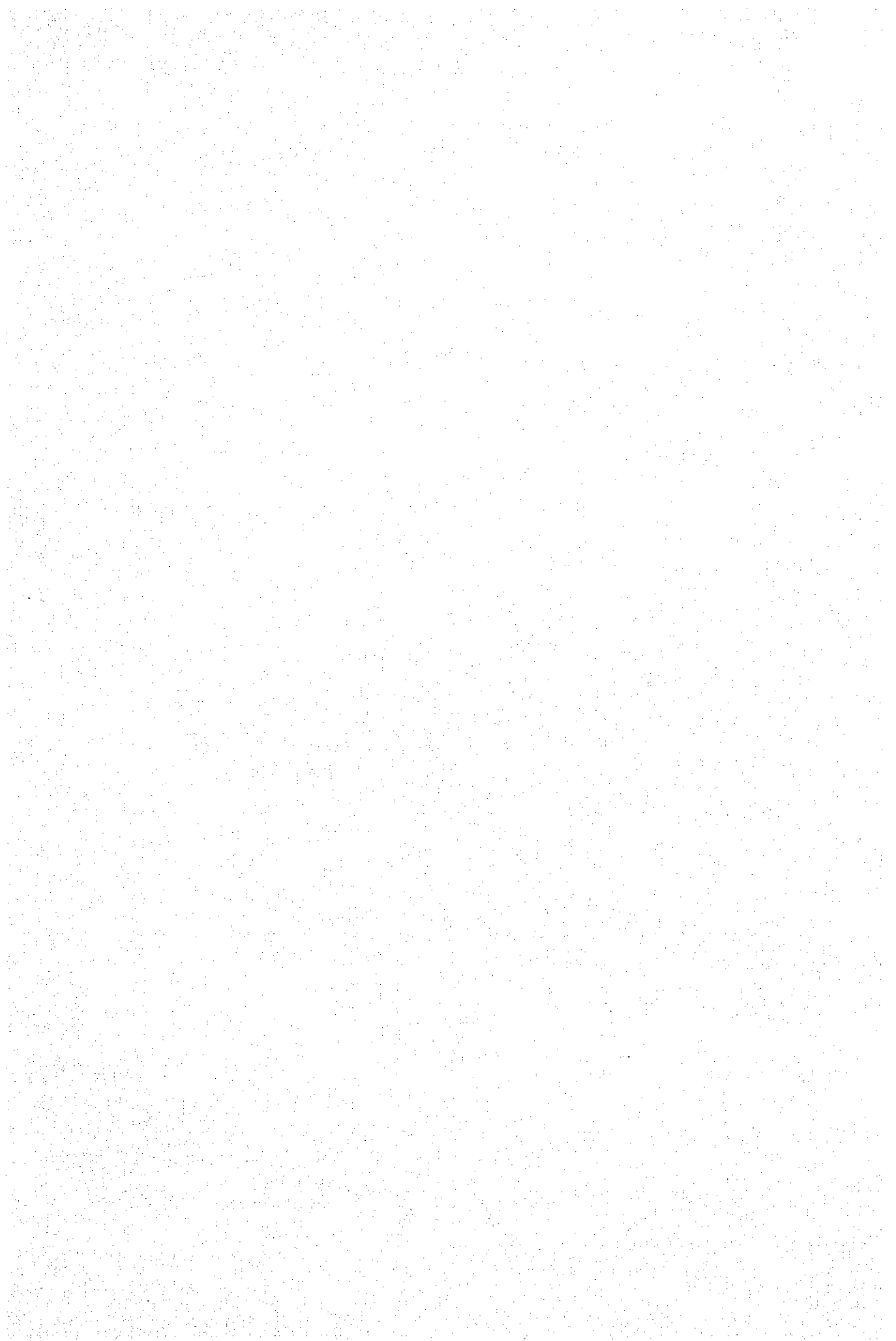
48. MALAYA UNIT NO. 1 OUTAGE/TROUBLE REPORT
49. EQUIPMENT SPECIFICATION SNYDER UNIT NO. 2
50. EQUIPMENT SPECIFICATION MALAYA UNIT NO. 2
51. EQUIPMENT SPECIFICATION SNYDER UNIT NO. 1
52. EQUIPMENT SPECIFICATION GARDNER UNIT NO. 1
53. EQUIPMENT SPECIFICATION MALAYA UNIT NO. 1
54. NAPOCOR'S RESPONSE TO THE CHALLENGE OF THE '80s
55. OUTLINE OF NAPOCOR AND OTHER RELEVANT ORGANIZATION
56. POWER PLANT ENGINEERING/ANALYSIS OF USEFUL SERVICE LIFE OF EQUIPMENT
57. TRAINING PROGRAM - UTILITY OPERATIONS
58. DETAIL OF WORKSHOP (EQUIPMENT & SKILLED MECHANICS)
59. SPARE PARTS REQUIREMENT OF MMRC PLANTS FOR OVERHAULING & REHABILITATION (Jan. 14, 1982)
60. MALAYA THERMAL PLANT DATA AND REPLY ON JICA CHECK SHEETS
61. INFORMATIONS ON GARDNER/SNYDER & MALAYA THERMAL PLANTS
62. THE ELECTRIC POWER SITUATION IN LUZON (1979 - 1982)  
- EPSL - SUBMITTED BY MOE COMMITTEE EPSL 7 March, 1981



SNYDER - 1

List of Drawings:

<u>Drawing Number</u>	<u>Title</u>
<u>Plant Layout Boiler Area</u>	
C-S13-001	Basement Floor Elev. 40'0"
C-S13-002	Mezzanine Floor Elev. 59'0"
C-S13-003	Operating Floor Elev. 78'0"
C-S13-004	Platform Elevation 86'0"
C-S13-005	Platform Elevation 94'0"
C-S13-006	- do - 104'6"
C-S13-007	- do - 117'4"
C-S13-008	- do - 130'0"
C-S13-009	- do - 137'3"
C-S13-010	- do - 145'0"
C-S13-011	- do - 151'0"
C-S13-012	- do - 156'0"
C-S13-013	- do - 163'5"
C-S13-014	- do - 169'0"
C-S13-015	- do - 183'4"
C-S13-016	Boiler Room Roof T.O.S. 208'8" Elevation
<u>Plant Layout Turbine Area</u>	
C-S13-017	Basement Floor Elev. 40'0"
C-S13-018	Mezzanine Floor Elev. 59'0"
C-S13-019	Operating floor Elev. 78'0"
C-S13-020	Turbine Room Roof Elev. 138'7"
C-S13-021	Plant Layout, Longitudinal Cross Section. Facing North
C-S13-022	Plant Layout Section in Front of Turbine Generator Facing East





MALAYA - 1

List of Drawings:

<u>Drawing Number</u>	<u>Title</u>
D-M13-005	General Layout Power Plant Site Layout
	<u>Plant Layout Boiler Area</u>
D-M13-022	Mezzanine Floor Elevation 63'0"
D-M13-023	Operating floor Elevation 82'0"
D-M13-024	Platform Elevation 90'0"
D-M13-025	- do - 98'0"
D-M13-026	- do - 108'6"
D-M13-027	- do - 130'6"
D-M13-028	- do - 147'6"
D-M13-029	- do - 156'0"
D-M13-030	- do - 163'6½"
D-M13-031	- do - 171'1"
D-M13-032	- do - 178'7½"
D-M13-033	- do - 186'0"
D-M13-034	- do - 203'6"
D-M13-035	Boiler Room Roof T.O.S. 225'8" Elevation
	<u>Plant Layout Turbine Area</u>
D-M13-036	Basement Floor Elev. 44'0"
D-M13-037	Mezzanine Floor Elev. 63'0"
D-M13-038	Operating Floor Elev. 82'0"
D-M13-039	Turbine Roof Elev. 154'6"
D-M13-041	Longitudinal Cross Section Facing West
D-M13-042	Cross Section Front of Turbine Generator Facing North
D-M13-043	Cross Section, Section in Front of Boiler Facing North

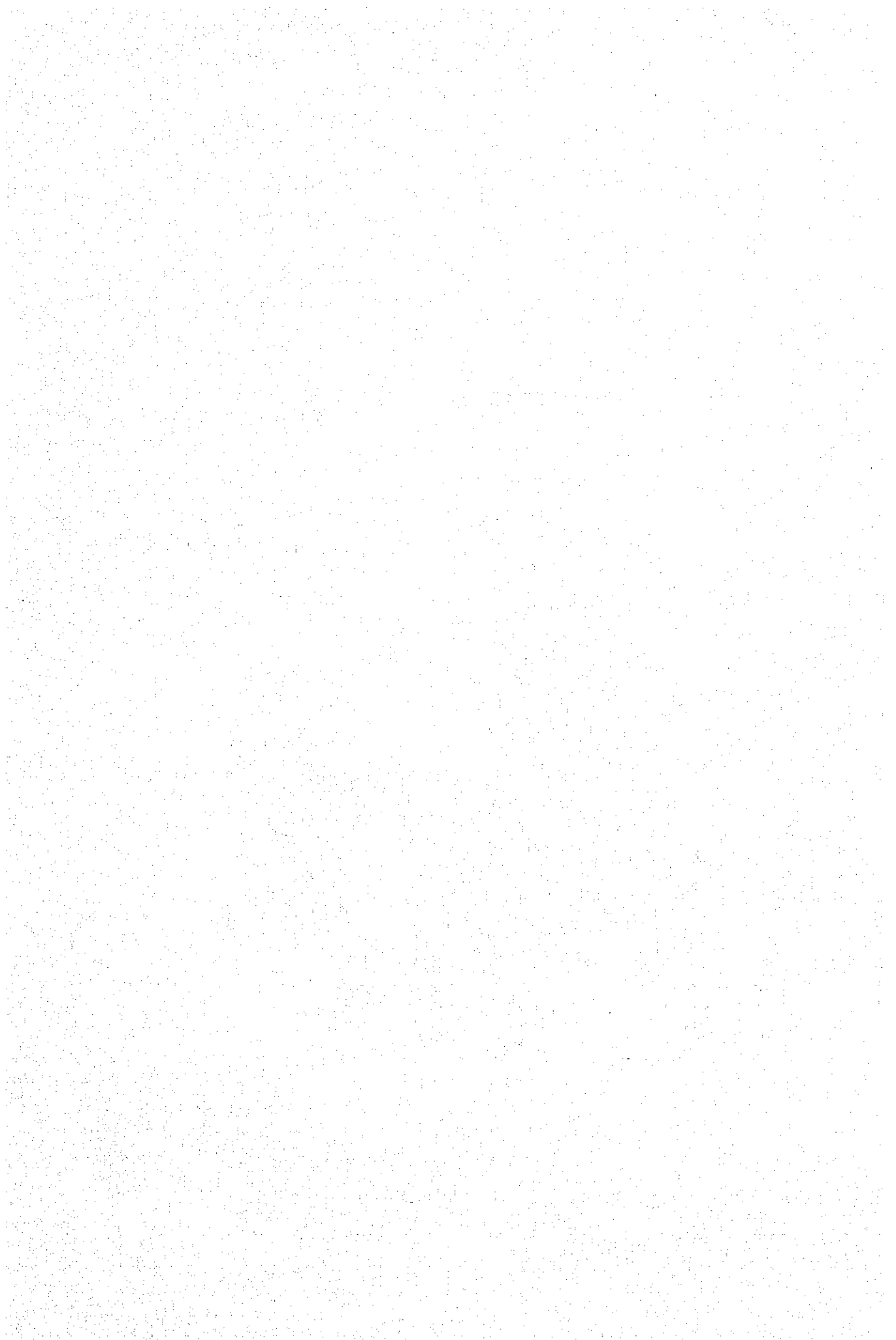


Miscellaneous Layout

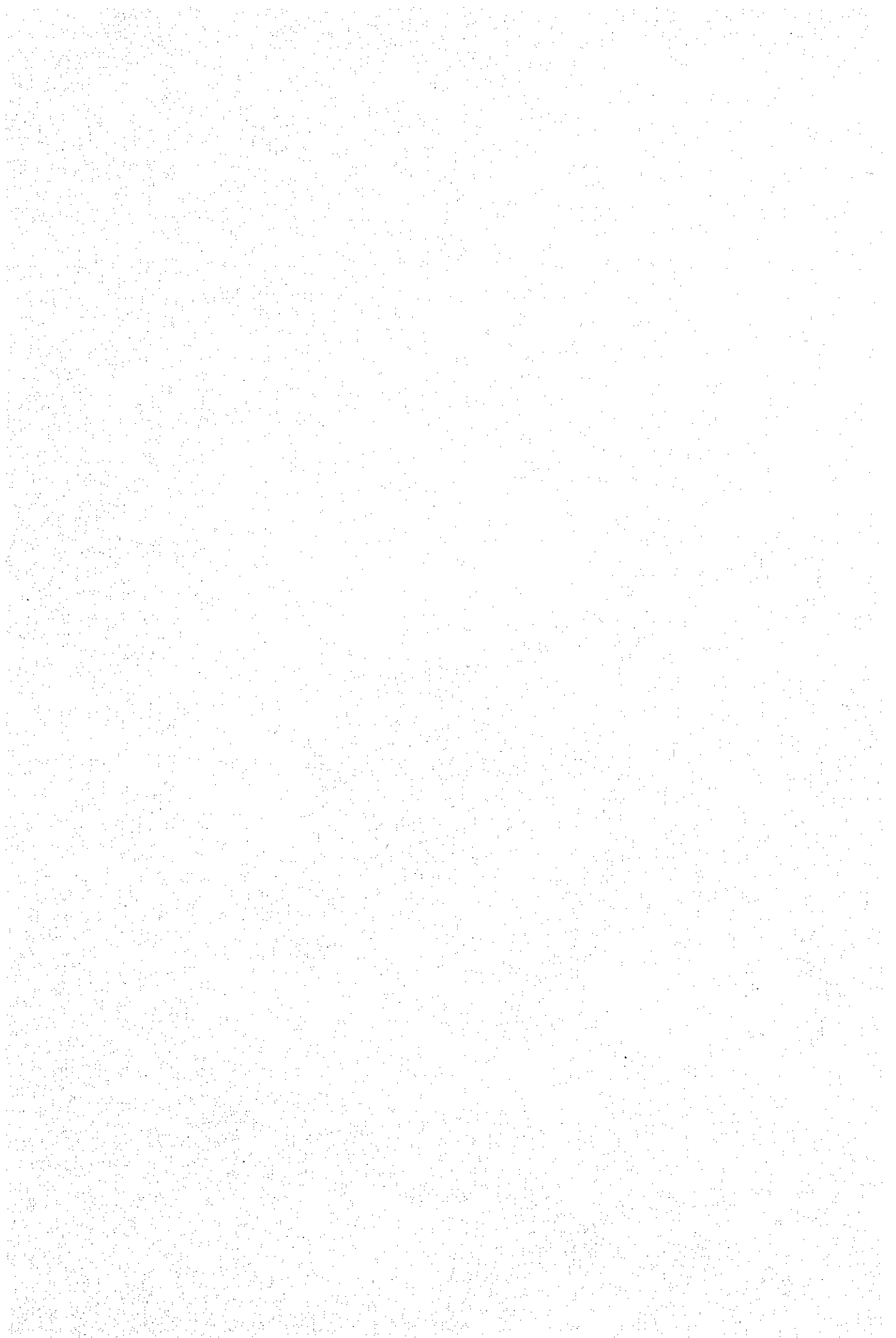
D-M13-052 (1/2)	Screen and Pump House (Plan)
D-M13-052 (2/2)	Screen and Pump House (Sections)
D-M13-053 (1/2)	Miscellaneous Equipment Outside the Plant North Side
D-M13-055	Fuel Oil Tank Farm (Across Provincial Road)
D-M13-061	Fuel Oil Tank Farm (Inside Plant Area)

Flow Diagram

D-M13-201	Main Cycle Water and Extraction Steam
D-M13-202	Main and Reheat Steam and By-pass Steam
C-M13-203	Auxiliary Steam and Steam Air Heaters
B-M13-204	Boiler Feed Pump
D-M13-205	Fuel Oil Supply (Inside Plant)
B-M13-206	Condenser Air and Ejector Drains
C-M13-207	Condenser Circulating Water and House Service Raw Water
B-M13-208	Heater Vents, Drains and Reliefs
C-M13-209	House Service Water
SS-M13-210 (1/5)	Heat Balance Flow (344 MW)
- do - (2/5)	- do - (330 MW)
- do - (3/5)	- do - (300 MW)
- do - (4/5)	- do - (225 MW)
- do - (5/5)	- do - (120 MW)
C-M13-211	House Service Air & Boiler Aspirating Air
C-M13-215	Water Washing Hydroveyor Exhauster Water Supply
C-M13-216 (1/2-2/2)	Fire Service Water
C-M13-218	Secondary Water Treatment
D-M13-223	Control Air Supply
C-M13-226	Screen Wash Water and Chlorine Solution
C-M13-228	Boiler Air and Gas



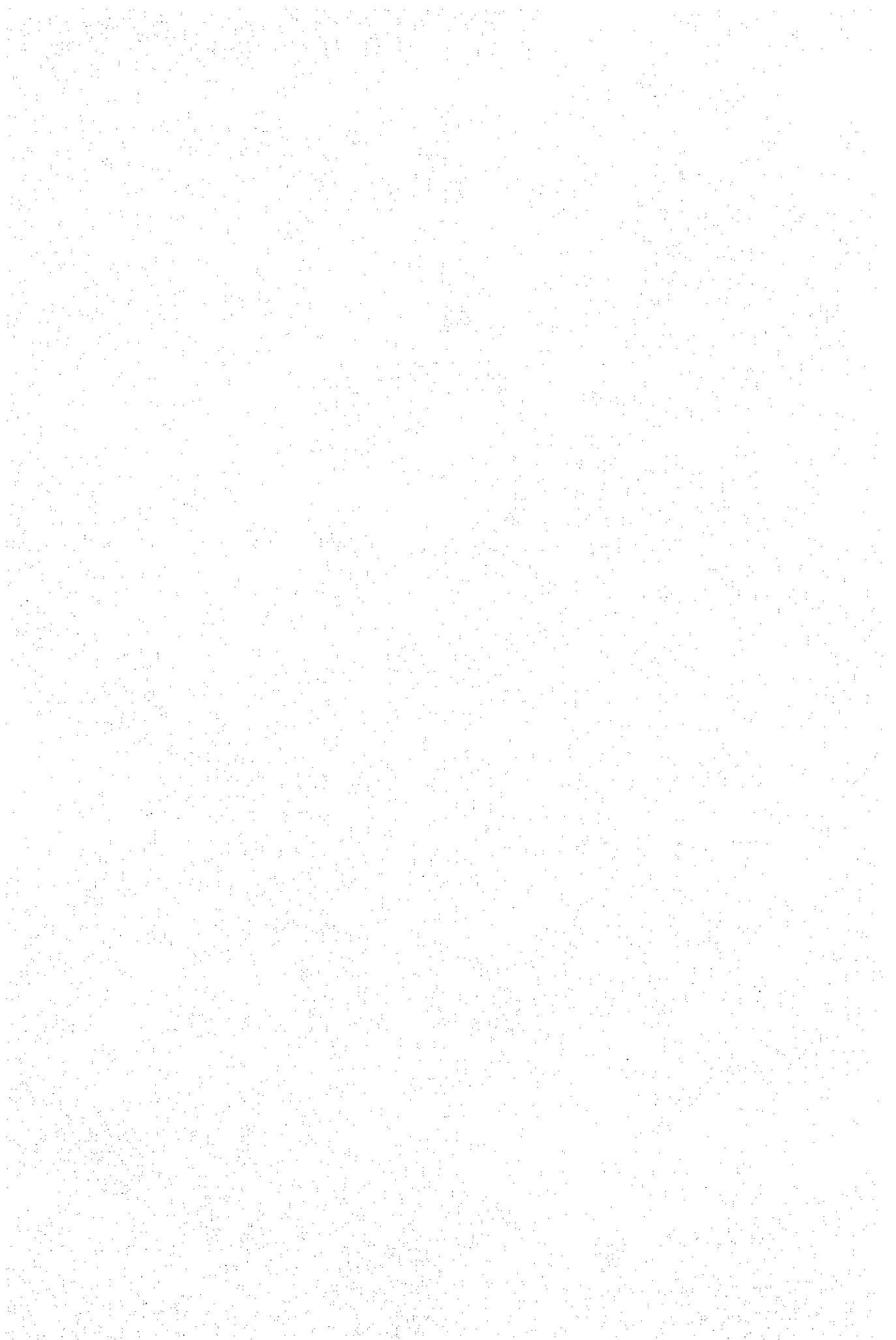
C-M13-231	Fuel Oil Supply (Outside Plant)
D-M13-232	Schematic Sampling
D-M13-233	Primary Water Treatment
D-M13-234	Condensate Polishing System



SNYDER - 2

List of Drawings:

<u>Drawing Number</u>	<u>Title</u>
	<u>Plant Layout - Boiler Area</u>
D-S23-001	Basement Floor, Elevation 40'-0"
D-S23-002	Mezzanine Floor, Elevation 59'-0"
D-S23-003	Operating floor, Elevation 78'-0"
D-S23-004	Platform Elevation 86'-0"
D-S23-005	Platform Elevation 94'-0"
D-S23-006	Platform Elevation 104'-6"
D-S23-007	Platform Elevation 126'-6"
D-S23-008	Platform Elevation 143'-6"
D-S23-009	Platform Elevation 152'-0"
D-S23-010	Platform Elevation 159'-6- $\frac{1}{2}$ "
D-S23-011	Platform Elevation 167'-1"
D-S23-012	Platform Elevation 174'-7- $\frac{1}{2}$ "
D-S23-013	Platform Elevation 182'-0"
D-S23-014	Platform Elevation 199'-6"
D-S23-015	Boiler Room Roof, T.O.S. 221'-8" Elevation
	<u>Plant Layout - Turbine Area</u>
D-S23-016	Basement Floor, Elevation 40'-0"
D-S23-017	Mezzanine Floor, Elevation 59'-0"
D-S23-018	Operating Floor, Elevation 78'-0"
D-S23-019	Turbine Room Roof, Elev. 138'-7"
	<u>Plant Layout - Cross Sections</u>
D-S23-025	Longitudinal Cross-Section Facing North
D-S23-026	Section in Front of Turbine-Generator Facing East
D-S23-027	Section in Front of Boiler Facing East





Miscellaneous Equipment Layout

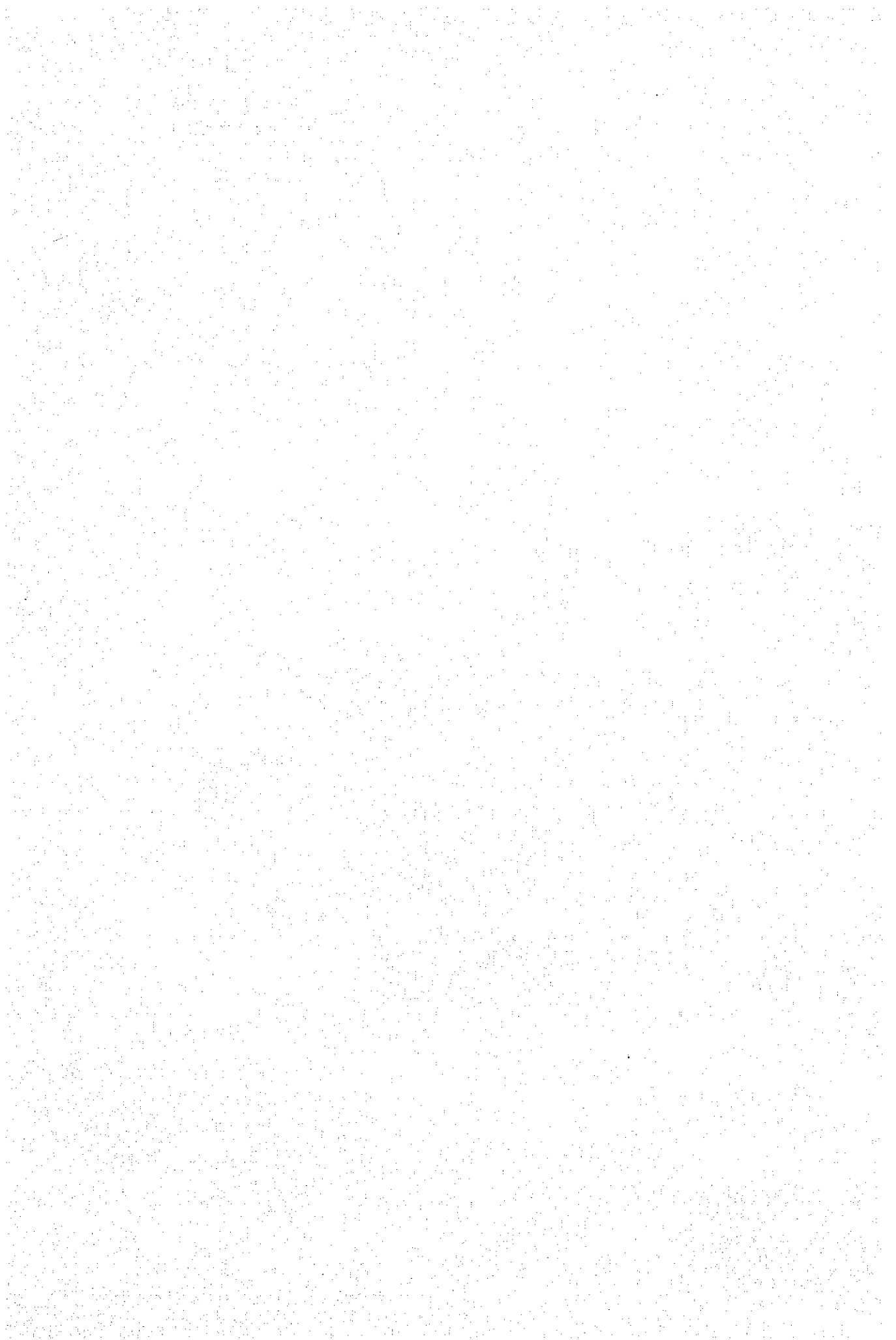
C-S23-040 Clearwell Layout  
C-S23-041 Screen Wash Pumps Layout  
B-S23-042 Chlorination House - Addition of  
Chlorinator and Evaporator

Air and Gas Flow System Layout

D-S23-070 Air Duct - Forced Draft to Air  
Preheater  
D-S23-071 Gas Duct - Air Preheater to Smoke  
Stack  
D-S23-072 Expansion Joint  
D-S23-073 Manhole for Dust Collector Hoppers  
C-S23-074 Gas Duct Isometric Layout

Flow and Heat Balance Diagrams

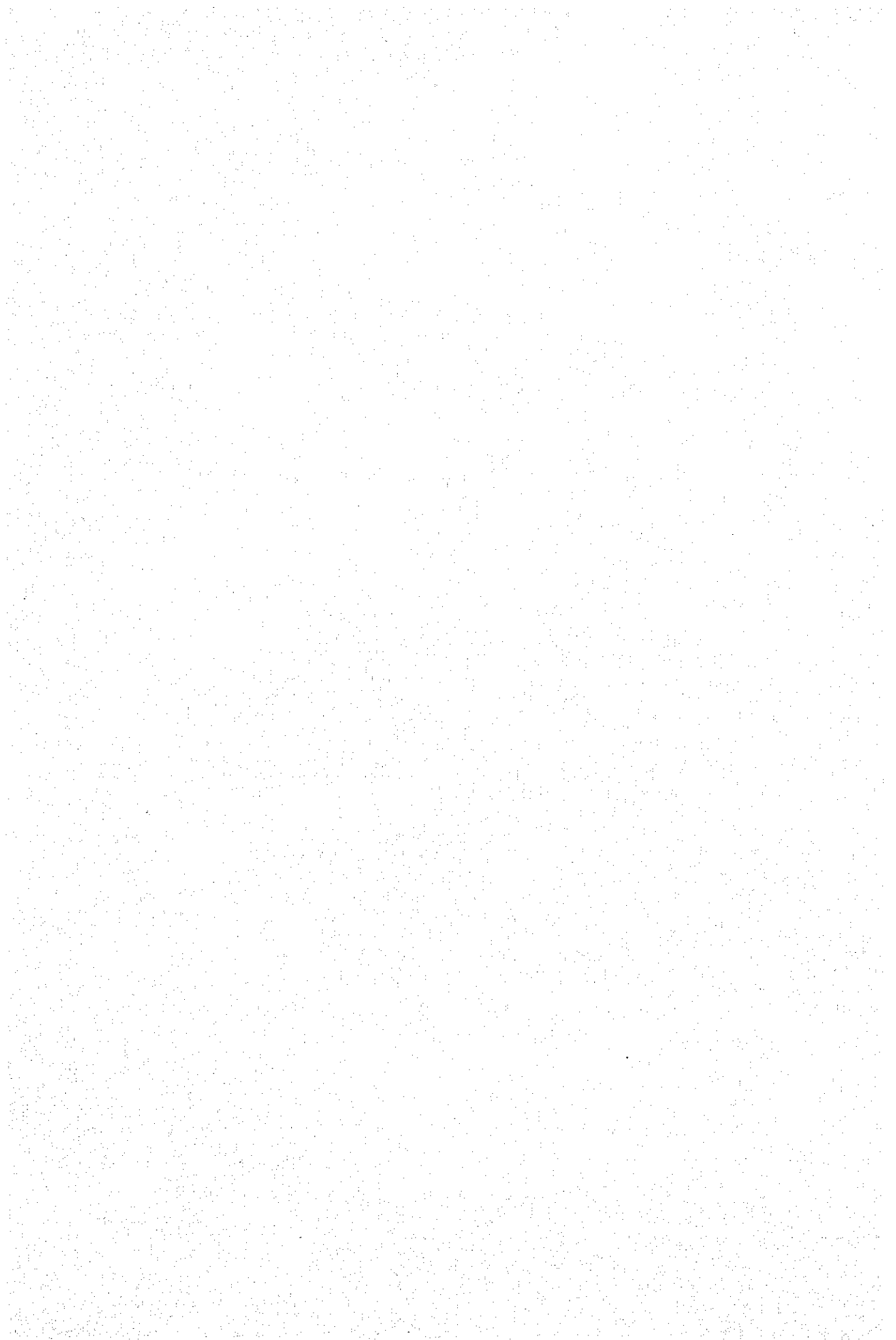
D-S23-201 Main Cycle Water & Extraction Steam  
D-S23-202 Main & Reheat Steam & By-pass System  
C-S23-203 Auxiliary Steam & Steam Air Heaters  
B-S23-204 Boiler and Feed Pump  
D-S23-205 Fuel Oil  
B-S23-206 Condenser Air & Ejector Drains  
B-S23-207 Condenser Circulating Water & House  
Service Raw Water  
B-S23-208 Heater Vents and Reliefs  
C-S23-209 House Service Water  
SS-S23-210 Heat Balance Flow (5 sheets)  
D-S23-211 Schematic Sampling  
C-S23-212 House Service Air & Boiler Aspirating  
Air  
D-S23-213 Boiler Sealing Air  
C-S23-214 Boiler Blowdown Vents & Drains



GARDNER UNIT NO. 2

List of Drawings:

<u>Drawing Number</u>	<u>Title</u>
	<u>Flow, Stress Analysis &amp; Heat Balance Diagram</u>
E-3B2-001	Main Cycle Flow Diagram
D-3B2-002	Fuel Oil Flow Diagram
D-3B2-003	Control Air Supply Diagram
D-3B2-004	Sampling Diagram
C-3B2-005	Temporary Blowing Out Steam
C-3B2-006	Heater Vents and Reliefs
C-3B2-007	Miscellaneous Turbine and Main Extraction Steam Drains
C-3B2-008	Condenser Air and Ejector Drains
C-3B2-009	Boiler Blow Down Vents and Drains
C-3B2-011	Secondary Water Treating
C-3B2-012	Circulating and Raw Water
C-3B2-013	Fire Service Water
C-3B2-014	House Service Water Flow Diagram
C-3B2-015	House Service Air & Boiler Aspirating Air Blowing Diagram
B-3B2-016	Schematic of Boiler Acid Cleaning
C-3B2-017	Turbine Lube Oil Conditioning System
C-3B2-018	Boiler Sealing Air
C-3B2-019	Equipment Water Washing and Hydro- veyor Exhauster Water
C-3B2-020	Pre-Boiler Cleaning
C-3B2-021	Heater Drips and Hotwell Make-up Control System
B-3B2-022	Boiler Feed Pump Flow Diagram
B-3B2-023	Gland Sealing Water
SS-3B2-024	Heater Extraction Steam Power Operated Non-Return Value Control Diagram



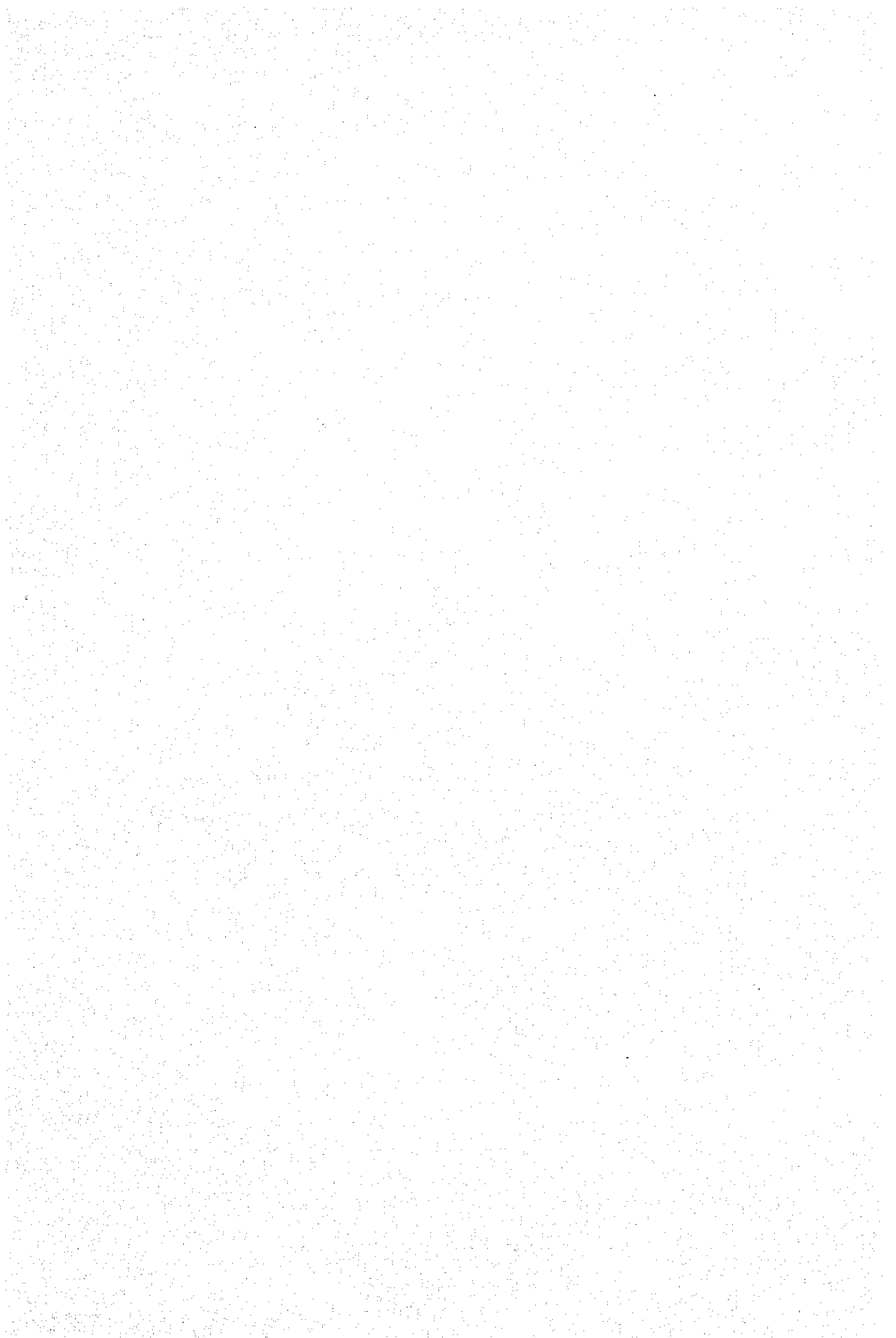
C-3B2-026	Sterile and Filtered Water
B-3B2-027	Steam Air Heater
C-3B2-028	Screen Wash Pump Water & Chlorine Solution
B-3B2-029	Chilled & Condensing Water System
E-001-004	Power Plant Site Layout

Plant Layout Boiler Area

C-G23-001	Basement Floor, Elev.	40'0"
C-G23-002	Mezzanine Floor, Elev.	59'0"
C-G23-004	Platform Elevation	86'0"
C-G23-005	- do -	94'0"
C-G23-006	- do -	104'6"
C-G23-007	- do -	117'4"
C-G23-008	- do -	130'0"
C-G23-009	- do -	137'3"
C-G23-010	- do -	145'0"
C-G23-011	- do -	151'0"
C-G23-012	- do -	156'0"
C-G23-013	- do -	163'5"
C-G23-014	- do -	169'0"
C-G23-015	- do -	183'4"
C-G23-016	- do -	208'8"

Flow & Heat Balance Diagrams

D-202	Main & Reheat Steam & By-pass System
SS-204 (4 sheets)	Heat Balance Flow Circulating Water and Raw Water
C-208	House Service Water
D-210	Fuel Oil
D-213	Schematic Sampling
C-217	Secondary Water Treatment
C-220	Auxiliary Steam & Steam Air Heaters
D-G23-212	House Service Air and Boiler Aspirating Air



Instruments & Controls

SS-G23-1002	Control & Interlock Scheme - Turbine Motor Driven Boiler Feed Pump
SS-G23-1004	Stand-by Boiler Feed Pumps
SS-G23-1019	Electrical Block Diagram - FDF Inlet Blades and Dampers
SS-G23-1021	SH By-pass Valve Control





MALAYA UNIT NO. 1

List of Drawings:

<u>Drawing Number</u>	<u>Title</u>
	<u>Instruments &amp; Controls</u>
D-M12-1005	Steam Temperature Flash Tank Round and By-pass Control System
SS-M12-1006	Schematic Diagram - Air Heater Cold End Temperature Control
SS-M13-1007	Schematic Diagram - Turbine Generator Electro-Hydraulic Governor Control, Combustion and Feedwater Control
SS-M13-1013	Control & Interlock Scheme - Turbine & Motor Driven Boiler Feed Pump
SS-M13-1014	Electrical Block Diagram - SH By-pass Valve Control
SS-M13-1016	Electrical Block Diagram - Flash Tank Round Interlock
SS-M13-1019	Electrical Block Diagram - Turbine Boiler Feed Pump Flushing and Starting Pump Interlock
SS-M13-1020	Flash Tank Steam to Auxiliary Steam Header Control Valve Interlock



SNYDER UNIT NO. 2

List of Drawings:

<u>Drawing Number</u>	<u>Title</u>
	<u>Instruments &amp; Controls</u>
C-S23-1005	Schematic Diagram - Turbine-Generator Electro-Hydraulic Governor Control, Combustion and Feedwater Control
D-S23-1008	Control Diagram - Steam Temperature Flash Tank Round & By-pass Control System
SS-S23-1011	Control & Interlock Scheme - Turbine & Motor Driven Boiler Feed Pump
SS-S23-1013	SH By-pass Valve Control
SS-S23-1014	Flash Tank Round Interlock
SS-S23-1015	FDF Inlet Blades and Dampers
SP-S23-1019	BTG Tripping Interlock

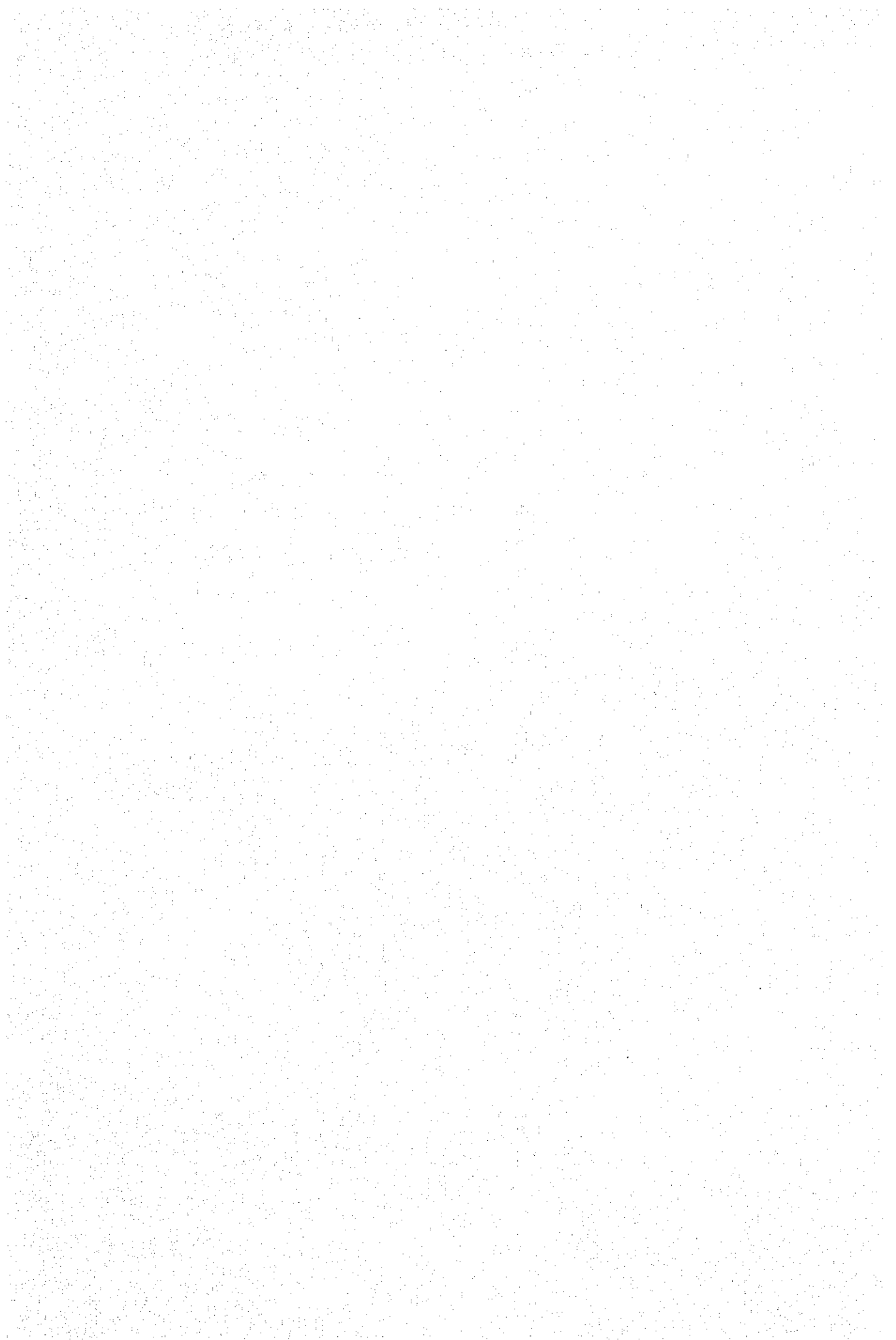


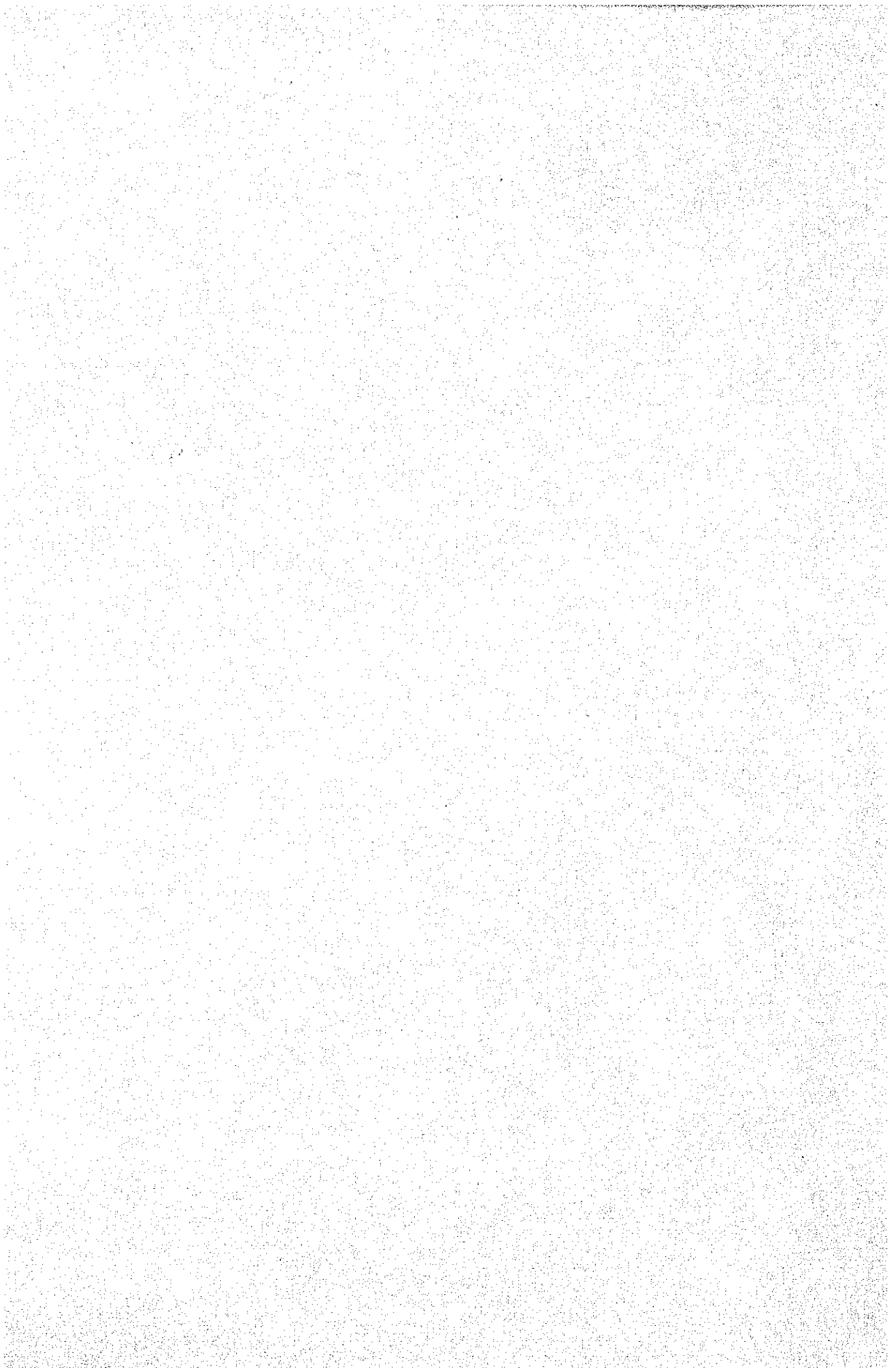
APPENDIX IV

Check sheets prepared by JICA

LIST OF CONTENT

1. General
2. Power Plant Outline Specification Check Sheet
3. Training Check Sheet
4. Periodical Inspection/Maintenance Check Sheet
5. Daily/Ordinary Operation Check Sheet
6. Trouble Classification Sheet
7. Instrumentation and Control





JICA