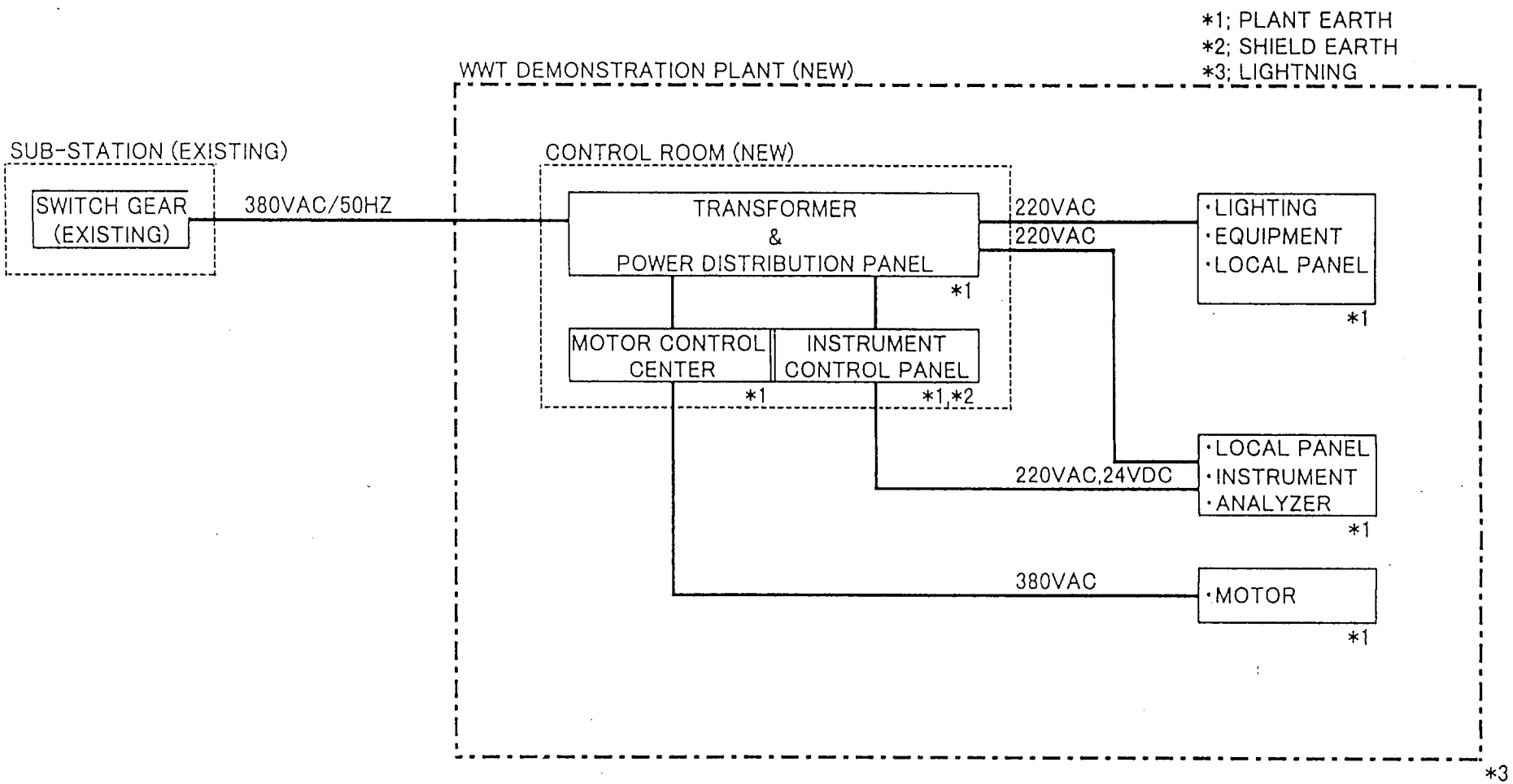
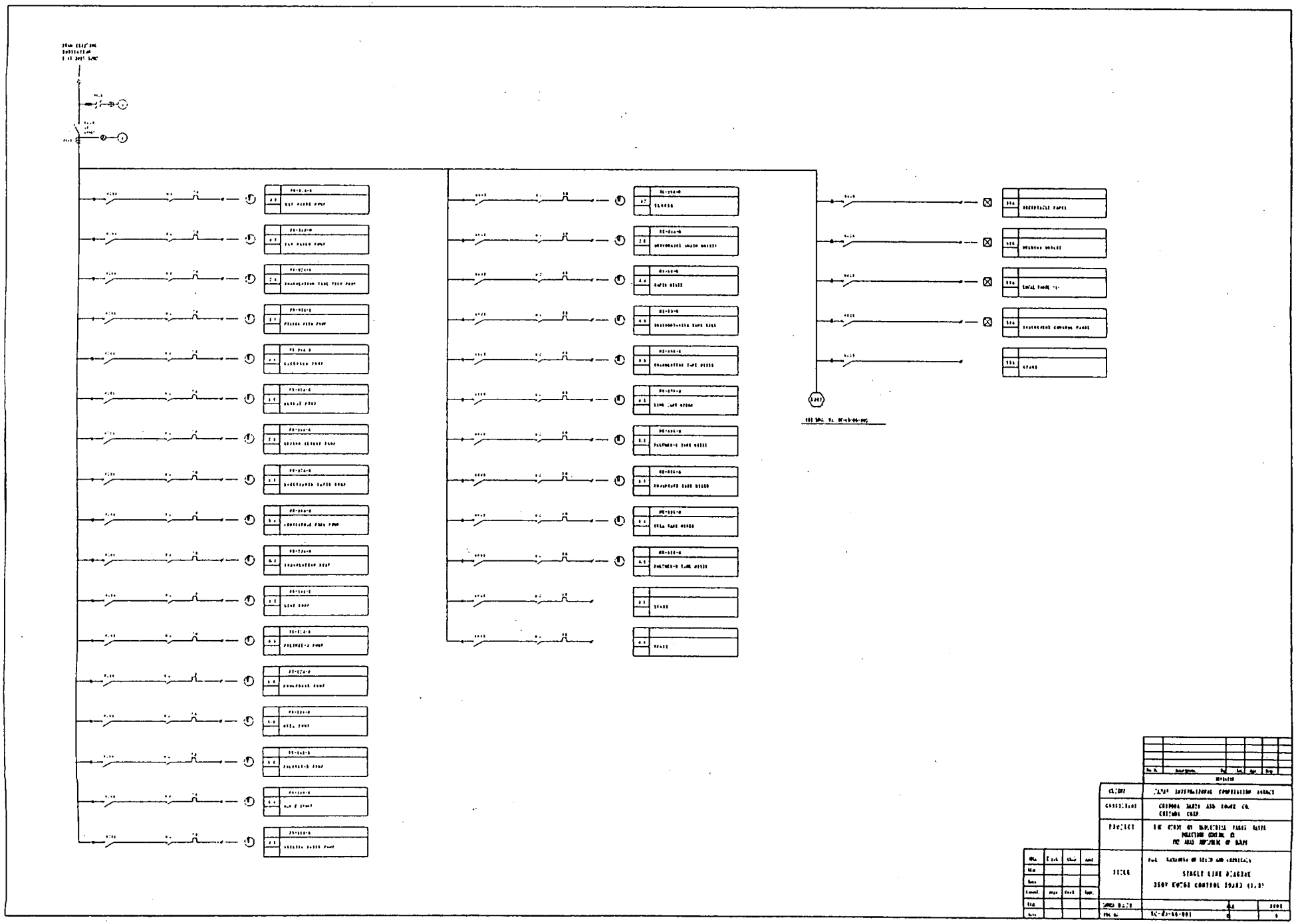
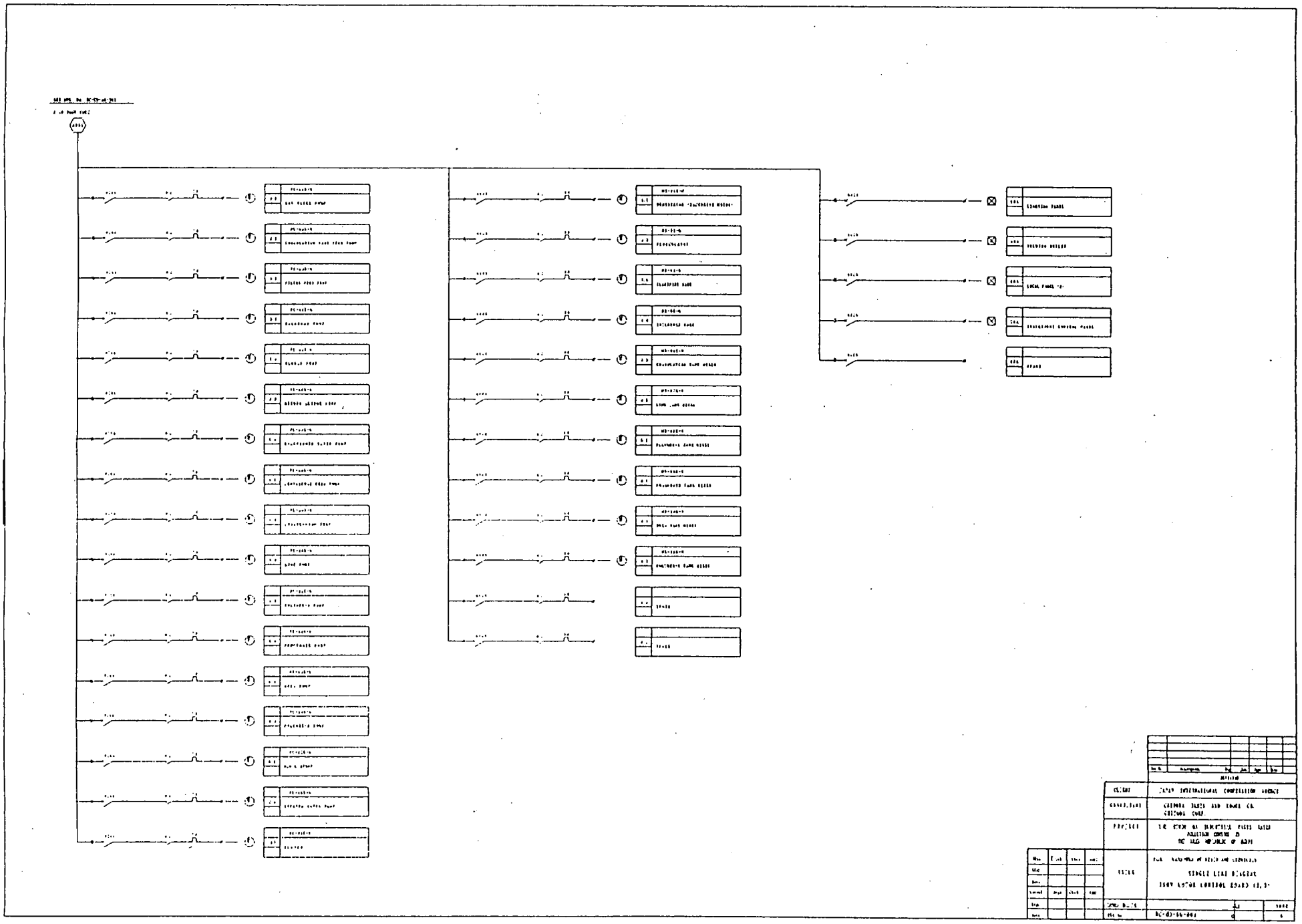
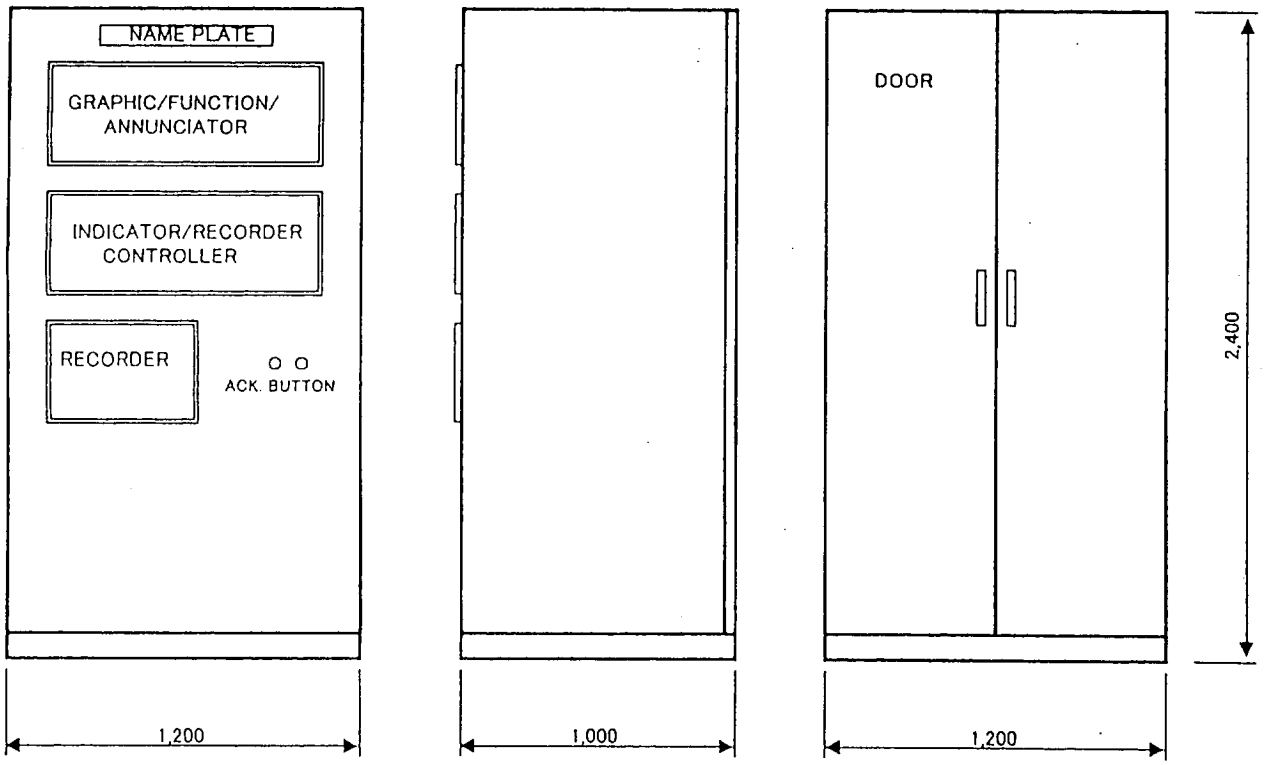
CONFIGURATION OF ELECTRICAL & INSTRUMENTATION SYSTEM FOR DEMONSTRATION PLANT









PANEL SPECIFICATION

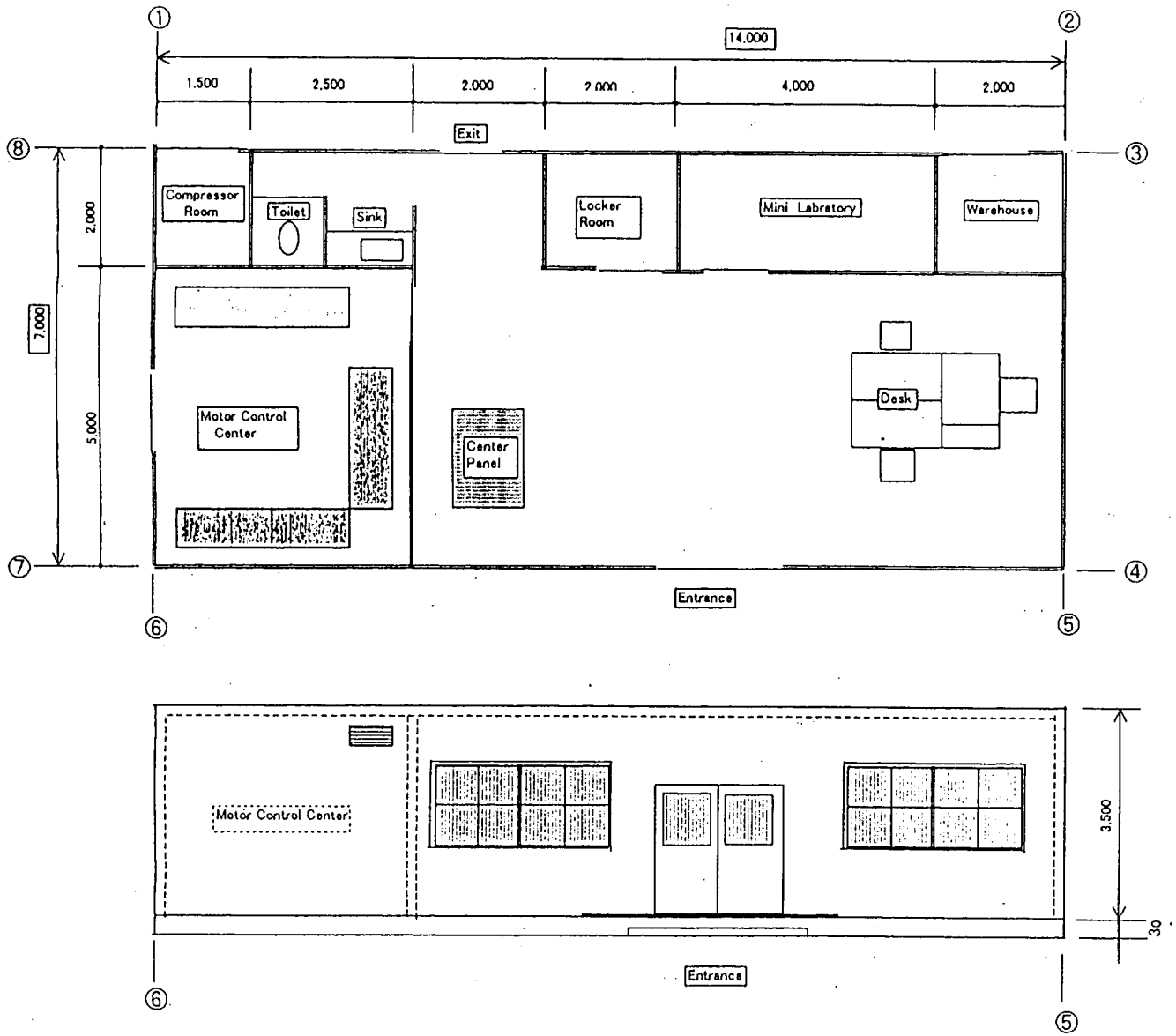
1. SELF STANDING TYPE FOR INDOOR
2. STRUCTURE : 3.2MM STEEL
3. COLOR : YELLOW GREEN
4. CABLE ENTRY : BOTTOM

CONTROL PANEL OUTLINE FOR DEMONSTRATION PLANT

(SCALE : NONE)
(UNIT: MM)

JICA	Chck	Tech.	Appr						
Sign									
Date									
CNSLT	Dsgn	Chck	Appr						
Sign				No	Descri	Dsgn	Chc	Appr	Date
Date	Dec 11 '99			REVISION					

CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY INDUSTRIAL DEVELOPMENT STUDY DIVISION
CONSULTANT	CHIYODA DAMES & MOORE CO. CHIYODA CORPORATION
PROJECT	THE STUDY ON INDUSTRIAL WASTE WATER POLLUTION CONTROL IN THE ARAB REPUBLIC OF EGYPT
TITLE	FOR MANSOURA CO. FOR RASINS AND CHEMICALS CONTROL PANEL OUTLINE FOR W.W.T. DEMONSTRATION PLANT
ISSUED DATE	SCALE: NONE
DWG NO	RC - BD - 70 - 1 REV. 0



JICA	Chck	Tech	Appr						
Sign									
Date									
CTS	Dsgn	Chck	Appr						
Sign				Rev	Description	Dsgn	Chck	Appr	Date
Date					revision				

CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY
CONSULTANT	CHIYODA DAMES & MOORE CO. CHIYODA CORPORATION
PROJECT	THE STUDY ON INDUSTRIAL WASTE WATER POLLUTION CONTROL IN THE ARAB REPUBLIC OF EGYPT
TITLE	FOR Nominated Factory W.W.T Cotrol Room
ISSUED	SCALE None
DWG	00-BD-56-01 REV 0

EQUIPMENT LIST for Mansoura Co. for Resins and Chemicals

DOC. NO. RC-BD-L1 (1/5)

CLIENT :Japan International Cooperation Agency

PROJECT :The Study on Industrial Waste Water Plant

PLANT :Monsoura Co. for Resins and Chemicals

WASTE W. :End of Pipe(Sanitary Waste W.+ Waste Water)

REV	1	2	3	MADE	
BY				CKD	
APVE				APVE	
DATE				DATE	06.6.99

Equipment NO.	Service	No. Req'd	Type of Equipment	Remarks
T-01	Equalization Tank	1	Vertical Cylindrical Type	Carbon Steel/Epoxy
			$5,811^{\phi} \times 6,105^{H} \times 120\ m^3$	Coating
T-02	Coagulation Tank	1	Vertical Cylindrical Type	Carbon Steel/Epoxy
			$1,430^{\phi} \times 2,000^{H} \times 3\ m^3$	Coating
T-03	Flocculation Tank	1	Vertical Cylindrical Type	Carbon Steel/Epoxy
			$2,860^{\phi} \times 3,000^{H} \times 15\ m^3$	Coating
T-04	Sedimentation Tank	1	Vertical Cylindrical Type	Carbon Steel/Epoxy
			$4,000^{\phi} \times 4,500^{H} \times 45\ m^3$	Coating
T-05	Clarifier	1	Vertical Cylindrical Type	Carbon Steel/Epoxy
			$7,000^{\phi} \times 4,000^{H} \times 120\ m^3$	Coating
T-06A/B/C	Sand Filter	3	Vertical Cylindrical Type	Carbon Steel/Epoxy
			$1,600^{\phi} \times 4,000^{H} \times 8\ m^3$	Coating
T-07A/B	Activated Carbon Filter	2	Vertical Cylindrical Type	Carbon Steel/Epoxy
			$1,600^{\phi} \times 4,500^{H} \times 9\ m^3$	Coating
T-08	Thickener	1	Vertical Cylindrical Type	Carbon Steel/Epoxy
			$2,400^{\phi} \times 4,000^{H} \times 13\ m^3$	Coating
T-09A/B	Coagulant Tank	2	Vertical Cylindrical Type	FRP
			$1,000^{\phi} \times 1,300^{H} \times 1\ m^3$	
T-10A/B	Lime Tank	2	Vertical Cylindrical Type	FRP
			$1,000^{\phi} \times 1,300^{H} \times 1\ m^3$	
T-11A/B	Polymer-A Tank	2	Vertical Cylindrical Type	FRP
			$800^{\phi} \times 1,000^{H} \times 0.5\ m^3$	
T-12A/B	Phosphate Tank	2	Vertical Cylindrical Type	FRP
			$800^{\phi} \times 1,000^{H} \times 0.5\ m^3$	

Note:

EQUIPMENT LIST for Mansoura Co. for Resins and Chemicals

DOC. NO. RC-BD-L1 (2/5)

CLIENT :Japan International Cooperation Agency

PROJECT :The Study on Industrial Waste Water Plant

PLANT :Monsoura Co. for Resins and Chemicals

WASTE W. :End of Pipe(Sanitary Waste W. + Waste Water)

REV	1	2	3	MADE	
BY				CKD	
APVE				APVE	
DATE				DATE	

Equipment NO.	Service	No. Req'd	Type of Equipment	Remarks
T-13A/B	Urea Tank	2	Vertical Cylindrical Type	FRP
			$1,200^{\phi} \times 1,800^{H} \times 2\ m^3$	
T-14	Polymer-B	1	Vertical Cylindrical Type	FRP
			$800^{\phi} \times 1,000^{H} \times 0.1\ m^3$	
T-15	NaOCl Tank	1	Vertical Cylindrical Type	FRP
			$800^{\phi} \times 1,000^{H} \times 0.1\ m^3$	
Z-01	Waste Water Pit	1	Vertical Square Type	Reinforced Concrete
			$4,000^{W} \times 4,000^{L} \times 2,000^{H} \times 16\ m^3$	
Z-02	Aeration Pond	1	Vertical Rectangular Type	Reinf. Coating
			$14,000^{W} \times 20,000^{L} \times 5,800^{H} \times 1,400\ m^3$	
Z-03	Clarified Water Pond	1	Vertical Square Type	Reinforced Concrete
			$2,000^{W} \times 2,000^{L} \times 3,000^{H} \times 8\ m^3$	
Z-04	Treated/Sterilizing Water P.	1	Vertical Rectangular Type	Reinforced Concrete
			$3,000^{W} \times 5,250^{L} \times 3,000^{H} \times 30\ m^3$	
Z-05	Waste Water Pond	1	Vertical Rectangular Type	Reinforced Concrete
			$3,000^{W} \times 4,000^{L} \times 3,000^{H} \times 30\ m^3$	
Z-06	Sludge Pond	1	Vertical Square Type	Reinforced Concrete
			$2,000^{W} \times 2,000^{L} \times 3,000^{H} \times 8\ m^3$	
Z-07	Dewatered Sludge Storage	1	Vertical Square Type	Reinforced Concrete
			$3,000^{W} \times 3,000^{L} \times 2,000^{H} \times 14\ m^3$	

Note:

EQUIPMENT LIST for Mansoura Co. for Resins and Chemicals

DOC. NO. RC-BD-L1 (3/5)

CLIENT :Japan International Cooperation Agency

PROJECT :The Study on Industrial Waste Water Plant

PLANT :Monsoura Co. for Resins and Chemicals

WASTE W. :End of Pipe(Sanitary Waste W.+ Waste Water)

REV	1	2	3	MADE	
BY				CKD	
APVE				APVE	
DATE				DATE	

Equipment NO.	Service	No. Req'd	Type of Equipment	Remarks
PU-01	Raw Water Pump	3	Submergible Type	SCS14/SCS14
A/B/C			30 m^3/h×20 m×3.7 kW	
PU-02A/B	Coagulation Tank Feed Pump	2	Horizontal Centrifugal Type	SCS13/SCS13
			30 m^3/h×12 m×2.2 kW	
PU-03A/B	Filter Feed Pump	2	Horizontal Centrifugal Type	SCS13/SCS13
			30 m^3/h×25 m×3.7 kW	
PU-04A/B	Backwash Pump	2	Horizontal Centrifugal Type	SCS13/SCS13
			80 m^3/h×15 m×5.5 kW	
PU-05A/B	Sludge Pump	2	Horizontal Centrifugal Type	SCS13/SCS13
			0.5 m^3/h×15 m×1.5 kW	
PU-06A/B	Return Sludge Pump	2	Horizontal Centrifugal Type	SCS13/SCS13
			15 m^3/h×15 m×2.2 kW	
PU-07A/B	Backwashed Water Pump	2	Horizontal Centrifugal Type	SCS13/SCS13
			2 m^3/h×12 m×1.5 kW	
PU-08A/B	Centrifuge Feed Pump	2	Horizontal Centrifugal Type	SCS13/SCS13
			1.5 m^3/h×15 m×1.5 kW	
PU-09A/B	Coagulant Pump	2	Reciprocating Type	SCS14/SCS14
			7 L/h×0.3 Mpa×0.4 kW	
PU-10A/B	Lime Pump	2	Reciprocating Type	SCS13/SCS13
			10 L/h×0.3 MPa×0.4 kW	
PU-11A/B	Polymer-A Pump	2	Reciprocating Type	SCS13/SCS13
			3 L/h×0.3 MPa×0.4 kW	
PU-12A/B	Phosphate Pump	2	Reciprocating Type	SCS13/SCS13
			5 L/h×0.3 MPa×0.4 kW	

Note:

EQUIPMENT LIST for Mansoura Co. for Resins and Chemicals

DOC. NO. RC-BD-L1 (4/5)

CLIENT :Japan International Cooperation Agency

PROJECT :The Study on Industrial Waste Water Plant

PLANT :Monsoura Co. for Resins and Chemicals

WASTE W. :End of Pipe(Sanitary Waste W.+ Waste Water)

REV	1	2	3	MADE	
BY				CKD	
APVE				APVE	
DATE				DATE	

Equipment NO.	Service	No. Req'd	Type of Equipment	Remarks
PU-13A/B	Urea Pump	2	Reciprocating Type	SCS13/SCS13
			15 L/h×0.3 MPa×0.4 kW	
PU-14A/B	Polymer-B Pump	2	Reciprocating Type	SCS13/SCS13
			1 L/h×0.3 MPa×0.4 kW	
PU-15A/B	NaClO	2	Reciprocating Type	PVC/PVC
			2 L/h×0.3 MP×0.4 kW	
PU-16A/B	Treated Water Pump	2	Horizontal Centrifugal Type	SCS13/SCS13
			30 m^3/h×12 m×2.2 kW	
B-01A/B	Blower	2	Root Type	FC/FC
			22 Nm^3/min×0.05 MPa×37 kW	
MZ-01	Dehydrator	1	Centrifuge Type	SCS13/SCS13
			45 kg-Dry/h×7.5 kW+1.5 kW	
			Sharples/Super-D-Canter	
MX-01	Rapid Mixer	1	Vertical Type, 0.4 kW	SUS304
MX-02	Flocculator	1	Vertical Type, 2.2 kW	SUS304
MX-03	Sedimentation Tank Rake	1	Center Drive Type, 0.4 kW	Carbon Steel
				/Epoxy Coating
MX-04	Clarifier Rake	1	Center Drive Type, 0.75 kW	Carbon Steel
				/Epoxy Coating
MX-05	Thickener Rake	1	Center Drive Type, 0.4 kW	Carbon Steel
				/Epoxy Coating
MX-06A/B	Coagulant Tank Mixer	2	Vertical Type, 0.2 kW	SUS304
MX-07A/B	Lime Tank Mixer	2	Vertical Type, 0.2 kW	SUS304
MX-08A/B	Polymer-A Tank Mixer	2	Vertical Type, 0.1 kW	SUS304
MX-09A/B	Phosphate Tank Mixer	2	Vertical Type, 0.1 kW	SUS304

Note:

EQUIPMENT LIST for Mansoura Co. for Resins and Chemicals

DOC. NO. RC-BD-L1

CLIENT :Japan International Cooperation Agency

PROJECT :The Study on Industrial Waste Water Plant

PLANT :Monsoura Co. for Resins and Chemicals

WASTE W. :End of Pipe(Sanitary Waste W.+ Waste Water)

REV	1	2	3	MADE	
BY				CKD	
APVE				APVE	
DATE				DATE	

Equipment NO.	Service	No. Req'd	Type of Equipment	Remarks
MX-10A/B	Urea Tank Mixer	2	Vertical Type, 0.4 kW	SUS304
MX-11A/B	Polymer-B Tank Mixer	2	Vertical Type, 0.1 kW	SUS304

Note:

INSTRUMENT LIST for Mansoura Co. for Resins and Chemicals

DOC. NO. :RC-BD-L2-(1/3) (1/3)

CLIENT :Japan International Cooperation Agency

PROJECT :The Study on Industrial W. W. Pollution Control

PLANT :Monsoura Co. for Resins and Chemicals

WASTE W. :End of Pipe(Sanitary Waste W.+ Waste Water)

REV	1	2	3	MADE	
BY				CKD	
APVE				APVE	
DATE				DATE	DEC. 16, '99

Equipment NO.	Service	No. Req'd	Type of Equipment	Remarks
AR-01	WW, T-02 Coagulation T. Out	1	pH 4~10	
			pH Analyzer	C.P.
AR-02	WW, Z-02 Aeration Pond	1	0~10 mg/L	
			Disolved Oxygen Analyzer	C.P.
FIC-01	Sedimentation line	1	10 m^3/h~50 m^3/h	
			Flow Indicating Controller	
FI-01	AS, BL-01A/B Blower Outlet	1	15 Nm^3/min~30 Nm^3/min	
			Flow Meter	
FI-02	WW, Z-02 Aeration Pond Inlet	1	5 m^3/h~30 m^3/h	
			Magnetic Flow Meter	
FI-03	WW, PU-08A/B Feed Pump Out.	1	0.5 m^3/h~3 m^3/h	
			Flow Meter	
LS-01	WW, Z-01 Waste Water Pit	1	500 mm~1,000 mm	
			Level Switch HH, H, L	
LC-01	WW, T-01 Equalization Tank	1	1,000 mm~4,500 mm	
			Level Controller	
LI-01	WW, T-01 Equalization Tank	1	500 mm~5,500 mm	
			Level Indicator	
LS-02	WW, Z-03 Clarified Water Pond	1	1,000 mm~1,500 mm	
			Level Switch H, L	
LS-03	CHL, Z-04 Treated Water Pond	1	1,000 mm~2,000 mm	
			Level Switch H, L	
LS-04	WW, Z-06 Sludge Pond	1	500 mm~2,000 mm	
			Level Switch H, L	
LS-05	WW, Z-05 Wastewater Pond	1	500 mm~2,500 mm	
			Level Switch H, L	

Note: C.P. = Center Panel Mount

L.P. = Local Panel Mount

INSTRUMENT LIST for Mansoura Co. for Resins and Chemicals

DOC. NO. :RC-BD-L2-(2/3) (2/3)

CLIENT :Japan International Cooperation Agency

PROJECT :The Study on Industrial W. W. Pollution Control

PLANT :Monsoura Co. for Resins and Chemicals

WASTE W. :End of Pipe(Sanitary Waste W.+ Waste Water)

REV	1	2	3	MADE	
BY				CKD	
APVE				APVE	
DATE				DATE	

Equipment NO.	Service	No. Req'd	Type of Equipment	Remarks
LG-01A/B	T-09A/B Coagulant Tank	2	Tubular	
			Level Gage	
LG-02A/B	T-10A/B Lime Tank	2	Tubular	
			Level Gage	
LG-03A/B	T-11A/B Polymer-A Tank	2	Tubular	
			Level Gage	
LG-04A/B	T-12A/B Phosphate Tank	2	Tubular	
			Level Gage	
LG-05A/B	T-13A/B Urea Tank	2	Tubular	
			Level Gage	
LG-06	T-14 Polymer-B Tank	1	Tubular	
			Level Gage	
LG-07	T-15 NaOCl Tank	1	Tubular	
			Level Gage	
PI-01A/B/C	WW, PU-01A/B/C Outlet	3	Buldon Tube	
			Pressure Indicator	
PI-02A/B	WW, PU-02A/B Outlet	2	Buldon Tube	
			Pressure Indicator	
PI-05A/B	WW, PU-05A/B Outlet	2	Diaphragm	
			Pressure Indicator	
PI-06A/B	WW, PU-06A/B Outlet	2	Diaphragm	
			Pressure Indicator	
PI-17A/B	AS, BL-01A/B Outlet	2	Buldon Tube	

Note: C.P. = Center Panel Mount

L.P. = Local Panel Mount

INSTRUMENT LIST for Mansoura Co. for Resins and Chemicals

DOC. NO. :RC-BD-L2-(3/3)

CLIENT :Japan International Cooperation Agency

PROJECT :The Study on Industrial W. W. Pollution Control

PLANT :Monsoura Co. for Resins and Chemicals

WASTE W. :End of Pipe(Sanitary Waste W.+ Waste Water)

(3/3)

REV	1	2	3	MADE	
BY				CKD	
APVE				APVE	
DATE				DATE	

Equipment NO.	Service	No. Req'd	Type of Equipment	Remarks
PI-03A/B	WW, PU-03A/B Outlet	2	Buldon Tube	
			Pressure Indicattor	
PI-04A/B	WW, PU-04A/B Outlet	2	Buldon Tube	
			Pressure Indicattor	
PI-16A/B	WW, PU-16A/B Outlet	2	Buldon Tube	
			Pressure Indicattor	
PI-08A/B	WW, PU-08A/B Outlet	2	Diaphragm	
			Pressure Indicattor	
PI-07A/B	WW, PU-07A/B Outlet	2	Buldon Tube	
			Pressure Indicattor	
PI-09A/B	Coagulant, PU-09A/B Outlet	2	Diaphragm	
			Pressure Indicattor	
PI-10A/B	Lime, PU-10A/B Outlet	2	Diaphragm	
			Pressure Indicattor	
PI-11A/B	Polymer, PU-11A/B Outlet	2	Diaphragm	
			Pressure Indicattor	
PI-12A/B	Phosphate, PU-12A/B Outlet	2	Diaphragm	
			Pressure Indicattor	
PI-13A/B	Urea, PU-13A/B Outlet	2	Diaphragm	
			Pressure Indicattor	
PI-14A/B	Polymer, PU-14A/B Outlet	2	Diaphragm	
			Pressure Indicattor	
PI-15A/B	NaOCl, PU-15A/B Outlet	2	Diaphragm	
			Pressure Indicattor	

Note: C.P. = Center Panel Mount

L.P. = Local Panel Mount

DOC.NO. : RC-BD-L1

INDUCTION MOTOR LIST

CLIENT :Japan International Cooperation Agency
PROJECT :The Study on Industrial Waste Water Plant
PLANT :Monsoura Co. for Resins and Chemicals
WASTE W. :End of Pipe(Sanitary Waste W.+ Waste Water)

REV	1	2	3	MADE	
BY				CKD	
APVE				APVE	
DATE				DATE	

Motor No.	Service	No. Required	Type	Output Estimate	Output Final	Speed Chrst	Revolution	Pole / r.p.m	V-Φ-Hz	Time Rating	Starting Current	Starting Torque	Insulation	Enclose.	Cable	Mounting	Drive	Bearing	Acc.	Location	Color Finish	Remarks
PU-01-A-C-M	Raw Water Pump	3	SC	3.7		C	CW	4 / 1500	380-3-50	C				TEFC		H	D			OD		
PU-02A/B-M	Coagulation Tank Feed Pump	2	SC	2.2		C	CW	4 / 1500	380-3-50	C				TEFC		H	D			OD		
PU-03A/B-M	Filter Feed Pump	2	SC	3.7		C	CW	4 / 1500	380-3-50	C				TEFC		H	D			OD		
PU-04A/B-M	Backwash Pump	2	SC	5.5		C	CW	4 / 1500	380-3-50	C				TEFC		H	D			OD		
PU-05A/B-M	Sludge Pump	2	SC	1.5		C	CW	4 / 1500	380-3-50	C				TEFC		H	D			OD		
PU-06A/B-M	Return Sludge Pump	2	SC	2.2		C	CW	4 / 1500	380-3-50	C				TEFC		H	D			OD		
PU-07A/B-M	Backwashed Water Pump	2	SC	1.5		C	CW	4 / 1500	380-3-50	C				TEFC		H	D			OD		
PU-08A/B-M	Centrifuge Feed Pump	2	SC	1.5		C	CW	4 / 1500	380-3-50	C				TEFC		H	D			OD		
PU-09A/B-M	Coagulation Pump	2	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		H	G			OD		
PU-10A/B-M	Lime Pump	2	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		H	G			OD		
PU-11A/B-M	Polymer-A Pump	2	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		H	G			OD		
PU-12A/B-M	Phosphate Pump	2	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		H	G			OD		
PU-13A/B-M	Urea Pump	2	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		H	G			OD		
PU-14A/B-M	Polymer-B Pump	2	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		H	G			OD		
PU-15A/B-M	NaOCl Pump	2	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		H	G			OD		
PU-16A/B-M	Treated Water Pump	2	SC	2.2		C	CW	4 / 1500	380-3-50	C				TEFC		H	G			OD		
BL-01A/B-M	Blower	2	SC	37		C	CW	4 / 1500	380-3-50	C				TEFC		H	V			OD		
MZ-01-A-M	Dehydrator (Main Motor)	1	SC	7.5		C	CW	4 / 1500	380-3-50	C				TEFC		H	V			OD		
MZ-01-B-M	Dehydrator (Backdrive Motor)	1	SC	1.5		C	CW	4 / 1500	380-3-50	C				TEFC		H	V			OD		
MX-01-M	Rapid Mixer	1	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-02-M	Flocculator	1	SC	2.2		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-03-M	Sedimentation Tank Rake	1	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-04-M	Clarifier Rake	1	SC	0.8		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-05-M	Thickener Rake	1	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-06A/B-M	Coagulation Tank Mixer	2	SC	0.2		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-07A/B-M	Lime Tank Mixer	2	SC	0.2		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-08A/B-M	Polymer-A Tank Mixer	2	SC	0.1		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-09A/B-M	Phosphate Tank Mixer	2	SC	0.1		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-10A/B-M	Urea Tank Mixer	2	SC	0.4		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		
MX-11A/B-M	Polymer-B Tank Mixer	2	SC	0.1		C	CW	4 / 1500	380-3-50	C				TEFC		V	G			OD		

Notes:

1. Type : SC = Squirrel Cage. W = Wound Rotor.
2. Speed : C = Constant. M = Multi. A = Adjustable. V = Varying.
3. Revolution Direction : Direction when viewed from coupling side.
   CW = Clockwise. CCW = Counter-Clockwise.
4. Voltage : Rated Voltage
5. Time Rating : C = Continuouse. ST = Short Time. P = Periodic.
6. Enclosure : TEFC = Totally-Enclosed Fan-Cooled.
   DR = Drip-Proof.
7. Cable(or Wire) : T = Top. B = Bottom. S = Side. H = Hub for conduit tube or flexible tube.
8. Mounting : H = Horizontal. V = Vertical
9. Drive : D = Direct. B = Belt. C = Chain. G = Gear.
10. Location : ID = Indoor. OD = Outdoor.

Overall Schedule for Implementation of Demonstration Plant (Preliminary)

Phase 1 Study

Dec. 11, 1999

Major Activities for Implementation	1999			2000												2001												2002					
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
1 Preparatory Activities before Bid for Supply and Construction of Demonstration Plant																																	
1.1 Selection of Demonstration Factory	11/24'99 ○																																
1.2 Compilation of Detailed Design Package, including: – List of Materials and Equipment – List of Construction works																																	
1.3 Short Listing of Suppliers who can supply the Plant as a whole																																	
1.4 Short Listing of Construction Contractors in Egypt to be qualified by JICA																																	
1.5 Agreement for Implementation of Phase 2 Study between JICA and Egyptian Side																																	
1.6 Contract between JICA and Phase 2 Study Team									○																								
2 Supply of the Plant																																	
2.1 Selection of the Plant Supplier by Competitive Bid										○																							
2.2 Design Verification and Development by Supplier																																	
2.3 Procurement of Materials and Equipment by Supplier																																	
2.4 Manufacturing and Preassembling as necessary																																	
2.5 Inspection and Test before Shipment																																	
2.6 Shipping																		○	·····	○													
3 Construction of the Plant																																	
3.1 Selection of Construction Contractor by Qualification by JICA and Study Team										○																							
3.2 Site Preparation and Temporary Facilities Installation																																	
3.3 Civil & Building Works: including Foundations, Concrete Basins, Control Room, Underground Piping, etc.																																	
3.4 Shop fabrication and installation of Locally procured Tanks, Structures, Pipes, etc.																																	
3.5 Unloading, Customs Clearance, Inland Transportation of Imported Mat'l & Eq																																	
3.6 Receiving, Storing																																	
3.7 Equipment Installation																																	
3.8 Piping																																	
3.9 Electrical																																	
3.10 Instrumentation																																	
3.11 Painting																																	
3.12 Precommissioning																																	
3.13 Mechanical Completion																											○						
3.14 Commissioning																																	
4 Operation of the Plant																																	
4.1 Performance Test																																	
4.2 Operation and Demonstration																																	→

Demo-Plant in Mansoula Co., Resins & Chemicals: ESTIMATE SUMMARY & DEMARCATION

(Base Case) 1999.12.16

ITEM	IBL		OBL		Demarcation (Eq. ¥1000)	
	Yen Portion (¥1000)	LE Portion (LE)	Yen Portion (¥1000)	LE Portion (LE)	Japanese Side	Egyptian Side
1. Equipment & Materials						
(1) Machinery	50,290					
(2) Piping Materials	10,207					
(3) Instrument'n Eq. & Mtl's	16,950					
(4) Electrical Eq. & Mtl's	12,600					
(5) Testing Eq., Etc.	3,854					
1. Subtotal	93,901	0	0	0	93,901	0
2. Field Construction .						
(1) Steel Tanks & Vessels		481,837				
(2) Acid-Proof Lining		0				
(3) Equipment Installation		60,500				
(4) Piping		128,980		17,600		600
(5) Foundations		75,000				0
(6) RC-made Reservoir/Structure		843,750				0
(7) Road/Pavement		30,000				0
(8) Building		361,760				0
(9) Platform, Piperack		30,000				0
(10) Painting		50,000				0
(11) Electrical Works		62,840		11,760		400
(12) Instrumentation		300,000				0
(13) Commissioning/Test		30,000				0
2. Subtotal	0	2,454,667	0	29,360	83,500	1,000
Direct Cost: 1 + 2 (Eq. ¥1000)	177,360		998			
3. Indirect Cost						
(1) Export Packing, Ocean Tra	13,500				13,500	0
(2) Import Duty, Inland Transportation*1		790,000		0		26,900
(3) Temporary Facilities*2		147,000		—	5,000	
(4) Subcontractor Expenses*3		613,667		—	20,900	
(5) Insurance, Social Tax*4		152,000		1,000	5,200	0
(6) Supervisor Expenses	10,000				10,000	
3. Subtotal	23,500	1,702,667	0	1,000	54,500	26,900
All Total: 1 + 2 + 3	117,401	4,157,334	0	30,360	231,901	27,900
All Total (Eq. ¥1000)	117,401	141,400	0	1,000		
IBL/OBL Total (Eq. ¥1000)	258,801		1,000			
Total Cost	259,801				231,901	27,900

*1 : (日本調達資材費+輸出梱包·海上輸送費) x25%
IBL=264,500千円x25%=66,125千円=1,945,000LE
OBL=9,500千円x25%=2,375千円=69,900LE

*2 : 現地工事費x6%=6,560,000LEx0.06=393,600LE

*3 : 現地工事費x25%=6,560,000LEx0.25=1,640,000LE

*4 : 1+2 (Superviser Feeを除く) x2.7%
IBL=7,142千円(210,000LE)+177,000LE=387,000LE
OBL=257千円(7,600LE)+30,500LE=38,100LE

Costs are Demarcated to Egyptian Side.

Unit Cost for Estimation of W.W.T. Demonstration Plant (Reference)

Factory Name: Mansoura Co. for Resins and Chemicals.
Design Case: Basic Design

1. Major Equipment

Equipment Name	Unit Cost [x10^{3}Yen]	Note
(1) Acid water pumps	600	Material: SCS
(2) Clarifier Rake	10,000	1 set
(3) Sedimentation Tank rake	8,000	1 set
(4) Thickener Rake	6,000	1 set
(5) Dehydrator	6,000	3 sets
(6) Motor Control Center	13,500	
(7) Center Control Panel	3,000	1 set

2. Field Work

Work Item	unit	unit Cost[LE]	Note
(1) Site Preparation	[m^2]	8	
(2) Civil (Earth Work)	[m^3]	34	
(3) RC Work	[m^3]	1,500	Foundation, Water Basin
(3) Storage Tank	[ton]	3,430	Equalization Tank, Chemical tank Neutralization Tanks
(4) Structural Steel	[ton]	2,000	Pipe rack, Operating Stage
(5) Equipment Installation	[ton]	400	Pumps, Clarifier rakes, Dehydrator
(6) Piping	[ton]	3,970	Except valves
	[in-m]	30	Except valves
(7) Painting	[m^2]	50	
(8) Local Building	[m^2]	2,600	W.W.T Control Room
(9) Electrical	[cable-m]	3	

Running Cost-Mansoura Co., Resins and chemicals

1999.11.23

* Unit cost is not fixed yet

T.Yasukawa

Items	Treating Capacity (m^3/h)	Feeding Ratio (mg/L)	Consump. (kg/h)	Unit Cost (LE/kg)	Cost-1 (LE/h)	Cost-2 (LE/day)	Cost-3 LE/year)	Unit Cost (LE/m^3)	Remarks
1 Chemical Cost									
1) Alum ($Al_2(SO_4)_2 \cdot 18H_2O$)	30	30	0.9	0.3	0.27	6	2,138	0.009	
* 2) Lime ($Ca(OH)_2$)	30	20	0.6	0.1	0.06	1	475	0.002	
3) Polymer-A (Anionic or Cationic)	30	0.3	0.01	27	0.24	6	1,925	0.008	
4) Polymer-B (Anionic or Cationic)	11 kg/h	1%	0.11	27	2.97	71	23,522	—	
5) $CO(NH_2)_2$	30	110	3.3	0.6	1.98	48	15,682	0.066	
* 6) H_3PO_4	30	30	0.9	0.6	0.54	13	4,277	0.018	
7) NaOCl	30	4	0.9	0.385	0.35	8	2,744	0.012	
Sub-Total	—	—	—	—	6.41	154	50,763	0.214	
2 Filter Media	Loading	Loss	Loss/h						
* 1) Anthracite (3 Sets)	4.2 m^3	20 %/year	0.2	1	0.20	5	1,584	0.007	
* 2) Sand (3 Sets)	1.8 m^3	10 %/year	0.1	0.3	0.03	1	238	0.001	
* 3) Activated Carbon (1 Set)	5.0 m^3	14 days	7.4	14.7	108.78	2,611	861,538	3.626	
Sub-Total	—	—	—	—	109.01	2,616	863,359	3.634	
			kWh/d	LE/kWh					
3 Power Consumption			1,244	0.12	6.22	149.23	49,248	0.207	
			m^3/day	m^3					
4 Industrial Water or Potable Water			5	0.528	0.11	2.64	871	0.004	
			Person/d	LE/P/year					
5 Operator	1 Person*3 Shift+1P		4	10,000	5.05	121.21	40,000	0.168	
6 Maintenance Fee	8,984,706				34.03	816.79	269,541	1.134	
(Plant Cost * 3 %/year) 305,480,000/34=8,984,706 LE									
Total Operation Cost	—	—	—	—	160.83	3,859.95	1,273,782	5.36	

Power Consumption

Tag No.	kW	Operation	Consump.
PU-01	3.7	24	88.80
PU-02	2.2	24	52.80
PU-03	3.7	24	88.80
PU-04	5.5	0.5	2.75
PU-05	1.5	24	36.00
PU-06	2.2	24	52.80
PU-07	1.5	24	36.00
PU-08	1.5	8	12.00
PU-09	0.4	24	9.60
PU-10	0.4	24	9.60
PU-11	0.4	24	9.60
PU-12	0.4	24	9.60
PU-13	0.4	24	9.60
PU-14	0.4	24	9.60
PU-15	0.4	24	9.60
PU-16	2.2	24	52.80
B-01	37	24	888.00
MZ-01	9	8	72.00
MX-01	0.4	24	9.60
MX-02	2.2	24	52.80
MX-03	0.4	24	9.60
MX-04	0.75	24	18.00
MX-05	0.4	24	9.60
MX-06	0.2	0.2	0.04
MX-07	0.2	24	4.80
MX-08	0.1	0.2	0.02
MX-09	0.1	0.2	0.02
MX-10	0.4	0.2	0.08
MX-11	0.1	0.2	0.02
Total	—	—	1,554.53 kWh/d

Client: JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Project Name: THE STUDY ON INDUSTRIAL WASTE WATER POLLUTION CONTROL IN THE ARAB REPUBLIC OF EGYPT

Factory Name: MANSOURA CO. FOR RESINS AND CHEMICALS

BASIC DESIGN

Document Tytle:

STUDY REPORT

FOR

W.W.T. RECOMMENDABLE PLANT

ISSUED DATE September 2000

Consultant: JICA STUDY TEAM

CHIYODA DAMES AND MOORE CO.

CHIYODA CORPORATION

1. Purpose

The Study Report aims to explain about the important design concepts that studied through the basic design of Waste Water Treatment (W.W.T.) Recommendable Plant in Mansoura Co. for Resins and Chemicals (hereinafter MRC) that is developed and revised the conceptual design submitted in November 1999.

2. Demonstration Plant and Recommendable Plant

2.1 Demonstration Plant

(1) Selection of the Companies

- The basic design is proceeded to 3 factories including MRS Factory nominated as Demonstration Plant on 5th October 1999 meeting.
- The Factories are selected based on the following criteria (M/M on June 2. 1999):
  - (a) Factories that are in need of improvement in their anti-pollution measures;
  - (b) Factories that are typical so that the recommended wastewater treatment systems can be expected to be diffused to other factories in Egypt;
  - (c) Factories that are interested in designing or upgrading the wastewater management;
  - (d) Factories that are financially able (either self-financing or from other financial resources) to adopt the recommendations on the appropriate waste water treatment system;
  - (e) Factories which similar projects by other donors are not under way.
- One factory that is satisfactory to the stipulated conditions will be selected as Demonstration Plant Factory by JICA and Egyptian Side.

(2) Waste Water Treatment Systems

The appropriate industrial waste water treatment systems ("the Systems") for Demonstration Plant may include in-process systems and the Systems will be prepared based on the following conditions:

- The Systems are of adequate technical level so that they will be to be adopted and spread widely in the Arab Republic of Egypt;
- The waste water treatment plants, constructed on the basis of the Systems, will be easily maintained locally and be operated at a low cost;
- The Systems will not necessarily treat whole waste water discharged from the factories.

2.2 Recommendable Plant

The conceptual design of the Demonstration Plant submitted on November 1999, the Egyptian Side suggested to JICA Study Team as follows;

- The target of treated water should be applied to the realistic wastewater discharge regulation in Egyptian Law.
  - In the conceptual design, the target of treated water of the demonstration plant has been the most stringent discharge regulation (Law 48/82 Underground Reservoir & Nile Branches/Canals).
    But, MRC Factory is applied to Law 48/82 Non Potable Surface Water (Industrial) of Wastewater Discharge Regulation in Egypt at present.

The Team agreed basically with the Egyptian comments. As a result, in the basic design of the System, the recommendable plant for wastewater treatment (W.W.T.) is prepared instead of the Demonstration Plant for MRC Factory considering the above comments.

3. Basic Design

The basic design was proceeded based on the conceptual design and 2nd supplemental wastewater survey, and considering above comment by the Egyptian Side. The following drawings and documents are prepared as the design package:

(1) Process Flow Diagram (PFD)
(2) Engineering Flow Diagram (EFD)
(3) Layout
(4) Skeleton Drawings of Major Equipment
(5) Single Line Diagram for Motor Control Board
(6) Equipment List, Instrument List, Motor List
(7) Plant Construction Cost, Running Cost

4. Existing Wastewater System

The existing wastewater sewer system of NSP Factory is shown on the attached drawing-1. All wastewater from process units, utility units and buildings are collected in the main sewer ditch, and discharged to the public sewer without any special treatment.

5. Design Conditions

5.1 Wastewater to be treated

All wastewater from process unit, utility units and building are treated by the Recommendable Plant except the following wastewater (waste liquid):

(1) Regeneration Wastewater from Formaldehyde Plat

(2) Norvolak Resin Solid Resin of Phenol Formaldehyde

The above waste liquid should be collected separately, and treated by combustion after recovery of phenol.

5.2 Flow rate and Qualities of Wastewater and Treated Water

Flow rate and qualities of wastewater and treated water are shown on the following Table-1:

Table 1 Flow rate and Water Qualities

	Influent Water	Treated Water	Law 48/82
Flow Rate Max [m^3/h]	20 -40	-	-
Ave. [m^3/h]	30	30	-
pH [-]	6 - 7	6 - 9	6 - 9
BOD [mg/L]	1,300	< 20	60
COD [mg/L]	2,400	< 30	100
SS [mg/L]	100	< 1	50
Oil &Grease [mg/L]	20	< 1	10
TDS [mg/L]	700	750	2,000
Phenol [mg/L]	460	< 0.005	< 0.005
Water Temp [℃]	35 - 40	30 - 32	< 35

[Note]

(1) TDS content of treated water can be met the regulation by means of separation of waste liquid from the process unit.

(2) Law 48/82 * shows the regulation of Non Potable Surface Water.

6. System Design

6.1 Treating System

Considering to be more reliable, stable, easy, economical, common technology in addition to the water quality of influent water and the regulation of Law 48/82, the following W.W.T. system is recommended:

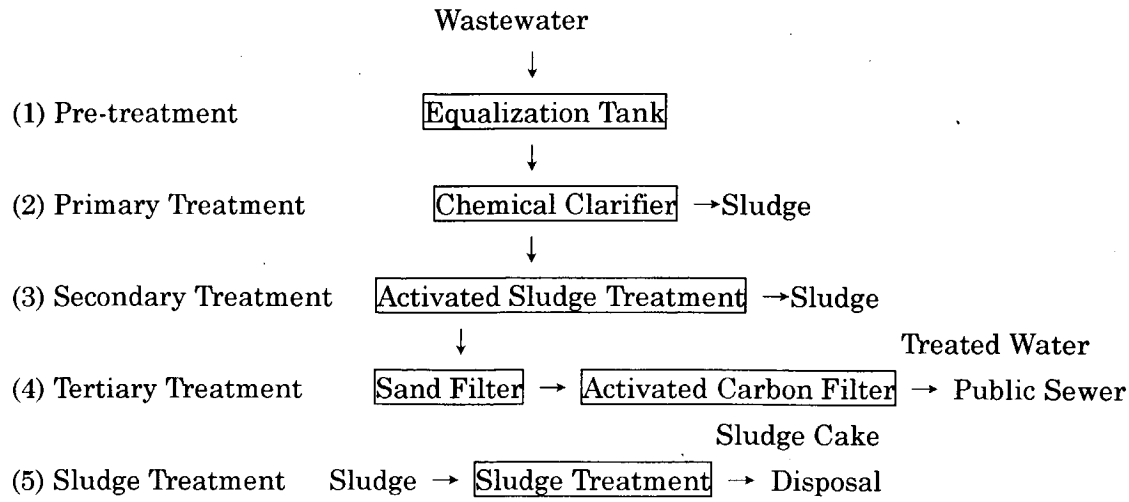


Fig.-1 Wastewater Flow Scheme

6.2 Description of Treating Unit

(1) Pre-treatment: Equalization Tank

1) Purpose

Each wastewater is different and changeable in flow rate and quality. In order to treat it stably, wastewater are stored and equalized in a tank with air bubbling devises.

2) Specification, Design Base

(a) Shape: Open top tank of circular and vertical type, installed above ground.

(b) Materials: Carbon steel with resin lining on the inner surface.

(c) Volume: equal to 4 hour-retention time of maximum flow rate in general.

(d) Attachment: Air bubbling devices (blower, air distributing pipes).

(2) Primary Treatment: Chemical Clarifier

1) Purpose

(a) Chemical Clarifier is provided to remove suspended solids in the wastewater. And also, heavy metals to be harmful for biological treatment may be removed if any.

(b) Treated water is fed to the biological treatment. And sludge from the bottom of sedimentation tank is sent to the sludge treating unit.

2) Specification, Design Base

(a) Chemical clarifier unit consists of coagulation and flocculation tank, clarifier and chemical injection device as auxiliary.

(b) Coagulation, flocculation tank

- Shape: Circular, vertical, above ground
- Materials: Carbon steel with epoxy coating
- Volume: 30 min.-retention time of average flow rate
  It is required for floc formation and floc growth acceleration completely.
- Attachment: Vertical mixer and flocculator

(c) Clarifier
- Shape: Circular, vertical, above ground
- Materials: Carbon steel with epoxy coating
- Surface Load: 3 $m^3/m^2/h$ (as experimental value)
- Attachment: Steel structural bridge hanging a sludge collecting rake

(d) Chemical Injection Unit
- The following chemicals are used as coagulant:

Coagulant	Alum=$Al_2(SO_4)_3 \cdot 18H_2O$	30 mg/L
Alkali agent	$Ca(OH)_2$	20 mg/L
Coagulation Aid	Polymer (Anion)	0.3 mg/L

- The unit consists of chemical drums with mixers and reciprocating pumps.

(e) SS contents in treated water is expected less than 20 mg/L.

(3) Secondary Treatment: Activated Sludge Treatment

1) Purpose

(a) As secondary treatment, biological treatment is applied to remove organic matters including phenols in wastewater.

(b) In the aeration basin, BOD, COD of wastewater are reduced by means of oxidizing and decomposing organic matters by micro aerobic bacteria.

(c) Slurry consisting bacteria group is separated supernatant (treated water) and sludge at the sedimentation tank.

2) Specification, Design Base

(a) Biological treatment unit consists of an aeration basin and sedimentation tank, chemical injection unit as an auxiliary.

(b) Aeration basin:
- Shape: Rectangular, above ground
- Materials: Reinforced concrete with corrosion proof
- Operating Conditions in general:
  Retention Time: 4－6 hours of average flow rate
  Dissolved oxygen; 2 mg/L as O
  Contents Ratio: BOD: N(nitrogen)as T-N: P(phosphorus)as T-P
  = 100: 5: 1
- Oxygen supplies; air bubbling device by a blower

· Nutrient injection devices; Chemical drums, mixers and pumps

Nutrient $CO(NH_2)_2$ as N

H_3PO_4 as P

(c) Sedimentation Tank:

· Shape: Circular, Vertical, above ground

· Materials: Carbon steel with epoxy coating

· Operating Conditions in general

Surface load: 24 $m^3/m^2/day$ = 1.0 $m^3/m^2/hour$

· Attachment: Steel structure bridge hanging a sludge collecting rake.

· The ratio of return sludge is around 25% of treated water.

(d) The following water qualities are expected as treated water of activated sludge treatment;

· BOD 20 mg/L

· COD 30 mg/L

· SS 30 mg/L

3) Reason to select Activated Sludge Treatment

(a) High organic matters (BOD, COD) including phenols are contained in wastewater. Therefore, it is required to remove these organic matters under the discharge regulation (Law 48/82).

(b) In order to remove organic matters, biological treatment (aerobic, anaerobic), activated carbon adsorption are applicable. Aerobic biological treatment may be most effective considering concentration of BOD, COD and economic point of view.

(c) As aerobic biological treatment, there are various type of activated sludge treatment, fixed sludge treatment, trickling filter and oxidation ditch.

(d) In this basic design, the activated sludge treatment is applied considering to be most basic, standard, applicable widely and inexpensive.

(e) Fixed sludge treatment is used generally for industrial wastewater treatment recently. But, it does not use because that structure, packing media and design conditions of fixed sludge treating plants are deferent based on know-how of each maker.

(4) Tertiary Treatment:

(4-1) Sand Filter Unit

1) Purpose

(a) Sand filter is provided to remove suspended solids in outlet water of activated sludge treatment (sedimentation tank).

(b) It is effective to extend the operation time of activated carbon filter and to

prevent activated carbon from deterioration.

2) Specification, Design Base

(a) Sand filter unit consists of filters, washing unit (blowers, pumps) and backwashed wastewater pond.

(b) Sand Filter

· Type: Pressure type

In order to sent treated water to the activated carbon filter directly, a pressure type filter is required.

· Shape: Circular, vertical

· Materials: Carbon steel with epoxy coating

· Required No.: 3 sets (2 filters are running normally and one (1) is stand-by)

· Filter Media:

Upper Layer: Anthracite (1.2 -1.5 mm Dia.) x (0.7-1.0 m thickness)

Lower Layer: Sand (0.5 -0.7 mm Dia.) x (0.4-0.6 m thickness)

· Filter Rate: 180 $m^3/m^2/d$ (standard for industrial wastewater)

· Filter(Media) is backwashed by water and air automatically, periodically.

Operation period: Filtration 18-24 hours/cycle/each

Backwashing 15-20 min./cycle/each

Backwashing Air bubbling + water

(c) Backwashed Wastewater Pond

· Shape: Rectangular ,semi-above ground

· Materials: Reinforced concrete

· Attachment: Wastewater return pumps

(4-2) Activated Carbon Filter Unit

1) Purpose

(a) Activated carbon filter is provided to remove phenols and a little of BOD, COD in filtered water.

(b) Adsorption by activated carbon is most effective and inexpensive to remove phenols completely.

2) Specification, Design Base

(a) Activated carbon filter unit consists of filters, washing unit (blowers, pumps) and treated water pond.

(b) Activated Carbon Filter

· Type: Pressure, fixed bed type

Pressure, fixed type of filter is most popular, simple, stable and inexpensive to remove phenols and low concentration of COD.

· Shape: Circular, vertical

- Materials: Carbon steel with epoxy coating
- Required No.: 2 sets
- Filter Media:
  Upper Layer: Granular type Activated carbon
  (0.8-1.0 mm Dia.) x (2.5-3.0 m thickness)
  Lower Layer: Sand (0.5 -0.6 mm Dia.) x (0.4-0.6 m thickness)
- Filter Rate: 360 $m^3/m^2/d$ (standard in W.W.T.)
- Contact time: 10 min. (standard in W.W.T)
- Filter(Media) is backwashed by water automatically, periodically.
  Operation period: Filtration 2 - 7 days/cycle/each
  Backwashing 15-20 min./cycle/each

(c) Treated Water Pond
- Shape: Rectangular ,semi-above ground
- Materials: Reinforced concrete
- Attachment: Backwashing pumps

(5) Sludge Treatment

1) Purpose

(a) Sludge is generated from the following treating units;
- Chemical Clarifier: Sedimentation tank bottom
- Biological Treating Unit: Clarifier bottom

(b) Solids content in sludge is approx. 0.5～2.0%, that is almost all water. Therefore, sludge is thickened in the Thickener, and then dehydrated by centrifuges.

(c) The sludge cake should be disposed to the specified landfill under management. Supernatant of thickener and filtrate of centrifuge are sent back to the equalization tank to re-treat.

2) Specification, Design Base

(a) The sludge treating unit consists of a sludge thickener, centrifuges and chemical injection unit.

(b) Sludge Thickener:
- Shape: Open top tank, circular and vertical type, above ground
- Materials: Carbon steel with epoxy coating on the inner surface
- Solid load: 60$kg/m^2/day$ (as experimental value)
- Expected SS contents: 2－5 %

(c) Dehydrator
- Type: Horizontal, screw decanter type of centrifuge

As dehydrator, there are centrifuge, filter press, vacuum filter and screen

filter, etc. Centrifuge is most compact, simple, effective and inexpensive, and easy to operate.

- Materials: Stainless steel
- Expected SS content of Sludge Cake: 15－20 % (85－80% of water content)
- Centrifuges are installed in a shelter.

(d) Chemical Injection Unit

- Polymer (Cation or Anion) is used for coagulant aid for dehydration.
- The unit consists of chemical drums with mixers and reciprocating pumps.

(6) Electrical, Instrumental Design

1) Electrical Design

(a) Primary power cables (380V-AC x 3 phase x 50 HZ) will be laid between the switch gear at the existing electric substation and a receiving/distributing board, transformer at the new electric substation in the W.W.T. control room.

(b) Secondary power cables (380V-AC) will be laid between MCC (Motor Control Center) at the new substation in the W.W.T. control room and each motors of equipment..

(c) Lighting cables (220V-AC) will be laid between a transformer, distribution board and each lighting implements.

(d) Earthwork is required for steel equipment, piping and structure adequately.

(e) NSP is requested to design and construct primary power supplying work between the existing substation and the receiving board at the new substation in the W.W.T. control room.

2) Instrumental Design

(a) The center instrument panel will be installed at the W.W.T. control room. Indicators, recorders, alarms and sequence timers, etc. will be mounted on the board, and W.W.T. system will be designed so as to operated automatically by the control panel.

(b) Control cables (220V-AC, 24V-DC) will be laid between a transformer, center panel and each instruments at field.

(c) Electric implements and instruments should be applied to tropical and dust proof type.

(d) Control valves will be operated pneumatically by compressed air.

6. Technical Provision for Basic Design

6.1 Location of Plant

(1) Major equipment of wastewater treatment plant shall be installed outdoors.

(2) Arrangement of equipment, piping and instrumentation shall be determined in consideration of easy operation and of a sufficient access for maintenance.
(3) The area of wastewater treatment plant shall be classified as a non-hazardous area.

6.2 Special Requirement

(1) The plants shall be designed so as to operate for 330 days a year continuously.
(2) The plants shall be operated automatically by the control panel in the control room.
(3) The control room shall be built in the W.W.T. area, and it shall consist of a control panel room, MCC (motor control center) room, mini-laboratory, toilet, locker room, warehouse, etc.
(4) One (1) spare pump shall be provided for each continuous running pump.
(5) Each chemical drum shall be designed to be seven (7) days stock at normal operation basically.

7. Discussion

7.1 Separation of High Concentration Wastewater

The following wastewater (waste liquid) are separated from W.W.T. recommendable plant in order to treat other wastewater stably.

(1) Regeneration Waste from Formaldehyde Plant
(2) Novolak resin Solid Resin of Phenol Formaldehyde

The above wastewater (waste liquid) should be burnt by a expensive or existing refuse incinerator, or boiler. But, before using the existing boiler, it should be confirmed not to attack to boiler tube.

7.2 Equalization of Volatile Matters

An equalization tank is essential to treat various kind of wastewater in flow rate and quality. But, it may occur air pollution around equalization tank if wastewater contains volatile matters such as solvent.

But, in this basic design, high concentration of volatile organic matters may not come to the equalization tank by separation of the above 2 wastewater.

In case that volatile organic matters comes to the equalization tank, the following mixing method are recommended:

(1) Mechanical mixing is better than air bubbling.
(2) Closed type of tank is used, and exhaust air contaminated volatile matters should be sent to an incinerator and burnt.

(3) Or, exhaust gas should be treated by an activated carbon filter or scrubber.

7.3 Save Exhaust Steam

It was found that waste stream temperature in the wastewater ditch was 65 ℃. Wastewater temperature is increased by exhaust steam from unmanaged steam traps. Activated sludge treatment should be operated less than 35 ℃ water temperature.

It is recommended to take countermeasure to save steam whole factory urgently.

8. Performance Guarantee

The basic design of W.W.T. of MRC Factory is designed on our survey data during limited short period and given data by MRC. This basic design procedure may be useful for W.W.T. design.

But, it is recommended that the existing production plants including utility supply system should be improved in wastewater discharge points of view. As a result, if new W.W.T. will be designed and constructed by yourself after some improvements, it is required to verify and settle the design conditions based on supplemental wastewater survey, then the detail design should be proceeded to be satisfied of the specified performance of the plant.

This recommendable basic design is only for reference. Therefore, the Study Team can not guarantee the plant performance if anybody will construct the new plant based on this basic design package in the future.

Client: JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Project Name: THE STUDY ON INDUSTRIAL WASTE WATER POLLUTION CONTROL IN THE ARAB REPUBLIC OF EGYPT

Factory Name: MANSOURA CO. FOR RESINS AND CHEMICALS

BASIC DESIGN

Document Title:

CALCULATION SHEET FOR W.W.T. RECOMMENDABLE PLANT

Issued Date: September 2000

Consultant: JICA STUDY TEAM

CHIYODA DAMES AND MOORE CO.

CHIYODA CORPORATION

1. Object

This design calculation sheet is applied to the study of W.W.T. Recommendation Plant planning for 「Mansoura Co.for Resins and Chemicals 」.

2. Wastewater to be treated

(1) Process Waste Water except Formalin Plant Regeneration Waste and Novolak Resin Solid Resin of Phenol Formaldehyde

The Formalin Plant regeneration Waste and Novolak Resin Solid Resin of Phenol Formaldehyde shall be treated by boiler or incinerator.

(2) Sanitary Waste Water

3. Design Conditions

(1) Waste management system in the Factory should be organized, and operated adequatly under the responsible managers.

(2) Suitable routine works, periodical maintainances should be conducted in the whole company.

4. Contents of Wastewater Treating Facility

(1) Pre-treatment : Equalization Tank

(2) Primary Treatment : Chemical Clarifier

(3) Secondary Treatment : Activated Sludge Treatment including Sludge treatment

(4) Advanced Treatment : Sand Filter and Activated Carbon Filter

5. Design Basis

5.1 Quality and Quantity of Influent Wastewater

Shown on Table-1.

5.2 Quality and Quantity of Treated Water

The Law 48/82 Non potable Surface Water (Industrial) is to Basic Design.

Treated water qualities are shown on Table-1.

Table－1 Design Basis of Wastewater Quality and Quantity

Items		Raw Water	Treated Water	Law48/82
Flow Rate	[m^3/h]	20 ～40	30	—
pH	[-]	6 ～7	6 ～9	6 ～9
SS	[mg/L]	100	< 1	< 50
BOD	[mg/L]	1,300	< 20	< 60
COD	[mg/L]	2,400	< 30	< 100
Oil&Grease	[mg/L]	20	< 1	< 10
Phenol	[mg/L]	460	< 0.005	< 0.005
TDS	[mg/L]	700	< 750	< 2,000
Water Temp.	[℃]	35 ～40	30 ～32	< 35

6 . Unit Design

6.1 Wastewater Collection (Out of Battery)

The waste water of end of pipe is pumped to Equalization Tank.

6.1 .1 Waste Water Pit (Z-01)

(1) Design Condition

1) Flow Rate(Q) : 700 m^3/d = 29.2 m^3/h

Take : 30 m^3/h = 0.50 m^3/min

2) Retention Time : 30 min.

3) Specification : Rectangular、RC(Semi-Underground)、1 set

(2) Sizing

1) Required Volume : 15 m^3

2) Effictive Height : 1 m(take)

3) Required Area : Ac= Q/Ah= 15 m^2

Take : $4{,}000^W \times 4{,}000^L \times 2{,}000^H \times 1$ Set

6.1 .2 Raw water Pump (PU-01A/B/C)

The Raw Water pumps (PU-01A/B/C) are normamally operated with one operation/two standby basis.

If water level in Waste water pit (Z-01) increase to high-high level point (LC-01), the one of two standby pump is automatically started by the level switch, LC-01.

If water level in Waste water pit (Z-01) decrease to high level point (LC-01), the one of two running pumps is automatically stoped by the level switch ,(LC-01). switch, LC-01.

1) Capacity Allowance : 5 % Design Flow Rate 31.5 m^3/h

2) Required Total Head : 20 m (take)

3) Efficiency of pump : 0.7

4) Motor Allowance : 0.9

5) Motor Power : 2.72 kW

Take : 31.5m^3/h x 0.2 Mpa x 3.7 kW×3 Sets

6.2 Equalization Tank

Waste water from end of pipe is storaged in the Equalization Tank (TK-01) for equalization of waste water quantity and quality for further treatment.

6.2 1. Equalization Tank (T-01)

(1) Design Conditions

1) Quality of Wastewater: Shown on Table-2
2) Retention Time : 4 h
3) Specification : Vertical cylindrical、1 set
4) Others : Air bubbling device

Table-2 Quantity and Quality of Wastewater

Items		Raw Water		Equalized W.
Flow Rate	[m^3/h]	20 ~40		30
pH	[-]	6 ~7		6 ~7
SS	[mg/L]	100		100
BOD	[mg/L]	1,300		1,300
COD	[mg/L]	2,400		2,400
Oil&Grease	[mg/L]	20		20
Phenol	[mg/L]	460		460
TDS	[mg/L]	700		700
Water Temp.	[℃]	35 ~40		35 ~40

(2) Sizing

1) Required Volume : 120 m^3
2) Effictive Height : 5 m(take)
3) Required Area : Ac= Q/Ah= 24 m^2 Diameter = 5.53

Take : $5,811^{\phi} \times 6,105^{H}$ (Chiyada Standard Tank)

4) Air Bubbling Device

a) Required Air (design base): 3 $Nm^3/m^2/h$
b) Required Air Quantity: 72 Nm^3/h= 1.2 Nm^3/min(take)

6.2 .2 Coagulation Tank Feed Pump (PU-02A/B)

Two pumps are provided as Coagulation Tank Feed Pumps(PU-2A/B).
One pump is normally in operation and the other pump is standby.

1) Capacity Allowance : 5 % Design Flow Rate 31.5 m^3/h
2) Required Total Head : 12 m (take)
3) Efficiency of pump : 0.7
4) Motor Allowance : 0.9
5) Motor Power : 1.63 kW

Take : $31.5m^3/h$ x 0.2 Mpa x 2.2 kW×2 Sets

6.3 Chemical Clarifier

(1) Purpose

The function of Chemical Clarifier is to reduce Suspended Solid (SS), free oil and color of the wastewater.

(2) Design Conditions

1) Wastewater : W.W. after equalized in T-01.
2) Capacity : 30 m^3/h
3) Quality of In & outlet of Clarifier: Shown on Table-3.
4) Chemicals : a) Coagulant= $Al_2(SO4)_3$
   b) pH Controller=$Ca(OH)_2$
   c) Coagulant Aid=Polymer

Table-3 Quantity and Quality of Wastewater

Items		Equalized W.		Clarified W.
Flow Rate	[m^3/h]	30		30
pH	[-]	6 ~7		7 ~8
SS	[mg/L]	100		20
BOD	[mg/L]	1,300		1,000
COD	[mg/L]	2,400		2,200
Oil&Grease	[mg/L]	20		5
Phenol	[mg/L]	460		460
TDS	[mg/L]	700		750
Water Temp.	[°C]	35 ~40		35 ~40

(3) Sizing

1) Coagulation Tank (T-02)
   a) Rapid Mixing Time : 5 min (take)
   b) Reruired Volume : V= 2.5 m^3
   c) Specification : Vertical Cylindrical, Carbon Steel with Epoxy Coating
   d) Number of Required : 1 set
   e) Demension : H= 1.6 m (take) Req'd Area= 1.56 m^2
      D= 1.41 m

   Take : $1,430^{\phi} \times 2,000^{H} \times 1$ Set

2) Flocculation Tank (T-03)
   a) Slow Mixing Time : 30 min (take)
   b) Reruired Volume : V= 15 m^3
   c) Specification : Vertical Cylindrical, Carbon Steel with Epoxy Coating
   d) Number of Required : 1 set
   Demension : H= 2.5 m (take) Req'd Area = 6 m^2
      D= 2.76 m

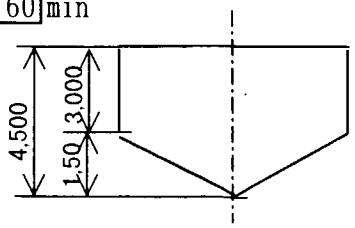
   Take : $2,860^{\phi} \times 3,000^{H} \times 1$ Set

3) Sedimentation Tank
   a) Surface Load : Ls= 3 $m^3/m^2/h$ (take)
   b) Required Area : As= 10 m^2
   c) Specification : Vertical Cylindrical, Carbon Steel with Epoxy Coating
   d) Number of Required : 1 set

e) Retention Time : Ts= 1 h (take)= 60 min

f) Demension : H= 3 m (take)

D= 3.6 m



Take : $4,000^{\phi} \times 4,500^{H} \times 2$ Sets

4) Generated Sludge

a) SS Removal : 2.4 kg/h= 57.6 kg/d

b) Concentration of SS: 1 % (take)

c) Sludge Draw-off : Q= 240 kg/h≒ 0.24 m^3/h

d) Dewatered Sludge : W= 16 kg/h = 0.384 Ton/day

5) Coagulant $Al_2(SO_4)_3 \cdot 18H_2O$ Injection Unit

a) Dosing Ratio : 30 mg/L, Max. 50 mg/L

b) Concentration : 20 wt % = 222.4 g/L

c) Specific Gravity : 1.112

d) Injection Rate : Q_{P0}= 4.0 L/h= 0.07 L/min

e) Tank Volume : V_{P0}= 0.7 m^3 (for 7days)

f) Height : H_{P0}= 1.0 m (take) A_{P0}= 0.68 m^2

g) Diameter : D_{P0}= 0.9 m

Take: $1,000^{\phi} \times 1,300^{H} \times 2$ Sets

6) pH Controller : $Ca(OH)_2$ Injection Unit

a) Dosing Ratio : 20 mg/L, Max. 50 mg/L

b) Concentration : 10 wt % = 100 g/L

c) Specific Gravity : 1

d) Injection Rate : Q_{P0}= 6.0 L/h= 0.10 L/min

e) Tank Volume : V_{P0}= 1.0 m^3 (for 7days)

f) Height : H_{P0}= 1.2 m (take) A_{P0}= 0.84 m^2

g) Diameter : D_{P0}= 1.0 m

Take: $1,000^{\phi} \times 1,300^{H} \times 2$ Sets

7) Coagulant Aid: Polymer Injection Unit

a) Dosing Ratio : 0.3 mg/L, Max. 0.5 mg/L

b) Concentration : 0.5 wt % = 5 g/L

c) Specific Gravity : 1

d) Injection Rate : Q_{P0}= 1.8 L/h= 0.03 L/min

e) Tank Volume : V_{P0}= 0.3 m^3 (for 7days)

f) Height : H_{P0}= 0.6 m (take) A_{P0}= 0.50 m^2

g) Diameter : D_{P0}= 0.8 m

Take: $800^{\phi} \times 1,000^{H} \times 2$ Sets

6.4 Biological Treating Unit (Activated Sludge Treatment)

(1) Purpose

To remove Organic Substances (BOD,COD,Phenol etc.) by aerobic micro bacterias.

(2)Design Conditions

1) Wastewater :Treated water from Chemical Clarifier

2) Treating Method :Activated Sludge Treatment

3) Capacity : 30 m^3/h

4) Water Quality :Shown on table-4

Table-4 Water Quality

Items		Clarified W.		Clarified W.
Flow Rate	[m^3/h]	30		30
pH	[-]	7 ~8		6 ~7
SS	[mg/L]	20		20
BOD	[mg/L]	1,000		50
COD	[mg/L]	2,200		100
Oil&Grease	[mg/L]	5		3
Phenol	[mg/L]	460		0.5
TDS	[mg/L]	750		750
Water Temp.	[℃]	35 ~40		32 ~35

5) Specification :

a) Aeration Basin :Rectangular/Above ground, RC, 1 set

b) Clarifier :Circular/Above ground, CS+Epoxy coating, 1 set

6) Chemicals

N and P are injected in case of lack of nutrient.

(3) Sizing

1) Aeration Basin

a) BOD Loading : 0.5 kg-BOD/m^3/day (take)

b) Volume of Basin : Vas= 1368 m^3

c) Height of Basin : Has= 5 m(take) Aas= 273.6 m^2

W= 14 W(take) L= 19.54 m

Take : $14,000^W \times 20,000^L \times 5,800^H \times 1$ Set

d) BOD Removal : R_{BOD}= 684 kg/day

e) MLSS : Ca= 2,000 mg/L

2) Clarifier

a) Surface Loading : Las= 1 $m^3/m^2/h$(take)= 24 $m^3/m^2/day$

b) Surface Area : Ass= 30 m^2

c) Height of Basin : Hss= 3 m (take)

d) Volume of Basin : Vss= 90 m^3

e) Retention Time : Tss= 3 h

f) Sludge Concentrati.: C_R= 10,000 mg/L

g) Diameter : Dss= 6.18 m

Take: $7,000^{\phi} \times 4,000^H \times 1$ Set

3) Surplus Sludge

a) BOD→SS Conversin Rate : 0.3 (take)

b) Sludge from Act. Sludge T.: Ws_1= 8.55 kg/h from BOD

c) Sludge from Chemical Clar.: Ws_2= 2.40 kg/h from SS

d) Total Generated Sludge : W_{TS}= 10.95 kg/h= 262.8 kg/day

f) Generated 85 % Water Cont.S W_{85}= 73 kg/h= 1,752 kg/day

g) Centrifuge Feed Flow : Q= 1.5 m^3/h

4) Air Requirement for Aeration

a) Oxygen Demand : W_{02}= a*R_{BOD}+b*Sa = 519.84 kg/day

a= BOD Factor = 0.55 $kg\text{-}O_2/kg\text{-}O_2$

b= MLVSS Factor= 0.07

Sa= 0.75*MLSS*Vol.of Basin/1,000= 2,052 kg

R_{BOD}= BOD Removal = 684 kg/day

b) Required Air : Qair= (W_{02}*3.57$m^3/kg\text{-}O_2$*1.2)/(0.08*24*60)

= 19.33 Nm^3/min

c) Blower capacity : Qta= 24.638 Nm^3/min

Take: 25 Nm^3/minx6 mHx37 kW

5) Return Sludge Ratio : Rs= Ca/(Cr-Ca)

= 25 %

6) Nutrient as N :$CO(NH_2)_2$ Injection Unit

a) Dosing Ratio :BOD : N = 100 : 5

BOD : $CO(NH_2)_2$ = 100 : 11

b) Concentration : 25 wt %

c) Specific Gravity : 1.069

d) Injection Rate : Q_{CO}= 12.3 L/h

e) Tank Volume : V_{CO}= 2.1 m^3 (7days)

f) Height : H_{PO}= 1.8 m (take) A_{PO}= 1.15 m^2

g) Diameter : D_{PO}= 1.2 m

Take: 1,200$^{\phi}$×1,800^{H}×2 Sets

7) Nutrient as P :H_3PO_4 Injection Unit

a) Dosing Ratio :BOD : P = 100 : 1

BOD : H_3PO_4 = 100 : 3

b) Concentration : 25 wt %

c) Specific Gravity : 1.189

d) Injection Rate : Q_{ph}= 3.0 L/h

e) Tank Volume : V_{ph}= 0.5 m^3 (7days)

f) Height : H_{PO}= 0.9 m (take) A_{PO}= 0.57 m^2

g) Diameter : D_{PO}= 0.8 m

Take: 800$^{\phi}$×1,000^{H}×2 Sets

8) Polymer-B

a) Dosing Ratio : 1 % as dry SS

b) Concentration : 0.5 wt %

c) Specific Gravity : 1

d) Injection Rate : Q_{ph}= 0.13 L/h

e) Tank Volume : V_{ph}= 0.02 m^3 (7days)

f) Height : H_{PO}= 0.5 m (take) A_{PO}= 0.04 m^2

g) Diameter : D_{PO}= 0.2 m

Take: $800^{\phi} \times 1,000^{H} \times 1$ Set

9) Sludge Thickener

a) Solids Loading Lss= 60 $kg/m^2/d$

b) Total Solids Lto= 262.8 kg/d

c) Required Area Ath= 4.38 m^2

d) Diameter D_{PO}= 2.36 m

Take: $2,400^{\phi} \times 4,000^{H} \times 1$Set

6.5 Sand Filter Unit

(1) Purpose

To remove overflow floc(SS) from Activated Sludge Treatment

(2) Design Conditions

1) Wastewater :Treated Water from Biological Treatment Unit

2) Capacity : 30 m^3/h

3) Water Quality :Show on Table-5

Table-5 Water Quality

Items		Biological T.		Filtered W.
Flow Rate	[m^3/h]	30		30
pH	[-]	7 ~8		6 ~7
SS	[mg/L]	20		5
BOD	[mg/L]	1,000		30
COD	[mg/L]	2,200		80
Oil&Grease	[mg/L]	5		2
Phenol	[mg/L]	0.5		0.5
TDS	[mg/L]	750		750
Water Temp.	[℃]	35 ~40		32 ~35

4) Specification :Vertical Cylindrical,Carbon Steel with Epoxy Coating, Pressure Type

5) No. of Filter :3 Sets (2 Operatio + 1 Stand-by)

6) Filter Media :Anthracite + Sand/Gravel

7) Backwashing : Water (Pump)

(3) Sizing

1) Filter

a) Filter Velocity : Vf= 180 m/day= 7.5 m/h (take)

b) Filter Area/Diameter Af= 2 m^2 Df= 1.6 m

c) Height : Hf=

d) <Linear part>

Upper of Trough	0.5 m
Trough	0.3 m
Trough-Anthracite	0.7
Anthracite	0.7 m
Sand+Gravel	0.8 m
Support+Under	0.7 m
Allowance	0.3 m
Total Height	4 m

Take: $1,600^{\phi} \times 4,000^{H} \times 3$ Sets

2) Filtered Water Pond & Waste Water Pond

a) Volume of Pond : Vfb= 60 min (take) 30 m^3

b) Depth of Pit : Hfb= 2.5 m (take) Surface Area 12 m^2

W= 3 m L= 4.00 m

Take: $3,000^{W} \times 4,000^{L} \times 3,000^{H}$

3) Backwashing Pump

a) Backwash Velocity : Ubw= 40 m/h (take)

b) Backwash Flow rate : Qbw= 80 m^3/h

c) Backwashing Time : Tbw= 10 min(take)

d) Backwashing Water : Vbw= 13.33 $m^3/h/Cycle$

e) Backwash Pump : Qp= 88 m^3/h Hp= 12 mH(take)

P= 4.10 kW 5.5 kW

Take : 88 m^3/h x 0.12 Mpa x 5.5 kW×2 Sets

6.5 Activated Carbon Filter Unit

(1) Purpose

To remove dissolved organic substances (BOD,COD,Phenol etc.) by adsorption.

(2) Design Conditions

1) Wastewater :Treated Water from Filter Unit

2) Capacity : 30 m^3/h

3) Water Quality :Show on Table-6

Table-6 Water Quality

Items		Filtered W.		Treated Water
Flow Rate	[m^3/h]	30		30
pH	[-]	6 ~7		6 ~9
SS	[mg/L]	5		1
BOD	[mg/L]	30		20
COD	[mg/L]	80		30
Oil&Grease	[mg/L]	2		1
Phenol	[mg/L]	0.5		0.005
TDS	[mg/L]	750		750
Water Temp.	[℃]	32 ~35		32 ~35

4) specification :Vertical Cylindrical,Carbon Steel with Epoxy Coating, Pressure Type

5) No. of Filter :2 Sets (1 Operatio + 1 Stand-by)

6) Filter Media :Activated Carbon

7) Backwashing : Water (Pump)

(3) Sizing

1) A/C Filter

a) Filter Velocity : Vf= 360 m/day= 15 m/h (take)

b) Filter Area/Diameter Af= 2 m^2 Df= 1.6 m

c) Retention Time : Ta= 10 min.

d) A/C Volume : Va= 5 m^3

Height : Hf=

Upper of Trough	0.4 m
Trough-A/C	0.8 m
Activated Carbon	2.5
Support+Under	0.5 m
Allowance	0.3 m
Total Height	4.5 m

<Linear part>

Take: $1,600^{\phi} \times 4,500^{H} \times 2$ Sets

6.6 Sterilization

(1) Purpose

To sterilize treated water including sanitary wastewater

(2) Design Condition

a) Wastewater :Filtered water

b) Disinfictant :NaCLO Conc 12 wt% Sp.Gra 1.0155

c) Dosage : 4 mg/L (Max. 6mg/L)

d) Contact Time : 15 min

(3) Sizing

a) Injection Rate : Q= 1 L/h

b) Req'd Drum Volume : V= 0.2 m^3 (for 7days)

c) Tank Dimension : Take: $800^{\phi} \times 1,000^{H} \times 1$ Set

d) Sterilization Pond : 7.5 m^3

e) Pond Dimension : H= 2 m (take) A= 3.75 m^2

W= 3 m (take) LA= 1.25

Take: $3,000^{W} \times 1,250^{L} \times 3,000^{H}$