APPENDIX-I. New-Community Development

Table I-1. Lot and Building Area of Houses

Description	Farmers House		Managers House	Technicians House	Workers House
	Small. H.	Large. H.			
Lot (m^2)	260	400	440	350	250
Bldg Area (m^2)	38	48	140	85	70
No. of Rooms	2	2	4	3	3

Table I-2. Village Area for Settlement Villages

	Scale of Village		
	Small-size (ha)	Medium-size (ha)	Large-size (ha)
Housing Area			
Farmers Houses	10.2	11.1	16.6
Non-Farmers Houses	1.7	2.3	3.5
Sub-Total	11.9	13.4	20.1
Windbreak Forest Area	1.4	2.6	4.0
Road Area	8.9	9.9	14.9
Others	2.2	2.3	3.6
Total	25.4 ha (60.5 fd)	28.2 ha (67.4 fd)	42.6 ha (101.4 fd)
Village Size	420 m x 605 m	470 m x 600 m	560 m x 760 m

Table I-3. Number of Houses by Community Scale

Type of Houses	Settlement Village			Service Village	Central Village
	Small-Size	Middle-Size	Large-Size		
Farmers House					
Small House:	-	425	640	-	-
Large House:	255	-	-	-	-
Sub-total	255	425	640	-	-
Non-Farmers House					
Managers House:	10	10	10	14	30
Technicians House:	20	25	25	80	285
Workers House:	15	40	75	31	115
Sub-total	45	75	110	125	430
Total	300	500	750	125	430
Number of Communities	2	1	9	3	1

Note: Existing houses are excluded

Table I-4. Road Length for Settlement Villages

Type of Village Road	Scale of Village		
	Small-size (m)	Medium-size (m)	Large-size (m)
Main Street (W = 22 m)	400	440	720
Main Road (W = 12 m)	3,900	4,350	6,500
Local Road (W = 6 m)	5,800	6,450	9,700
Total	10,100	11,240	16,920

Table I-5. Potable Water Requirement in the F/S Area

Description	Settlement Village			Investers Complex			Total
	Small-Size	Medium-Size	Large-Size	No. 1	No. 2	Cattle House	
Water Requirement per unit (m^3/day)	785	1,168	1,976	1,290	1,650	350	-
Number of Unit	2	1	9	1	1	1	15
Total Water Requirement (m^3/day)	1,570	1,168	17,784	1,290	1,650	350	23,812

Table I-6. Potable Water Requirement for Settlement Villages

Description	Unit Water Requirement	Small Size Village		Medium Size Village		Large Size Village	
		Pop./Head Served	Water Demand	Pop./Head Served	Water Demand	Pop./Head Served	Water Demand
			m^3/day		m^3/day		m^3/day
Domestic	150 l/capita/day	1,500	225	2,500	375	3,750	563
Commercial/Public	0.8 l/m^2/day	8,200 m^2	7	14,500 m^2	12	18,200 m^2	15
Cattle:							
Cow	100 l/Head/day	2,700	270	3,600	360	-	-
Goat/Sheep	10 l/Head/day	-	-	-	-	68,700	687
Sub-Total			502		747		1,265
Losses (25%)			126		187		316
Future Expansion (25%)			157		234		395
Total			785		1,168		1,976
Peak Hour Demand (m^3/hr)			54.5		81.1		137.2
" (m^3/s)			(0.015)		(0.023)		(0.038)
Capacity of Elevated Tank (m^3)			390		580		990

Table I-7. Potable Water Requirement for Investors Complex

Description	Unit Water Requirement	Rumana (No. 1) Pop./Head Served	Rumana (No. 1) Water Demand m^3/day	Rabaa (No. 2) Pop./Head Served	Rabaa (No. 2) Water Demand m^3/day	Tina Plain (Cattle house) Pop./Head Served	Tina Plain (Cattle house) Water Demand m^3/day
Domestic	150 l/capita/day	200	30	200	30	200	3
Cattle: Cow	100 l/head/day	7,200	720	9,500	950	2,200	220
Agro-industry							
Slaughter House (Cow)	3.0 m^3/head	21	63	21	63	-	-
Others		-	13	-	13	-	-
Sub-total			826		1,056		223
Losses (25 %)			206		264		57
Future Expansion (25%)			258		330		70
Total			1,290		1,650		350
Peak Hour Demand (m^3/hr)			90		115		25
" (m^3/s)			(0.025)		(0.032)		(0.007)
Capacity of Elevated Tank (m^3)			645		825		175

Table I-8. Sewage Discharge

Description	Settlement Village			Service Village (Qatia)
	Small V.	Medium V.	Large V.	
	(m^3/day)	(m^3/day)	(m^3/day)	(m^3/day)
Water Consumption				
Domestic	225	375	563	885
Commercial/Public	7	12	15	29
Total	232	387	578	914
Sewage Discharge				
Domestic (80%)	180	300	450	708
Commercial/Public (100%)	7	12	15	29
Total	187	312	465	737
	(0.0022m^3/s)	(0.0036m^3/s)	(0.0054m^3/s)	(0.0085m^3/s)
Treatment Plant Capacity	200	350	500	740

Table I-9. Amount of Solid Waste Disposal

Description	Settlement Village			Service Central Village		Others	Total
	Small V.	Medium V.	Large V.				
From Private Houses							
Population	1,500	2,500	3,750	20,500 2/	5,350	7,800 1/	
Unit Disposal Rate (kg/capita/day)	0.6	0.6	0.6	0.6	0.6	0.6	
Amount of Disposal (kg/village)	900	1,500	2,250	12,300	3,210	4,680	
From Commercial/Public Offices							
Number of Employees	45	75	110	625	410	85	
Unit Disposal Rate (kg/employee/day)	0.2	0.2	0.2	0.2	0.2	0.2	
Amount of Disposal (kg/village)	9	15	22	125	82	17	
Total per Village (kg)	945	1,515	2,272	12,425	3,292	4,697	
Number of Villages	2	1	9	-	1	-	
Total Amount of Disposal (kg)	1,890	1,515	20,448	12,425	3,292	4,697	44,267
Allocation	2	1	9				
Inflamable Disposal (80%) (kg)	1,512	1,212	16,358	9,940	2,634	3,758	35,414
Noninflamable Disposal (20%) (kg)	378	303	4,090	2,485	658	939	8,853

Note: 1/ Total population for investors complex and existing Rumana village
2/ Total population for 3 service villages of Balouza, Qatia & Nigila

Table I-10. Electric Power Demand

Description	Settlement Village			Investors Complex	Irrigation Pump Station	Total
	Small V.	Medium V.	Large V.			
1) Village Use						
Number of Households	300	500	750	-	-	
Unit Power Demand (kw)	1.6	1.6	1.6	-	-	
Total Power Demand (kw)	480	800	1,200	-	-	
Commercial & Public Use (kw)	100	200	400	2,000	-	
Total per village (kw)	580	1,000	1,600	2,000	-	
Number of Villages	2	1	9	2	-	
Total Power Demand (kw)	1,160	1,000	14,400	4,000	-	20,560
2) Irrigation Pump Use						
Number of Stations	-	-	-	-	80	
Unit Power Demand (kw)	-	-	-	-	85	
Total Power Demand (kw)	-	-	-	-	6,800	6,800
Grand Total (kw)	1,160	1,000	14,400	4,000	6,800	27,360

Table I-11. Number of Telephone Lines for Settlement Village

Description	Settlement Village			Investors Complex	Total
	Small Village	Medium Village	Large Village		
Private Use	10	10	10	20	
Public Call Boxes	5	7	11	-	
Public & Commercial Offices	10	13	15	-	
Agro-industry	-	-	-	10	
Total per village	25	30	45	30	
Number of Villages	2	1	9	2	
Total	50	30	405	60	545

Table I-12. Public and Social Facilities for Settlement Villages

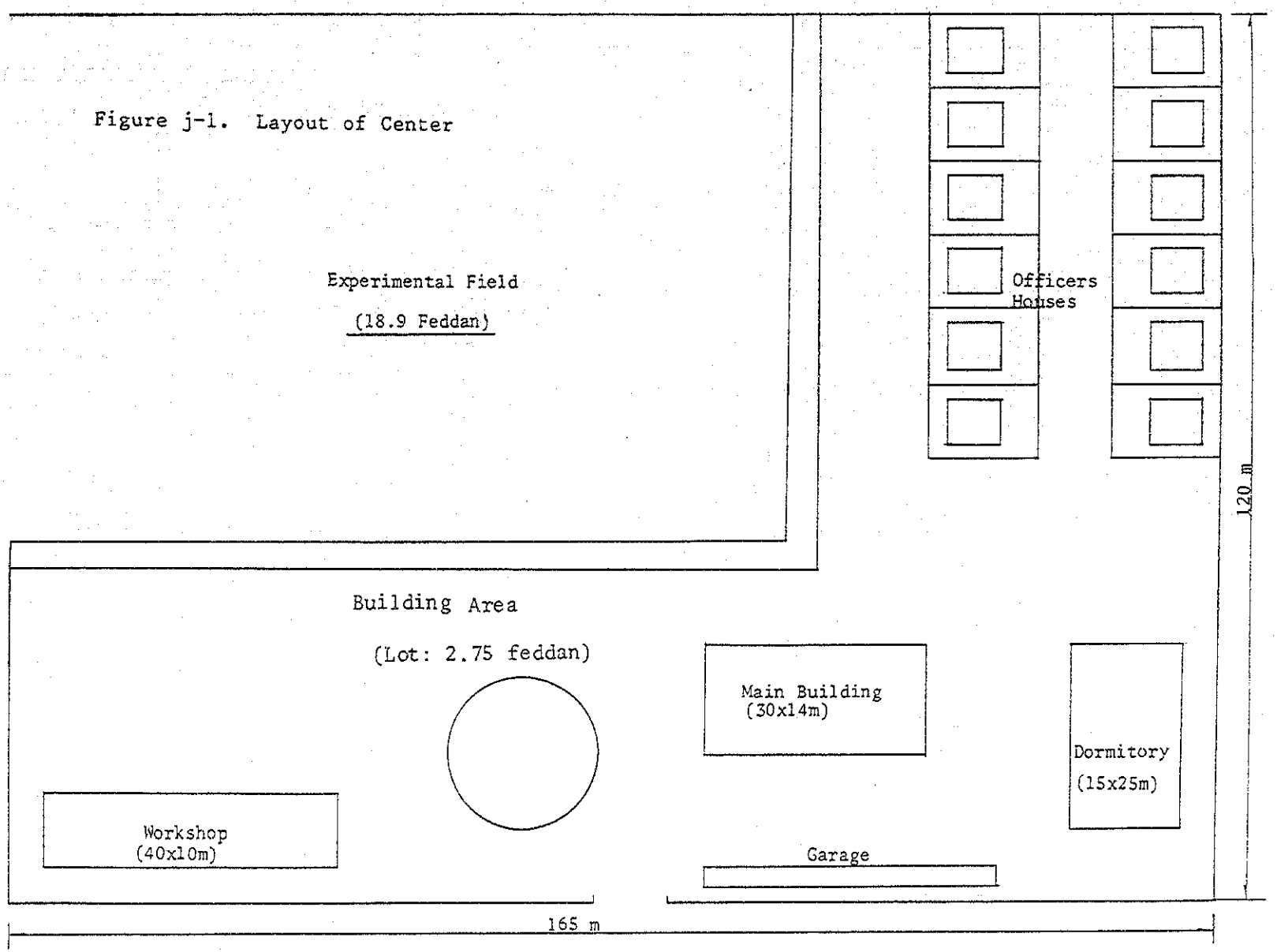
Name of Facilities	300 Households				500 Households				750 Households			
	Bldg. Area (m^2)	Lot Area (m^2)	No. of Bldgs	No. of Staff (person)	Bldg. Area (m^2)	Lot Area (m^2)	No. of Bldgs	No. of Staff (person)	Bldg. Area (m^2)	Lot Area (m^2)	No. of Bldgs	No. of Staff (person)
Primary School	1,000	6,000	1	12	1,000	6,000	1	16	1,500	7,000	1	21
Preparatory School	-	-	-	-	1,000	6,000	1	16	1,500	7,000	1	21
Health Unit	-	-	-	-	-	-	-	-	200	300	1	8
Police Station	-	-	-	-	-	-	-	-	40	100	1	6
Post Office	50	100	1	4	50	100	1	5	50	100	1	5
Telephone Office	50	100	1	5	50	100	1	6	50	100	1	6
Fire Station	-	-	-	-	-	-	-	-	100	200	1	6
Community Center	150	250	1	4	150	250	1	4	200	300	1	5
Cooperative/Association Unit	100	150	1	5	100	150	1	5	100	150	1	5
Shops/Stores	100	150	2	4	100	150	4	8	100	150	4	8
Mosque	150	300	1	2	150	300	1	2	250	350	1	2
Cemetary	-	4,000	-	-	-	5,000	-	-	-	6,000	-	-
Sewage Treatment Plant	100	1,000	1	9	100	1,000	1	13	120	2,000	1	17
Total		12,200		45		19,500		75		24,200		110

Table I-13. Public and Social Facilities for Service and Central Villages

Name of Facilities	Service Village				Central Village			
	Bldg. Area (m^2)	Lot Area (m^2)	No. of Bldgs	No. of Staff (person)	Bldg. Area (m^2)	Lot Area (m^2)	No. of Bldgs	No. of Staff (person)
Primary School	1,500	7,000	2	30	2,500	10,000	3	75
Preparatory School	1,500	7,000	2	30	2,500	10,000	3	75
Secondary School	-	-	-	-	4,000	20,000	2	50
Vocational School	-	-	-	-	1,500	5,000	1	20
Rural Health Unit	200	300	1	5	200	300	1	5
Hospital	-	-	-	-	1,800	5,000	1	30
Police Station	150	500	1	4	300	1,000	1	10
Post Office	50	200	1	5	200	300	1	15
Telephone Office	100	200	1	5	200	300	1	10
Fire Station	200	300	1	5	300	400	1	10
Village Council Bldg.	200	300	1	5	2,000	3,000	1	40
Youth Center	-	-	-	-	1,000	20,000	1	15
Community Center	300	500	1	2	400	700	1	4
Cooperative/Association Unit	150	300	1	3	300	500	1	5
Shops/Stores	100	150	6	6	100	150	10	10
Workshop	750	1,500	1	5	800	1,800	1	6
Mosque	300	400	1	1	600	1,000	1	1
Cemetary	-	6,000	-	-	-	35,000	-	-
Sewage Treatment Plant	150	3,000	1	15	150	3,000	1	15
Refuse Treatment Plant	-	-	-	-	500	10,000	1	20
Bank	150	200	1	4	150	200	1	4
Social Sport Club	-	-	-	-	500	12,000	1	5
Cinema Theater	-	-	-	-	800	1,000	1	5
Total		42,600		125		20,200		430

APPENDIX-J. Agricultural Development Center

Figure j-1. Layout of Center



Layout of Experimental Field

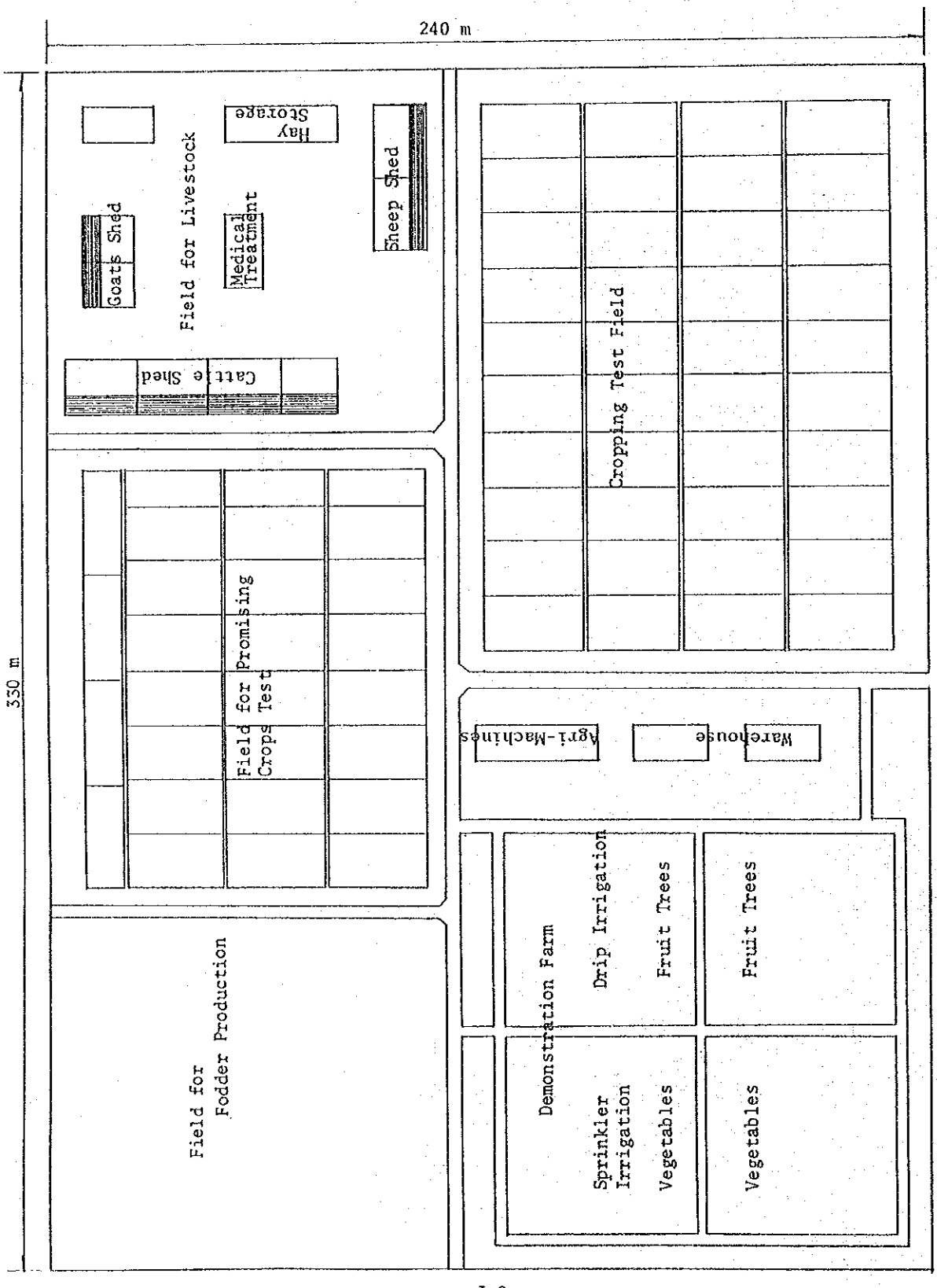
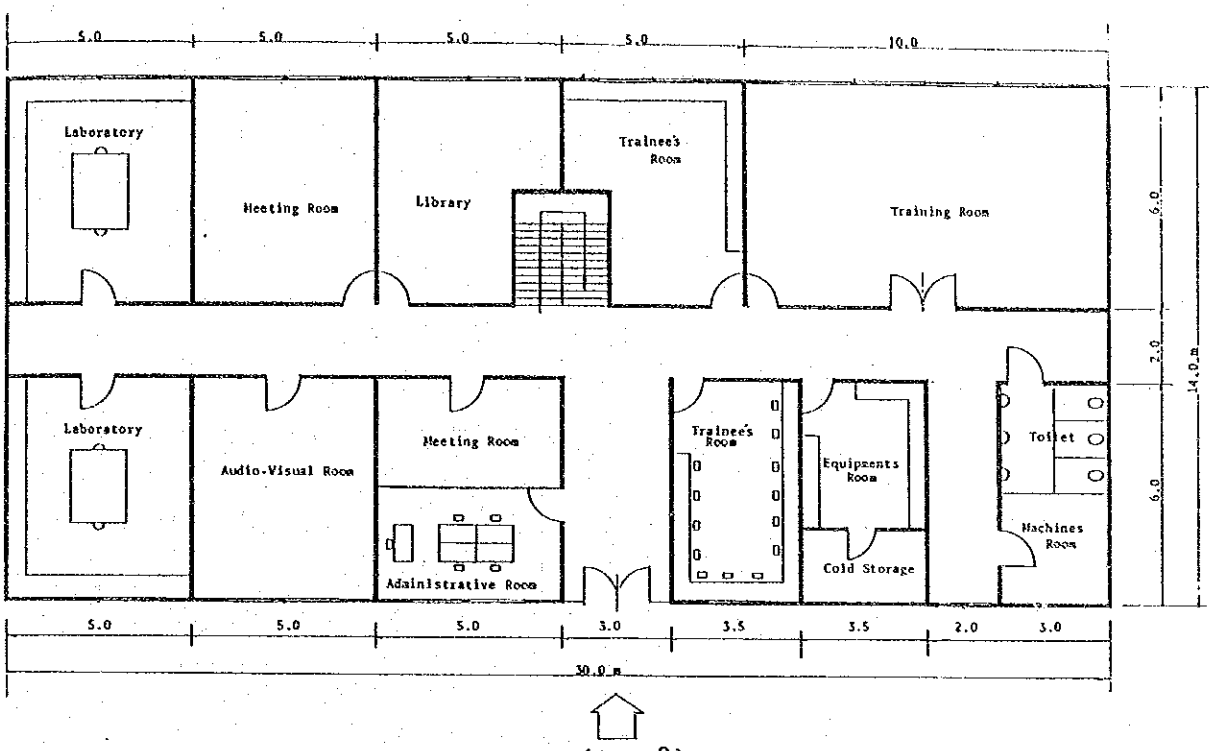
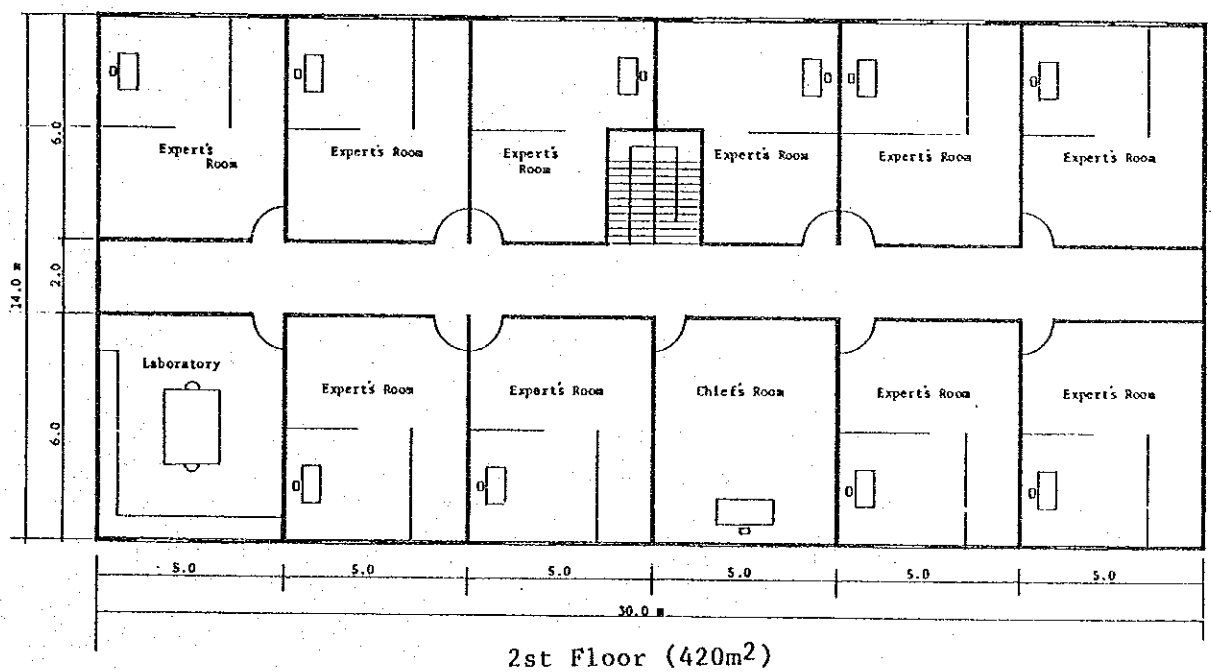


Figure j-2, Floor Plan of Center Building



1st Floor (420m2)



2st Floor (420m2)

APPENDIX-K. Facility Design

Table K-1. Alternative Quantities of Siphon Structure

Item		Unit	Case-1	Case-2	Case-3
Diameter		m	5.30	4.60	4.1
Number of Siphon			x 2	x 3	x 4
length of Siphon		m	1,350 x 2	1,350 x 3	1,350 x 4
Siphon excavation		cu.m	90,700	108,500	120,900
weight of RC Segment		t	40,400	53,600	64,800
Siphon lining		cu.m	11,800	15,400	18,400
Starting Shaft			(15.0x21.8)	(13.9x30.2)	(12.6x37.7)
excavation	d = 39.5 m	cu.m	12,900	13,600	15,400
diaphragm wall	d = 44.0 m t = 1.2 m	sq.m,	3,500	4,100	4,600
waling/strut		t	400	420	520
bottom slab conc.		cu.m	300	420	480
intermediate shaft			(4.0x21.8)	(4.0x30.2)	(4.0x37.7)
excavation	d = 46.5 m	cu.m	4,100	5,600	7,000
diaphragm wall	d = 51.0 m t = 1.2 m	sq.m	2,900	3,700	4,500
waling/strut		t	280	390	490
bottom slab conc.		cu.m	87	120	150
receiving shaft			(8.0x21.8)	(8.0x30.2)	(8.0x37.7)
excavation	d = 46.5 m	qu.m	8,200	11,200	14,000
diaphragm wall	d = 51.0 m t = 1.2 m	sq.m	3,300	4,100	4,900
wale/strut		t	410	570	710
bottom slab conc.		qu.m	170	240	300
temporary Siphon facility		L.S	2	3	4
construction power		KVA	1,680	2,160	2,240
Construction period		Mon.	45 (55)	47	47

remark: ( ) shows 1 shield machine for two lines

Figure K-1 Construction Schedule of Siphon under the Suez Canal

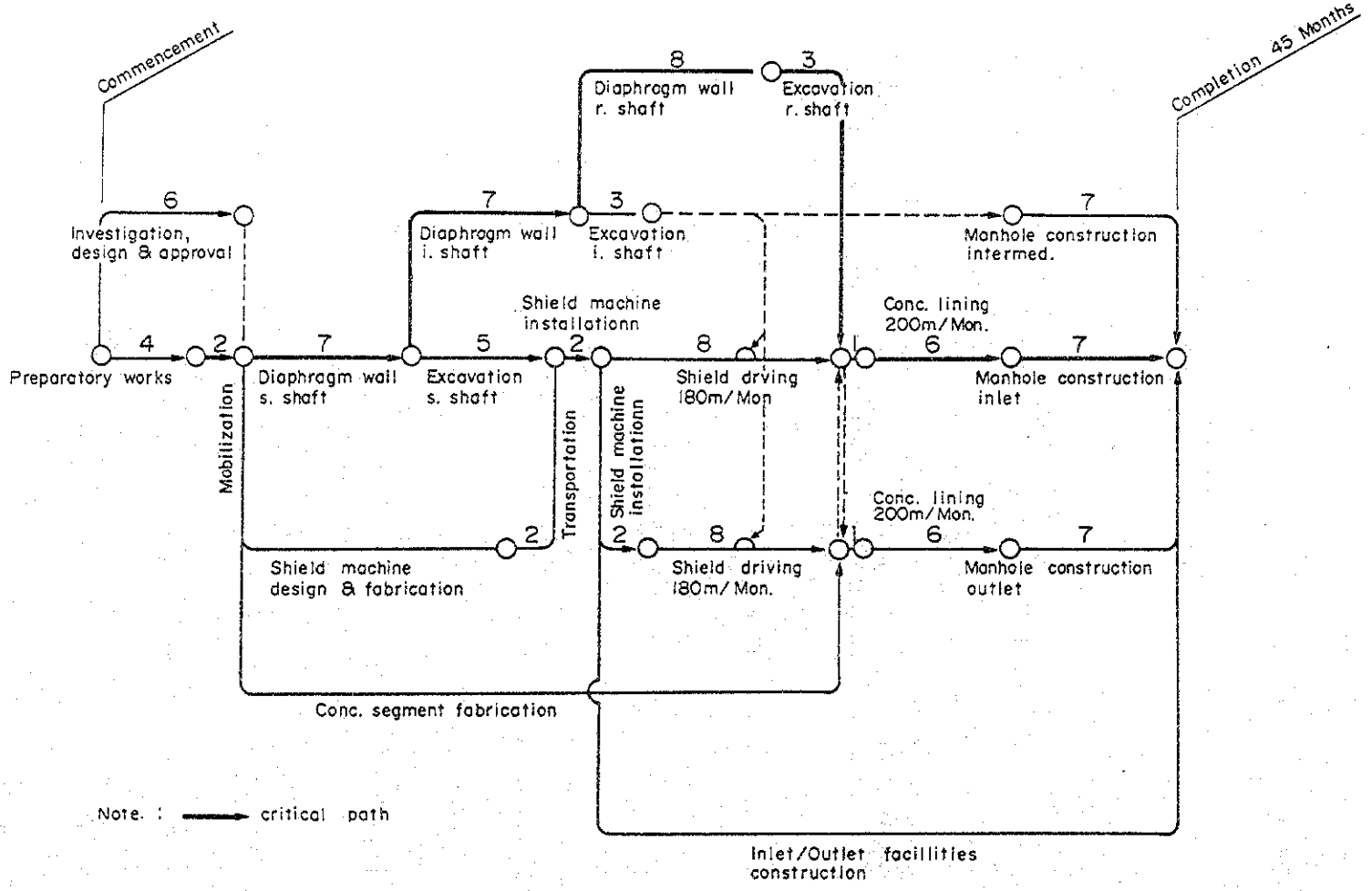
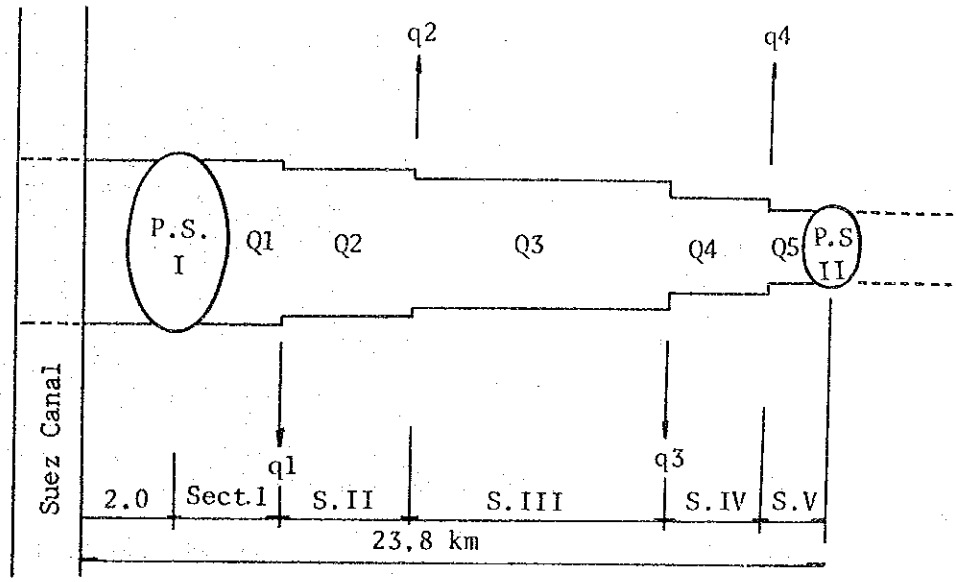
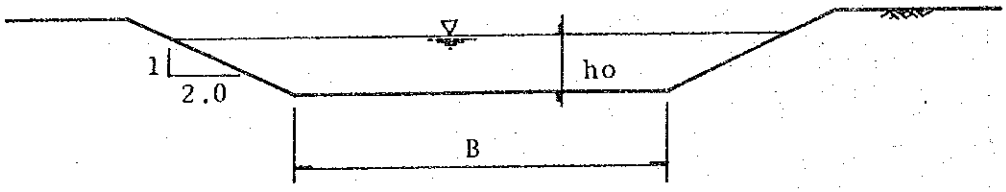


Table K-2. Peak Discharge of the El Salam Canal in Tina Plain



Section	Diverted Canal	Diverted Discharge cu.m/s	Discharge cu.m/s	Length km
I	-		Q_1 = 88.7	6.0
II	South Tina Plain (1)	q_1 = 5.7	Q_2 = 83.0	4.0
III	North Tina Plain	q_2 = 10.6	Q_3 = 72.4	3.0
IV	South Tina Plan (2)	17.3		
	South Qantara East	7.1		
	Kathib El Agramia	7.9		
		q_3 = 32.3	Q_4 = 40.1	7.0
V	-	q_4 = 1.5	Q_5 = 38.6	1.8

Table K-3. Canal Bed Slope and Section for Tina Plain



Condition

- Discharge ..... 88.6 m^3/s (Section I)
- Manning's roughness 0.022
- Slope gradient ..... 1 : 2.0
- Maximum Velocity ..... 0.70 m/s
- Maximum Water Depth ..... 4.0 m

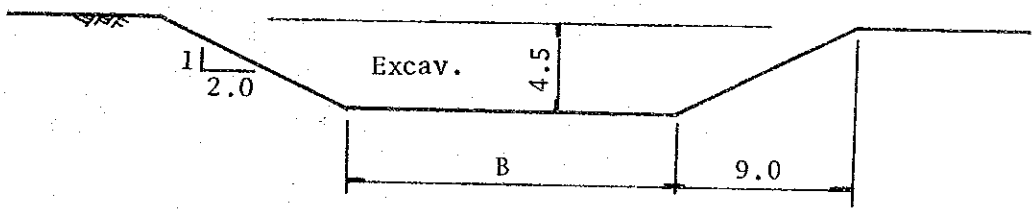
Bed Slope	Loss h/23 km (m)	Width B (m)	Depth ho (m)	Velocity ($Q = 88.7\ m^3/s$) (m/s)	Velocity ($Q' = 23.5\ m^3/s$) (m/s)
2/100,000	0.46	40	4.0	0.45	0.28
3/100,000	0.69	33	4.0	0.54	0.37
4/100,000	0.92	27	4.0	0.62	0.43
5/100,000	1.15	25	4.0	0.68	0.45
6/100,000	1.38	22	4.0	0.73	0.48

Table K-4 . Canal Bed Slope and Earth Work Cost for Tina Plain

(Q = 88.7 cu.m/s, L = 10.0 km)

Bed Slope	Cost (1,000 LE)			
	Initial C.	Annual C.	Maintain C.	Total
2/100,000	8,820	721	221	942
3/100,000	7,560	618	189	807
4/100,000	6,480	529	162	691
5/100,000	6,120	500	153	653

Initial Cost = (B+ 9.0) m x 4.5 m x 10,000 m x 4.0 LE/cu.m



$$\text{Annual Cost} = \text{Initial Cost} \times \frac{i(1+i)^n}{(1+i)^n - 1}$$

i: Interest (8%)
n: Economic Life (50 yrs)

Maintenance Cost = Initial Cost x 2.5%

Table K-5. Canal Bed Slope and Annual Cost for Tina Plain including pump operation cost
(Q = 88.7 cu.m/s, L = 10.0 km)

Bed Slope	h	Cost (1,000 LE)		
	m	Earth Work	Electricity	Total
2/100,000	0.20	942	42	984
3/100,000	0.30	807	63	870
4/100,000	0.40	691	85	776
5/100,000	0.50	653	106	759*

h: Pump Head for 10.0 km
Earth Work: Refer to Table K-4.
Electricity Charge: P x (T + 17.4)
(P = Motor Output = 0.262 x 88.7 m^3/s x 60s x h)
(T = Electric Tariff = 172.3 LE/kw)

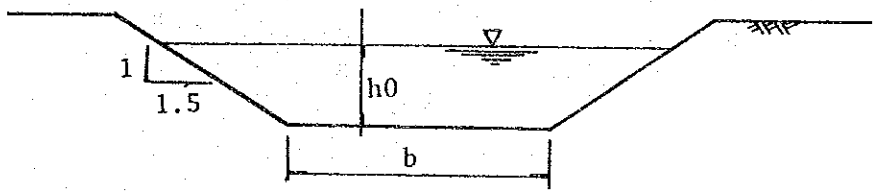
$$\text{Motor Output} \ldots\ldots P\ (kw) = \frac{0.163 \times Q \times H}{np \times ng} \times (1 + R) = 0.262 \times Q \times H$$

Q: Pump Capacity (cu.m/min)
H: Head (m)
R: Motor Allowance (30%)
np: Pump efficiency (85%)
ng: Transmission efficiency (95%)

Table K-6. Bed Slope and Concrete Canal Section

(Q = 38.6 cu.m/s section)

Bed Slope	b (m)	ho (m)	A (sq.m)	V (m/s)	B/ho
1/100,000	3.0	4.0	35.8	1.08	0.738
1/9,000	2.7	4.0	34.8	1.11	0.675
1/8,000	2.40	3.96	33.0	1.17	0.606
1/7,000	2.34	3.86	31.4	1.23	0.606
1/6,000	2.27	3.75	29.5	1.31	0.606
1/5,000	2.19	3.61	27.5	1.40	0.606



Condition: $Q = 38.6\ m^3/s$

$n = 0.015$ (concrete lining)

$V = 1/n \times R^{2/3} \times I^{1/2}$

Note: 1/10,000, 1/9,000 ... Max. uniform flow depth = 4.0 m

1/8,000 - 1/5,000 ... Most effective cross section

Table K- 7 Investment Cost for Concrete Canal
(Q = 38.6 m^3/s section)

Bed Slope	h	Annual Cost (x 1,000 LE)			
		Investment	Electricity	Total	
	m				
1/10,000	0.100	59.6	10.2	69.8	
1/9,000	0.111	58.3	11.3	69.6	
1/8,000	0.125	56.6	12.7	69.3	*
1/7,000	0.142	55.0	14.5	69.5	
1/6,000	0.166	53.2	16.9	70.1	
1/5,000	0.200	50.8	20.4	71.2	

Note: h = Pump head for 1.0 km of Canal
Investment: Refer to Table K-8.
Electricity Charge = P x T
P = Max. Motor Output = 0.232 x Q x H
T = Annual Tariff = (172.3 + 17.4) LE/kw

Table K-8. Bed Slope and Annual Cost for Concrete Canal
(Q = 38.6 m^3/s)

Canal Dimension			Cost (x 1,000 LE)			
Bed Slope	B	H	Initial C.	Annual C.	Maintain C.	Total
	m	m				
1/10,000	3.3	4.70	648	53.1	6.5	59.6
1/9,000	3.0	4.70	634	52.0	6.3	58.3
1/8,000	2.70	4.66	615	50.4	6.2	56.6
1/7,000	2.64	4.56	597	49.0	6.0	55.0
1/6,000	2.57	4.45	578	47.4	5.8	53.2
1/5,000	2.49	4.31	553	45.3	5.5	50.8

Note: Initial Cost = Earth Works + Lining Work
Earth Work = (B + 1.5 H) x H x 5.0 LE/m^3
Lining Work = (B + 3.6 H) x 20 LE/m^2

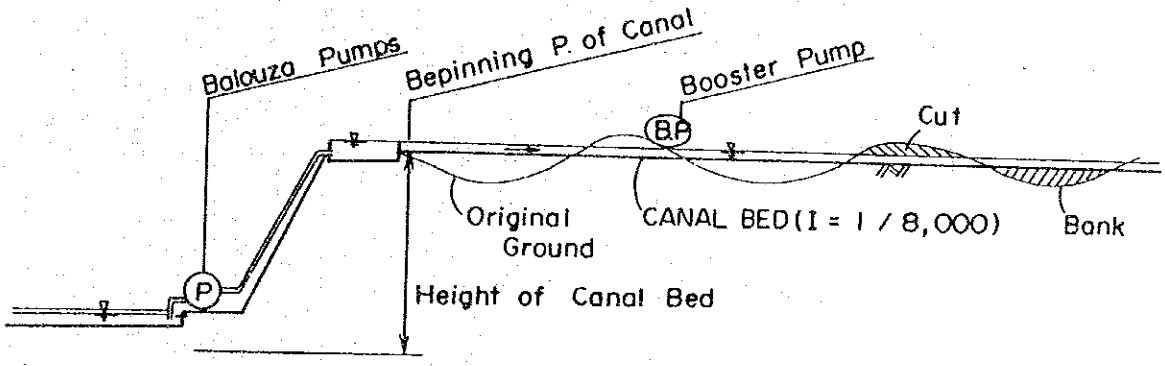
$$\text{Annual Cost} = \text{Initial C.} \times \frac{i\,(1+i)^n}{(1+i)^n - 1}$$

i = interest (8.2%)
n = Economic Life (50 yrs)

Maintenance Cost = Initial C. x 10%

Table K-9. Canal Height and Cost for Sandy Area (I = 1/8,000)

El. (m)	Volume (1,000 cu.m) Excav.	Embank	Cost (1,000 LE) Earth Work	Annual Cost	B. Pump	Total
7.00	6,907	572	23,581	1,934	1,416	3,350
8.00	5,653	969	21,804	1,788	1,374	3,162
8.50	5,117	1,237	21,536	1,766	1,353	3,119
9.00	4,636	1,553	21,673	1,777	1,332	3,109*
9.50	4,224	1,928	22,312	1,830	1,312	3,142
10.00	3,865	2,357	23,380	1,917	1,290	3,207
11.00	3,289	3,359	26,662	2,186	1,249	3,435



Note: Earth Work C. = Excav. V. x 3.0 LE/m^3 + Embank x 5.0 LE/m^3

Annual C. = Earth Work C. x 8.2%

Booster Pump C. = 0.232 x Q x H x (172.3 + 17.4) LE/kw

(Q = 15.77 cu.m/s x 60 s.)

EL. = Canal Bed height at the beginning of the Canal

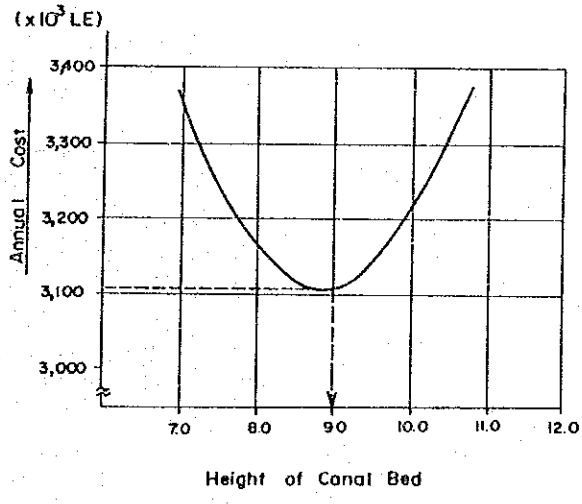


Table K-10 Pump Operation Units and Capacity (Tina Station)

Month	Q	Case 1 (ϕ2,800 x 5)			Case 2 (ϕ2,600 x 6)			Case 3 (ϕ2,200 x 3, ϕ2,500 x 3)					
		n	E	P	n	E	P	n	E	P	n	E	P
Jun.	36.6	2	104	1,800	3	82	1,810	2	100	1,080	1	107	730
Feb.	51.5	3	97	2,530	4	87	2,540	2	100	1,080	2	106	1,440
Mar.	71.3	4	101	3,510	5	96	3,520	3	100	1,620	3	92	1,880
Apr.	76.1	4	107	3,740	5	103	3,760	3	100	1,620	3	104	2,110
May	61.3	3	115	3,020	4	104	3,030	3	100	1,620	2	103	1,400
Jun.	88.1	5	100	4,330	6	99	4,350	3	100	1,620	4	99	2,690
Jul.	88.7	5	100	4,350	6	100	4,380	3	100	1,620	4	100	2,720
Aug.	73.3	4	104	3,610	5	99	3,620	3	100	1,620	3	97	1,980
Sep.	58.1	3	109	2,860	4	98	2,870	3	100	1,620	2	92	1,250
Oct.	23.5	2	66	1,160	2	79	1,160	1	100	540	1	90	620
Nov.	32.0	2	90	1,580	2	109	1,580	3	100	1,640	-	-	-
Dec.	29.6	2	84	1,460	2	100	1,460	-	-	-	2	105	1,420

Note: Q = Discharge (m^3/s)

n = Number of Pumps to be operated for Q

P = Q / pump capacity per unit x Motor Output per unit (kw)

E = Pump Capacity (%)

Table K-11 Pump Operation Units and Capacity (Balouza Station)

Month	Q	(Case-1) ϕ1,500 x 3		(Case-1) ϕ2,000 x 3		(Case-2) ϕ1,650 x 4		(Case-2) ϕ1,800 x 2		(Case-3) ϕ1,500 x 5		(Case-3) ϕ1,800 x 2		(Case-4) ϕ1,350 x 6		(Case-4) ϕ1,800 x 2	
		n	E	n	E	n	E	n	E	n	E	n	E	n	E	n	E
Jan.	17.2	-	-	2	108	-	-	2	114	2	100	1	101	-	-	2	115
Feb.	24.0	3	100	1	113	1	100	2	120	3	104	1	120	2	100	2	107
Mar.	31.7	1	100	3	111	4	100	1	103	5	100	1	103	4	100	1	103
Apr.	36.0	2	100	3	108	3	100	2	120	4	109	2	100	5	100	2	107
May	25.9	2	100	2	99	3	100	1	105	2	113	2	100	2	100	2	119
Jun.	39.0	3	100	3	100	4	100	2	100	5	100	2	100	6	100	2	100
Jul.	38.6	3	97	3	100	4	98	2	100	5	98	2	100	6	100	2	97
Aug.	31.4	1	100	3	114	2	112	2	120	5	100	1	101	4	100	2	103
Sep.	24.2	-	-	3	101	1	103	2	120	3	105	1	120	2	100	2	108
Oct.	11.7	2	117	-	-	2	98	-	-	1	88	1	100	1	100	1	103
Nov.	16.1	-	-	2	101	-	-	2	109	3	112	-	-	-	-	2	107
Dec.	14.4	1	100	1	118	2	120	-	-	3	100	-	-	3	120	-	-
Total		(18)		(26)		(26)		(18)		(41)		(14)		(35)		(20)	

Note: Q = Discharge (m^3/s)

n = Number of Pumps to be operated for Q

E = Pump Capacity (%)

Table K-12 Electric Charge

Case	Motor Power x Pump Unit kw	Total Motor Power kw	Charge (1,000 LE/yr) Fixed	Accumulated	Total
(Tina Station)					
Case - 1	870 x 5	4,350	75.7	749.5	825.2
- 2	730 x 6	4,380	76.2	754.7	830.9
- 3	680 x 4 + 540 x 3	4,340	75.5	747.8	823.3
(Balouza Station)					
Case - 1	1,590 x 3 + 1,010 x 3	7,800	135.7	1,343.9	1,479.6
- 2	1,500 x 2 + 1,210 x 4	7,840	136.4	1,350.8	1,487.2
- 3	1,500 x 2 + 970 x 5	7,850	136.6	1,352.6	1,489.2
- 4	1,500 x 2 + 820 x 6	7,920	137.8	1,364.6	1,502.4

Note: Fixed C. = Total Power x 17.4 LE/kw

Accumulated C. = Total Power x 172.3 LE/kw/yr

Table K-13 Electric Tariff per K.W. for Pump Station

Month	Monthly hr	Accumulated hr	Tariff per K.W. millimines/kw
Jan.	744	744	744 x 31.2 = 23,213
Feb.	672	1,416	256 x 31.2 + 416 x 29.4 = 20,218
Mar.	744	2,160	84 x 29.4 + 660 x 25.6 = 19,366
Apr.	720	2,880	340 x 25.6 + 380 x 22.0 = 17,064
May	744	3,624	620 x 22.0 + 124 x 16.7 = 15,711
Jun.	720	4,344	720 x 16.7 = 12,024
Jul.	744	5,088	656 x 16.7 + 88 x 14.3 = 12,214
Aug.	744	5,832	744 x 14.3 = 10,639
Sep.	720	6,552	720 x 14.3 = 10,296
Oct.	744	7,296	744 x 14.3 = 10,639
Nov.	720	8,016	720 x 14.3 = 10,296
Dec.	744	8,760	744 x 14.3 = 10,639
			Total = 172,319

Tariff for more than 500 kw

Operation Hour		Tariff	
Annual fixed cost		17.4 LE/kw	
First	1,000 hr x Max. Power	31.2	millimes/kw hr
Following	500 "	29.4	"
"	1,000 "	25.6	"
"	1,000 "	22.0	"
"	1,500 "	16.7	"
More than 5,000 hr to the end of the year		14.3	"

Table K-14 Survey Grid of El Salam Canal

IP	E	N	Distance	O	R	C.L.	T.L.	B.C.	E.C.
			m		m	m	m	m	m
	433,600	3,431,900							
1	461,320	3,432,460	26,325.370	141°02'01"	1,000	679.964	353.789	25,971.581	26,651.545
2	463,730	3,430,590	3,050.410	149°32'36"	"	531.469	272.225	29,075.941	29,607.410
3	466,210	3,430,270	2,500.560	165°03'11"	"	260.825	131.182	31,704.563	31,965.388
4	467,560	3,430 450	1,361.947	128°51'11"	500	446.258	239.276	32,956.877	33,403.135
5	468,980	3,429,100	1,959.311	193°37'09"	1,000	237.653	119.412	35,003.758	35,241.411
6	469,980	3,427,550	1,844.587	122°49'43"	500	498.821	272.448	36,694.138	37,192.959
7	472,750	3,427,550	2,770.000	245°02'14"	"	567.450	318.763	39,371.748	39,939.198
8	473,290	3,428,710	1,279.531	129°47'21"	1,000	876.177	468.548	40,431.418	41,307,595
9	475,670	3,429,340	2,461.971	194°46'12"	"	257,738	129.612	43,171.406	43,429.144
10	476,920	3,430,050	1,437.567	152°24'12"	"	481.561	245.592	44,491.507	44,973.068
11	480,070	3,430,160	3,151.920	220°40'32"	"	709.789	370.661	47,508.735	48,218.524
12	481,480	3,431,460	1,917.837	195°51'37"	"	276.760	139.297	49,626.403	49,903.163
13	482,300	3,432,800	1,570.987	133°33'32"	500	405.199	214.513	51,120.340	51,525.539
14	484,120	3,433,190	1,861.317	166°29'48"	1,000	235.634	118.388	53,053.955	53,289.589
15	485,340	3,433,160	1,220,369	184°38'30"	"	80.996	40.528	54,351.042	54,432,038
16	487,510	3,432,930	2,182.155	166°01'22"	"	243.902	122.583	56,451.082	56,694,984
17	488,300	3,433,040	797.622	166°11'26"	"	240.974	121.097	57,248.926	57,489.900
18	491,600	3,432,700	3,317.469					60,686.272	

E,N.....Coodinate of Grid o .....Inter Angle R .....Radius of Curve

C.L.....Curve Length T.L.....Tangent Length B.C. ....Beginning of Curve

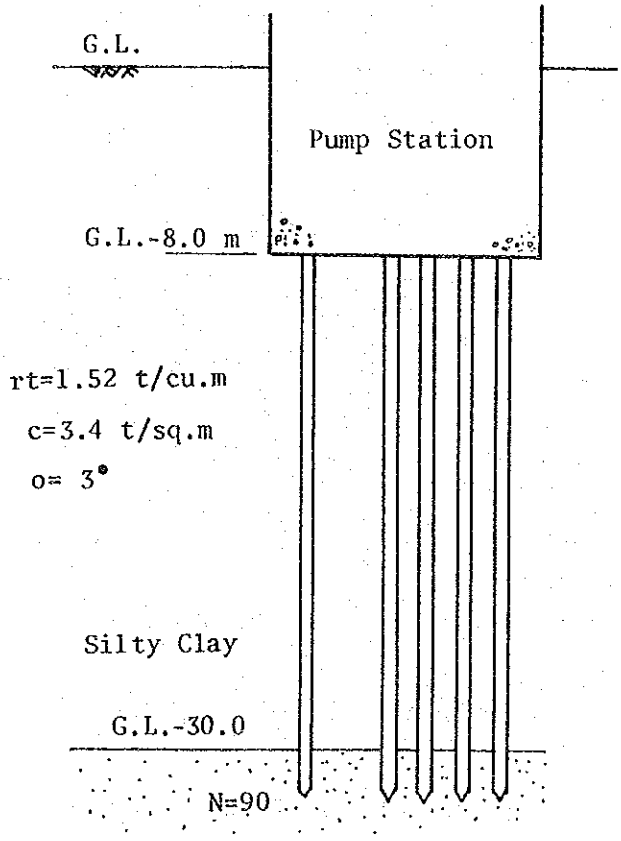
E.C. ....End of Curve

Table K-15 Soil Classification and Standard Properties

Class	Density		Void R.	Piping Resist.	Permiability k (cm/sec)	Sheer Strength			Sheer Strength	Supervision	Compactivity (%)		Foundation Resist.
	γ_{dmax} (t/m³)	w_{opt} (%)	e_0			C_0 (kg/cm²)	C_{sat} (kg/cm²)	ϕ (°)			1.4 kg/cm²	3.5 kg/cm²	
GW	>1.91	<13.3	·	High	1^{-3}~1^{-1}	($2.7^{-2}\pm1.3^{-2}$)	·	·	>38	Very High	Very Easy	<1.4	·	good
GP	>1.76	<12.4	·	H - M	5^{-3}~1^{-1}	($6.4^{-2}\pm3.4^{-2}$)	·	·	>36	High	Very Easy	<0.8	·	good
GM	>1.83	<14.5	·	H - M	1^{-7}~1^{-4}	(>3^{-7})	·	·	>34	High	Very Easy	<1.2	<3.0	good
GC	>1.84	<14.7	·	Very High	1^{-8}~1^{-6}	(>3^{-7})	·	·	>31	High	Very Easy	<1.2	<2.4	good
SW	1.91±0.08	13.3±2.5	0.37±·	H - M	5^{-4}~5^{-2}	(·)	0.40±0.04	·	38±1	Very High	Very Easy	1.4±·	·	good
SP	1.76±0.03	12.4±1.0	0.50±0.03	L - Very Low	5^{-5}~5^{-1}	(7.2^{-4})	0.23±0.06	·	36±1	High	E - M	0.8±0.3	·	g - poor
SM	1.83±0.02	14.5±0.4	0.48±0.02	M - L	1^{-7}~5^{-4}	($7.5^{-6}\pm4.8^{-6}$)	0.52±0.06	0.20±0.07	34±1	High	E - M	1.2±0.1	3.0±0.4	g - poor
SM-SC	1.91±0.02	12.8±0.5	0.41±0.02	-	—	($8.0^{-7}\pm6.0^{-7}$)	0.51±0.22	0.15±0.06	33±3	-	-	1.4±0.3	2.9±1.0	-
SC	1.84±0.02	14.7±0.4	0.48±0.01	High	1^{-8}~5^{-6}	($3.0^{-7}\pm2.0^{-7}$)	0.75±0.15	0.11±0.06	31±3	H - M	E - M	1.2±0.2	2.4±0.5	g - poor
ML	1.65±0.02	19.2±0.7	0.63±0.02	L - Very Low	1^{-8}~5^{-6}	($5.9^{-7}\pm2.3^{-7}$)	0.68±0.10	0.09±·	32±2	M - L	M - V. Difficult	1.5±0.2	2.6±0.3	poor
ML-CL	1.75±0.02	16.8±0.7	0.54±0.03	-	—	($1.3^{-7}\pm0.7^{-7}$)	0.64±0.17	0.22±·	32±3	-	-	1.0±0.2	2.2±0.0	-
CL	1.73±0.02	17.3±0.3	0.56±0.01	High	1^{-8}~1^{-6}	($8.0^{-8}\pm3.0^{-8}$)	0.88±0.10	0.13±·	28±2	Middle	E - M	1.4±0.2	2.6±0.4	g - poor
OL	·	·	·	Middle	1^{-8}~1^{-6}	(·)	·	·	·	Low	M - V. Difficult	·	·	poor
MH	1.31±0.06	36.3±3.2	1.15±0.12	M - H	1^{-9}~1^{-7}	($1.6^{-7}\pm1.0^{-7}$)	0.73±0.30	0.20±0.01	25±2	Low	D - V. Difficult	2.0±1.2	3.8±0.8	poor
CH	1.50±0.03	25.5±1.2	0.80±0.04	Very High	1^{-10}~1^{-8}	($5.0^{-8}\pm5.0^{-8}$)	1.04±0.34	0.11±0.06	19±5	L - M	Very Difficult	2.6±1.3	3.9±1.5	poor
OH	·	·	·	-	—	(·)	·	·	·	-	-	·	·	poor
Pt														

Note: Copied from the Earth and Earth Rock Dams, USBR (indicated the reliability within 90%)

Figure K-2 Bearing Capacity of the Pile at Pump Station (Tina Plain)



Qs = q x Ap + fs x U x L (Terzaghi)

Qs = Bearing Capacity
q = " of Pile top (+/m^2)
Ap = Cross Section of Tile (m^2)
fs = Coefficient of friction
(Silty clay = 3.0)
u = Circumference of pile (m)
L = Pile length (m)

$q = 3.0 \times N \times Ap = 30 \times 90 \times 0.283 = 764$ (+/m^2)

N : N's Value (= 90)

$Qs = 764 \times 0.283 + 3.0 \times 1.88 \times 22 = 340$ (t)

$Qa = 1/3 \times Qs = 113$ (t)

Qa: Bearing Capacity for long term

Item k-I, Design Criteria of Canal

1) Mean Velocity Formula

Manning's Formula was used to determine the canal cross section, as presented below.

$$V = 1/n \times R^{2/3} \times S^{1/2}$$

$$Q = A \times V$$

$$= 1/n \times A \times R^{2/3} \times S^{1/2}$$

V : Mean velocity (m/s)
n : Coefficient of roughness
R : Hydraulic mean radius (m)
S : Channel slope
A : Cross section area (m^2)
Q : Design discharge

2) Coefficient of Roughness

On the basis of "the Irrigation Canal Lining" published by the FAO in 1977 the "n" value of coefficient of roughness is adopted in the following manner.

Earth Canal ..... n = 0.022
Concrete lining canal ..... n = 0.015

The El Salam canal constructed in the west of Suez Canal is designed to applied the "n" value of 1/45.

3) Permissible Velocity

Water velocity should be within the minimum velocity of antihydrophyte to growth and maximum velocity in order not to cause erosion or unstable flow.

Factors to identify minimum velocity are indefinite, however generally they are assumed to be in the range of 0.25 - 0.4 m/s for unlined canals. Usually maximum velocity can be determined by applying kennedy's Formula as provided below:

$$Vc = cd^{m}$$

where, Vc = Kennedy critical velocity (m/sec)
C = Coefficient depending primarily on the characteristics of the material forming the canal (0.5)
d = depth of flow (m)
m = exponent varying with character of flowing water 0.64 for water containing very fine silt 0.50 for clear water

In this Tina Plain, maximum velocity is decided 0.7 m/s according to the investigation of the soil material of this area which is designed to prevent eroding.

4) Canal Section

The canal is designed to employ trapezoidal cross section and its depth, width and bed slope are determined through the case study by varying dimensions to employ the most economical section under the permissible velocity.

5) Inside Slope

To maintain a stable inside canal face, the inside slope is determined by the nature of the soil.

The slope gradient of 1:2.0 is proved its stability by the experiences already applied for the El Salam canal in the western area of Suez Canal which has a same soil with the Tina Plain area.

Usually inside slope of canal should be between 1V : 1.5 H and 1V : 2H. On the other hand, in the sandy area, its value was decided at 1 : 1.5 according to the slope stability calculation (method of Fellenius).

To keep the canal embankment with a designed gradient (1 : 1.5), it is indispensable to have the lining to prevent the saturation of embankment in the sandy area.

Slope stability calculation

- Standard soil properties in sandy area (USBR)

1. Soil Classification : SP
2. Cohesion : C = 2.3 t/m^2 (dry), 0.0 (saturated)
3. Angle of internal friction: $\phi 36°$
4. Dry density

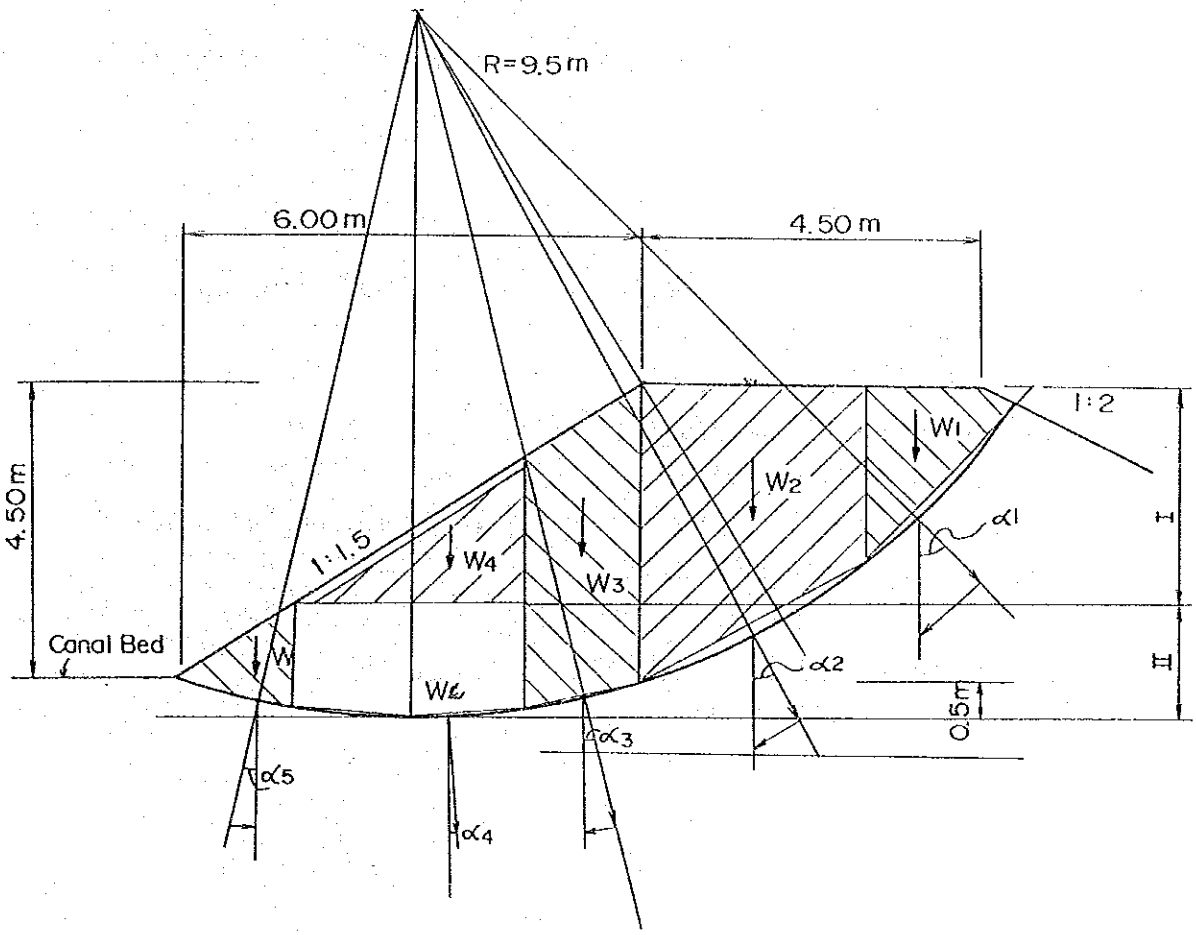
Seqment	Vert Force		W'	WN	$W_N \tan\phi$	C	1	C 1
W_1	6.20	43.86	4.30	4.47	3.25	2.3	3.3	7.59
W_2	19.54	27.85	9.13	17.28	12.55	2.3	3.4	7.82
W_3	9.77	14.44	2.43	9.87	6.87	2.3	1.5	3.45
W_4	5.28	5.88	0.54	5.25	3.81	2.3	4.4	10.12
W	7.66	-	-	7.66	5.57	2.3	3.0	6.90
Ws	1.85	11.78	0.38	1.81	1.31	2.3	1.6	3.68
Total				45.93	33.36			39.56

Moving Force Wn = 45.93

Resisting Force (Wn tanϕ + C 1) = 72.92

$$\text{Safety against sliding} = \frac{72.92}{45.93} = 1.59$$

Figure K-3 Slope Stability Calculation



AREA	m²
W1	3.52
W2	11.1
W3	5.55
W4	3.00
W5	1.05

W_ℓ = 4.35m²

α	° deg
α_1	43.86°
α_2	27.85°
α_3	14.44°
α_4	5.88°
α_5	11.78°

6) Freeboard

Water level in a canal always has the potential to rise above the designed water level.

Some of the major reasons are:

a) unexpected roughness coefficient caused by improper construction:
b) waving by wind; and
c) increase in rainfall amount

Therefore, freeboard has been designed as follows with due consideration of the above points:

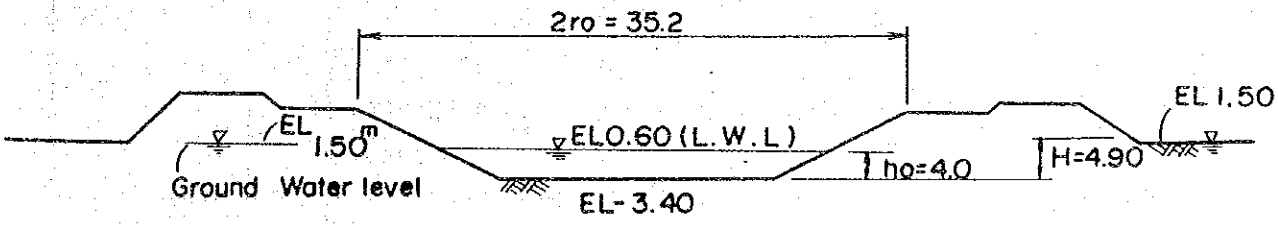
Area	Lining	Bank
	m	m
Tina Plain Area	-	0.50
Desert Area	0.40	0.40

Item k-2. Ground Water Leakage to the Canal Section in Tina Plain

After crossing the Suez Canal by the siphon laid for 1,350 m, the head losses varies from 0.30 to 0.90 m in accordance with the range of canal discharge from 23.5 to 88.7 m^3/s so that the water level at the outlet of the siphon becomes to 1.20 - 0.60 m above the sealevel as that the water level at the inlet is 1.50 m. The location of Tina Pump Station is recommended at least 2 km far from the future boundary of Suez Canal to keep the sedimentation basin for dredging.

The water level of the El Salam Canal drops more 0.10 m to cross this sedimentation area with the canal bed slope of 5/100,000. By using the geological survey results done by the Mimistry of Irrigation in 1980, the leakage of the ground water to the EL Salam Canal is estimated by the following equation.
This equation is applied to calculation of the leakage in the Tina Plain.

Consequently, the leakage discharge is little affected to the canal water.



Typical Section between Siphon Outlet and Tina Pump Station

$Q = 4 \cdot K \cdot Ro \cdot (H^2 - ho^2)$ .....Thiem's equation

Q : Ground Water leakage to the canal Section
K : Permeability (10^{-7} m/s silty clay)
ro: Canal Width
H,ho: Depth from canal bed (silty clay)

$Q = 4 \times 10^{-5} \times 35.2/2 \times (4.9^2 - 4.0^2) = 5.6 \times 10^{-5}\ m^3/s$

Item K-3 WATER CONTROL SYSTEM OF EXTENDED EL SALAM CANAL

CONTENTS

1. GENERAL

1.1 General

The objectives of this water control system are the effective and efficient use of water in the El Salam Irrigation and Drainage System by centralized control of the main facilities in the system from the Balouza Control Station.

Fig. K-4 shows the configuration of the El Salam Irrigation and Drainage System.

1.2 Controlled Facilities

Table K-11 lists the objects of this water control system.

Table K-17 Controlled Facilities

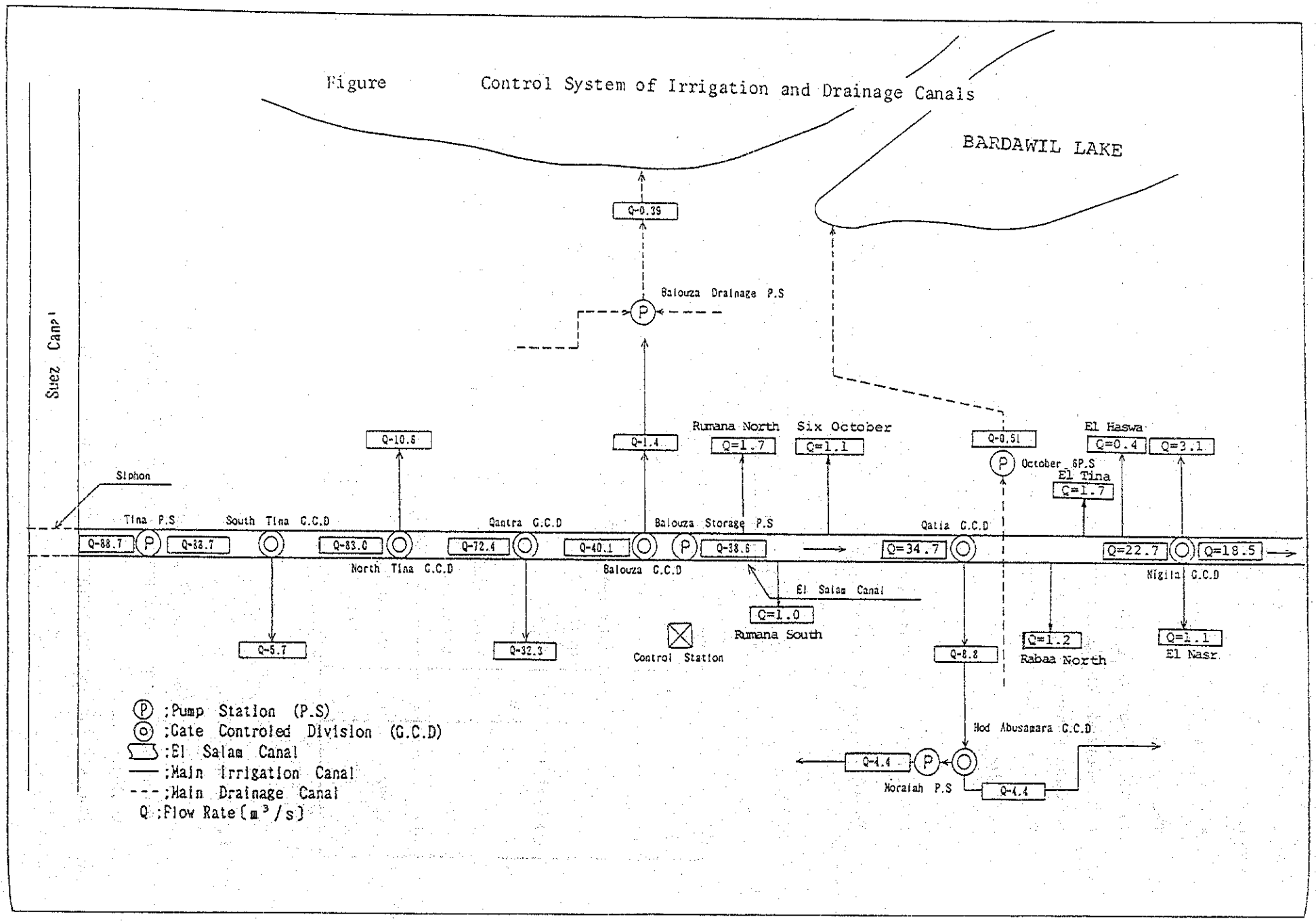
Category	No.	Facility	No. of Site	Site Name
Irrigation	1	Gate controlled division	7	South Tina, North Tina Qantra, Balouza, Qatia Hod Abusamara, Nigila
	2	Storage pump station	3	Tina, Balouza, Moraiah
Drainage	3	Drainage pump station	2	Balouza, October 6

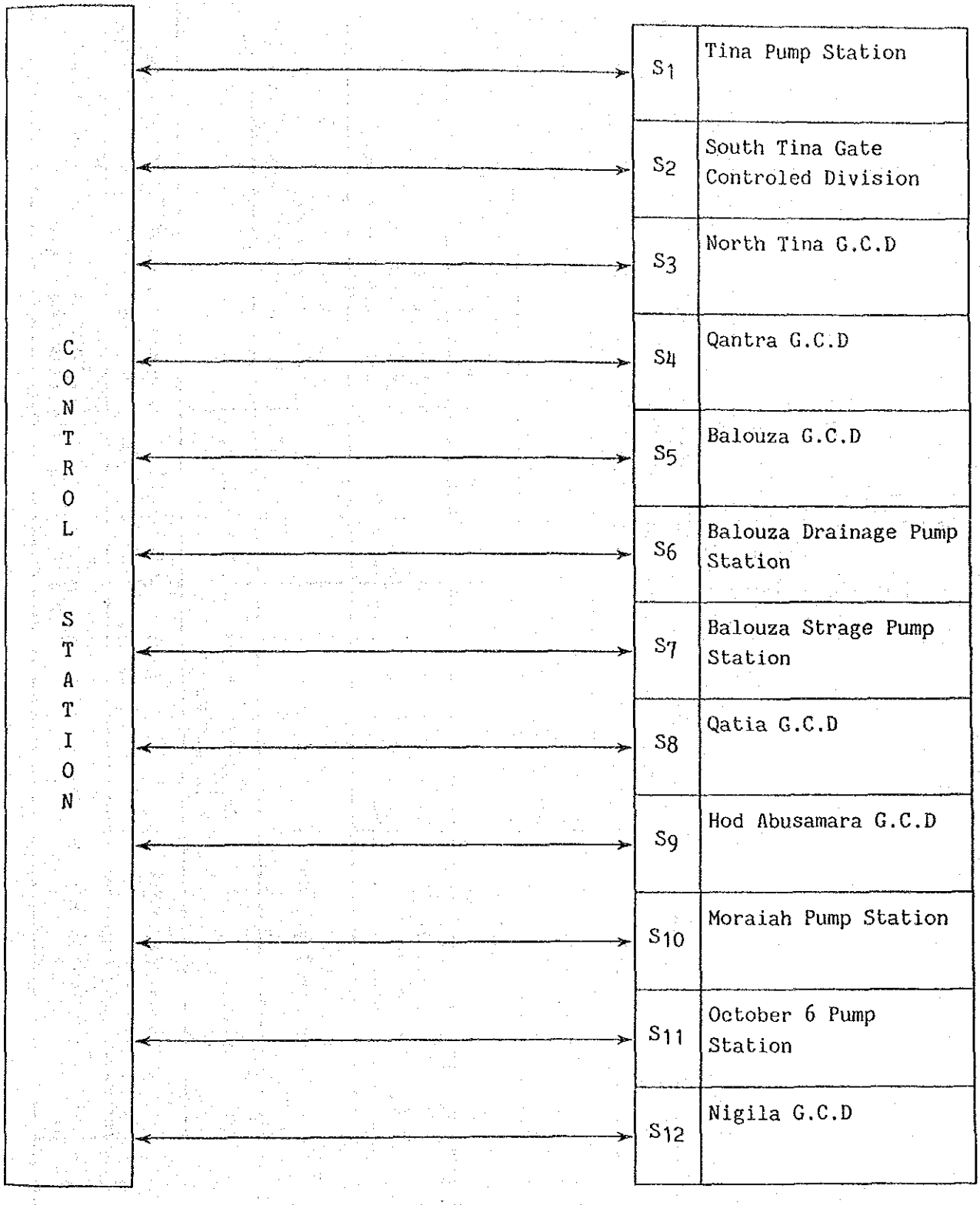
1.3 Transmission System

This water control system uses the 1-to-n direct reporting system in which the control station functions as the master station and each controlled facility as a slave station.

Fig. K-5 shows the transmission system of this water control system.

Figure Control System of Irrigation and Drainage Canals





G.C.D ; Gate Controled Division

Figure K-5 Transmission System

1.4 MEASURING AND CONTROL METHOD

(1) Muasuring methods

Table K-18 lists the measuring methods used in this water control system.

Table K-18 Measuring Methods

Facility	No.	Measuring item	Offered system		Other contract	
			Method	signal level	Method	signal level
Gate controlled-division	1	Water level (Main canal)	Pressure method Water level meter	DC 4~20mA		
	2	Water level (Diversion)	Pressure method Water level meter	DC 4~20mA		
	3	Gate opening			Potentiometer Opening gauge	DC 4~20mA
Pump station	4	Water level (Intake side)			Float type water level meter (Potentiometer)	DC 4~20mA
	5	Water level (discharging side)			Float type water level meter (Potentiometer)	
	6	Salinity	Conductivity method Salinity meter	DC 4~20mA		
	7	Discharging valve opening			Potentiometer Opening gauge	DC 4~20mA
	8	Pump wing angle			Potentiometer wing angle gauge	DC 4~20mA

(2) Control methods

This water control system uses two control methods: local manual control and remote manual control.

The remote manual control from the control station includes the control of pumps and discharging valves at the storage and drainage pump stations.

Table K-19 lists the control methods used in this water control system.

Table K-19 Control Methods

No.	Controlled facility	Control item	Control method	
			Local Manual control	Remote manual control
1	Gate at gate controlled division	Open-close control	0	
2	Storage pump	On-off control	0	0
		Wing angle control	0	0
3	Discharging valve at storage pump station	Open-close control	0	0
4	Dust remover	On-off control	0	
5	Drainage pump	On-off control	0	0

2. SYSTEM FUNCTIONS

2.1 System Configuration

The water control system consists of a control station and twelve slave stations. Each slave station collects and sends data to the control station for centralized control by the control station. The slave stations are divided into seven gate control division works and five stations.

The control station also performs remote control of the five pump stations.

Fig. K-6 shows the system configuration.

Refer to Fig.K-8 through 10 in the attached drawings for the equipment layout in the diversion works and pump stations.

2.2 Slave Station Function

(1) Gate control division

The gate controlled division collect and send data to the control station.

The collected data include the gate state supervisory signals, gate opening signals, canal and diversion water level signals, and slave station equipment state supervisory signals.

The gate control division controlled by this water control system are classified into two types by structure (depending on the presence of the main canal gate) as shown in figures K- 7 and K- 8 .

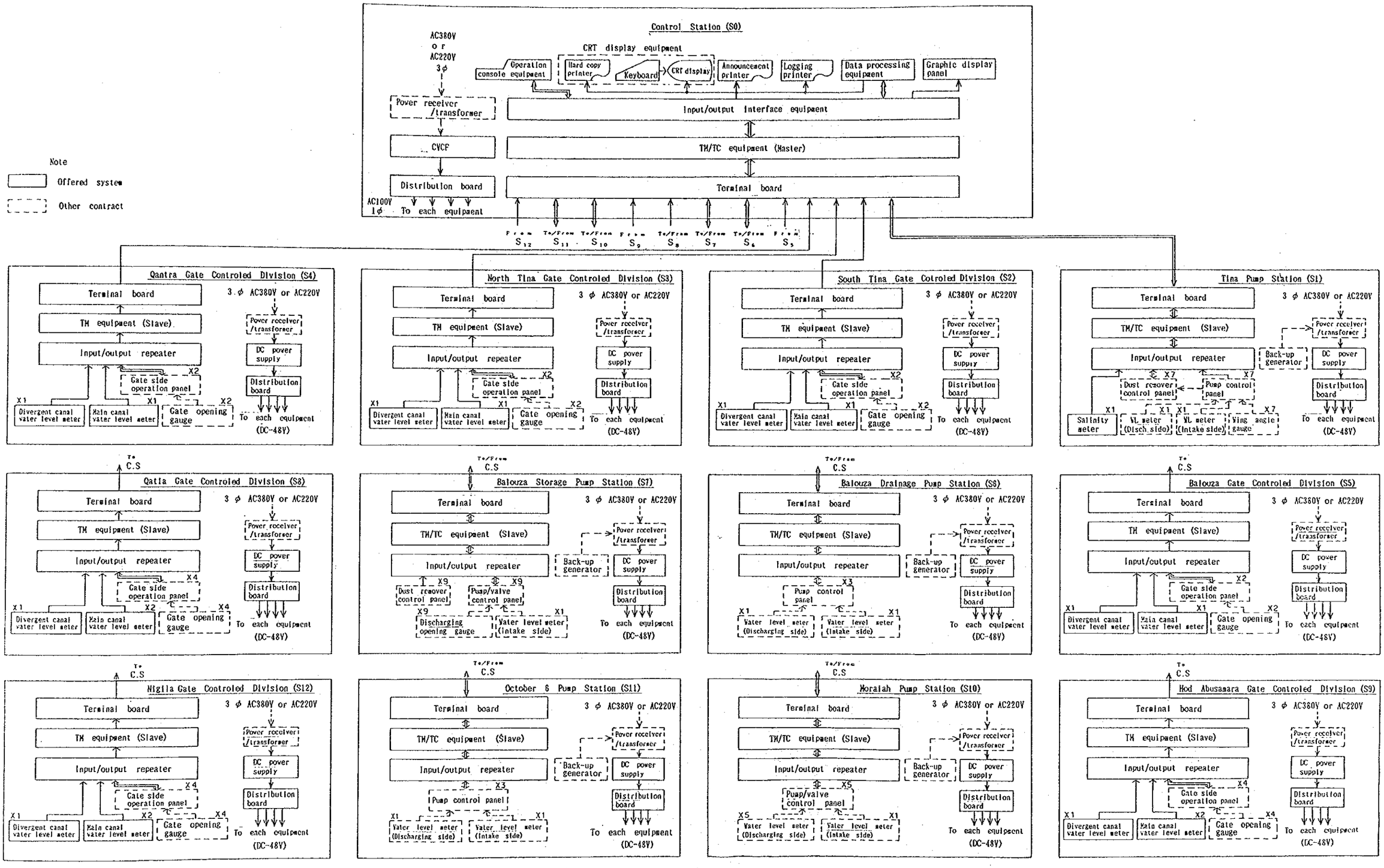
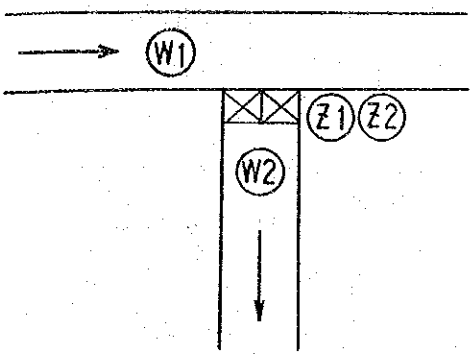


Fig.K-6 SYSTEM CONFIGURATION

(a) Gate controlled division without main canal gate

The four gate controlled division at the South Tina, North Tina, Qantra, and Balouza are of this type.



Z1 , Z2 : Diversion gate opening signals

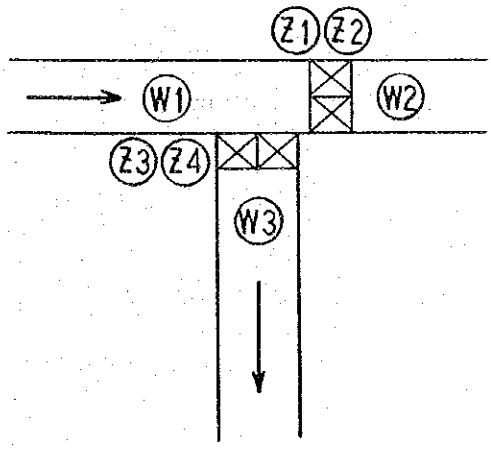
W1 : Water level (main canal upstream)

W2 : Water level (diversion)

Fig. K-7 Gate Controlled Division Configuration (Type 1)

(b) Gate controlled division with main canal gate

The three gate controlled divisions at the Qatia, Had Abusamare, and Nigila are of this type.



Z1 , Z2 : Main canal gate opening signals

Z3 , Z4 : Diversion gate opening signals

W1 , W2 : Water level (main canal upstream)

W3 : Water level (diversion)

Fig. K-8 Gate Controlled Division Configuration (Type 2)

(2) Pump station

The pump stations collect and send data to the control station. They also receive control signals from the control station and send them to the facilities to be controlled.

The collected data include the state supervisory signals for the pumps, dust removers, discharging valves, and so on; measuring data such as the water level signals and discharging valve opening signals; and the slave station equipment state supervisory signals.

The pump stations controlled by this water control system are classified into two types by purpose; storage pump stations and drainage pump stations.

There are three types of storage pump stations varying in structure and function (presence of the discharging basin, dust removers, discharging valves, and so on). Fig. K-8 through K-10 show the configurations of the pump stations.

There is only one type of drainage pump station. Fig. K-11 shows its congifuration.

(a) Storage pump staion (type 1)

This type has an intake basin, a discharging basin, and dust removers. The Tina pump station is of this type.

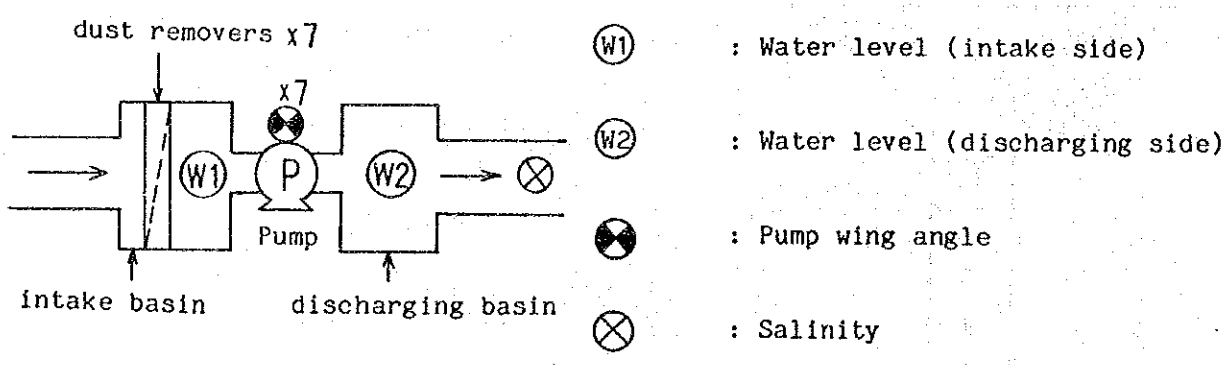


Fig. K-9 Configuration of Type 1 Storage Pump Station

(b) Storage pump staion (type 2)

This type has an intake basin, dust removers, and discharging valves. The Balouza storage pump station is of this type.

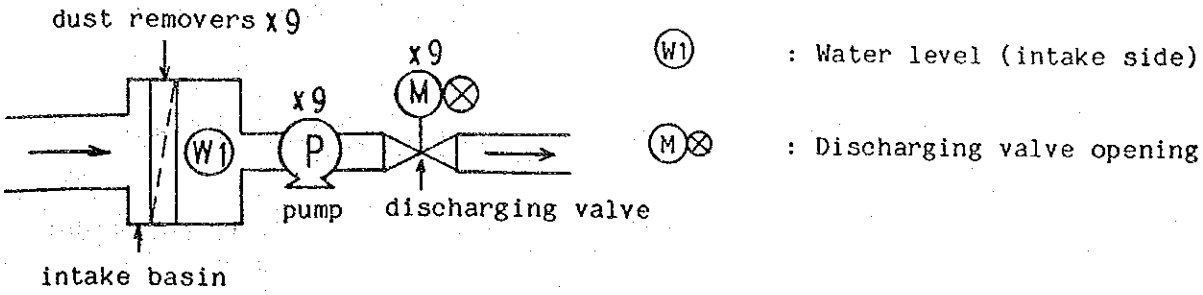


Fig. 2.5 Configuration of Type 2 Storage Pump Station

(c) Storage pump staion (type 3)

This type has an intake basin and discharging valves. The Moraiah pump station is of this type.

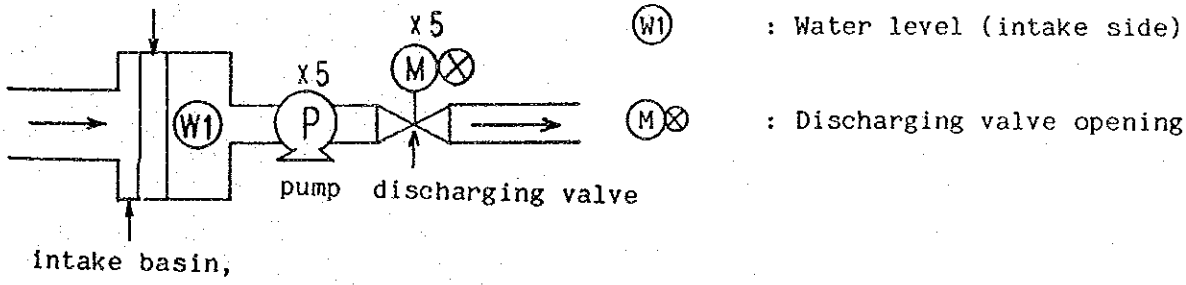


Fig. K-10 Configuration of Type 3 Storage Pump Station

(d) Drainage pump station

This type has an intake basin and a discharging basin. The Balouza drainage pump station and October 6 pump station are of this type.

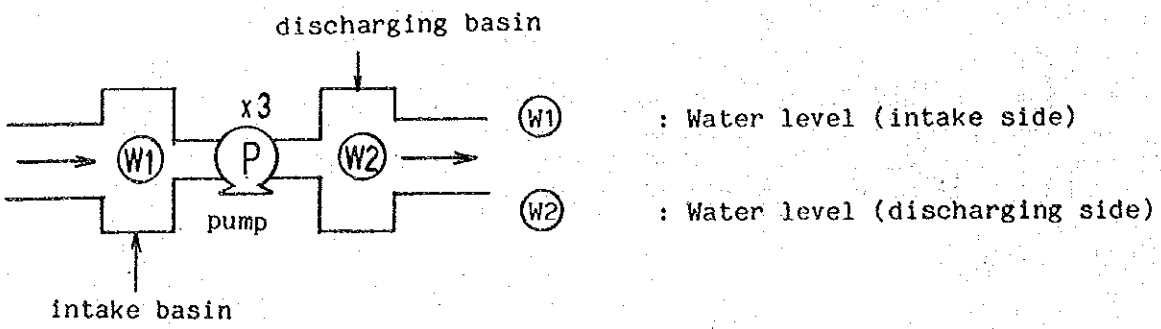


Fig. K-11 Configuration of Drainage Pump Station

Table K-20 summarizes the functions of the slave stations described above in three categories: measuring, remote supervision, and remote control.

Table K-20 Control items for each slave station

Note : Numbers enclosed in parentheses in the Measuring columns are not included in the offered system.

Station No.	Station name	Measuring							Remote supervision					Remote supervision			Remarks
		Water level (intake side)	Water level (discharging side)	Diversion works water level	Discharging valve opening	Gate opening	Pump wing angle	Salinity		Pump	Dust remover	Discharging valve	Gate		Pump	Discharging valve	Pump wing angle control	
S_1	Tina Pump Station	(1)	(1)	–	–	–	(7)	1		7	7	–	–		7	–	7	
S_2	South Tina Gate Controled Division	–	–	2	–	(2)	–	–		–	–	–	2		–	–	–	
S_3	North Tina Gate Controled Division	–	–	2	–	(2)	–	–		–	–	–	2		–	–	–	
S_4	Qantra Gate Controled Division	–	–	2	–	(2)	–	–		–	–	–	2		–	–	–	
S_5	Balouza Gate Controled Division	–	–	2	–	(2)	–	–		–	–	–	2		–	–	–	
S_6	Balouza Drainage Pump Station	(1)	(1)	–	–	–	–	–		3	–	–	–		3	–	–	
S_7	Balouza Storage Pump Station	(1)	–	–	(9)	–	–	–		9	9	9	–		9	9	–	
S_8	Qatia Gate Control Division	–	–	3	–	(4)	–	–		–	–	–	4		–	–	–	
S_9	Hod. Abusamara Gate Controled Division	–	–	3	–	(4)	–	–		–	–	–	4		–	–	–	
S_{10}	Moraiah Pump Station	(1)	–	–	(5)	–	–	–		5	–	5	–		5	5	–	
S_{11}	October 6 Pump Station	(1)	(1)	–	–	–	–	–		3	–	–	–		3	–	–	
S_{12}	Nigila Gate Controled Division	–	–	3	–	(4)	–	–		–	–	–	4		–	–	–	
Total		(5)	(3)	17	(14)	(20)	(7)	1		27	16	14	20		27	14	7	

2.3 Control Station Functions

The control station collects data transmitted from the slave stations (diversion works and pump stations) and displays, records, and processes the collected data.

The control station also performs remote supervision and control of the pump stations.

(1) Data collection

The control station collects the supervisory information and measuring data listed in Table K-6 transmitted from the slave stations.

(2) Display

The control station has three measns of displaying the collected data: a graphic display panel for constant display of irrigation and drainage water system conditions, an operation console equipment for selective display of necessary data, and a CRT display equipment.

(a) Graphic display panel

The graphic display panel displays measuring data to enable understanding of all irrigation and drainage system conditions for effective ane efficient watering.

See Fig.K-14 in the attached drawings for the graphic display panel layout.

(b) Operation console equipment

The operation console equipment displays the measuring data from the diversion workds; measuring data required for remote control from the pump stations; operating conditions of the gates, pumps, discharging valves, and other facilities; equipment states; and so forth.

(c) CRT display equipment

The CRT display equipment displays the states of the controlled facilities, measuring data, and processed data. It also displays screens for setting reference values (for the H-Q conversion, water level alarm decision, and so forth).

(3) Recording

The control station has exclusive printers for printing the results of observation and alarm information with the slave stations.

(a) Observation result print-out

The logging printer prints the measuring data transmitted from the telemetering equipment in each slave station in the form of hourly and daily reports.

(b) Announcement print-out

If an abnormal condition of a system component equipment is detected, abnormal hydranlic or hydrological data is detected, or a reference value set for alarm detection is exceeded, the announcement printer prints alarm information.

(c) CRT screen print-out

The hard copy printer prints the current CRT screen image any time upon receipt of a manual print-out request.

(4) Data processing

The data necessary for centralized control of the slave stations from the control station is input to the data processing equipment. The data processing equipment performs arithmetic operations on the data and outputs the results to the display equipment and printers.
The main arithmetic operations executed on the collected data are as follows:

(a) Totalization

The data processing equipment calculates the daily total, daily average, daily maximum, and daily minimum values from the data collected since the reference time every day.

(b) H-Q conversion

The data processing equipment performs height-quantity (H-Q) conversion on the diversion water levels received from the diversion works, then calculates the transient and integrated discharges.

(c) Other arithmetic operations

The data processing equipment also decides alarms from the measuring data values and compensates the missing measuring data.

(5) Remote supervision and control

The operation console equipment permits the remote manual control of each facility in the pump stations by selecting the facility while observing the state, opening, and other data with the selected facility on the display panel of the console.

2.4 Control Items

Table K-2 (1/14 to 14/14) lists the control items in this water control system.

Table K-21 Control Items (1/14)

Station number	S_1	Station name	Tina Pump Station	1/2

No.	Control item	Number of item			Local					Transmission			Control station																Remarks
					Sensor		Indication	Control			Carrier		Indication				Control		Processing				Recording						
		Number of facilities	Number of data items	Total	Method	Output		Manual	Automatic	Direct	Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement		
1	Water level (intake side)	1	1	1	Float type (Potentiometer)	DC4~20mA	A				○		D		D				○				○				
2	Water level alarm (intake side)	1	1	1		Contacts	L							○	○	○						○			○		Water level meter fault
3	Water level alarm (intake side)	1	2	2		Contacts	L								○	○						○			○		Upper and lower limits
4	Water level (discharging side)	1	1	1	Float type (Potentiometer)	DC4~20mA	A				○		D		D				○				○				
5	Water level alarm (discharging side)	1	1	1		Contacts	L							○	○	○						○			○		Water level meter fault
6	Water level alarm (discharging side)	1	2	2		Contacts	L								○	○						○			○		Upper and lower limits
7	Pump wing angle	7	1	7	Potentiometer	DC4~20mA	A				○			D	○				○				○				
8	Pump wing angle alarm	7	1	7		Contacts	L							○	○	○						○			○		Wing angle gauge fault
9	Salinity	1	1	1	Conductivity	DC4~20mA	A				○		D		D				○				○				
10	Salinity alarm	1	1	1		Contacts	L							○	○	○						○			○		Salinity meter fault
11	Salinity alarm	1	1	1		Contacts	L								○	○						○			○		Upper limit
12	Storage pump supervision	7	2	14		Contacts	L				○		○	○	○									○			Start and stop
13	Storage pump supervision	7	2	14		Contacts	L				○			○	○	○									○		Serious and light faults
14	Storage pump supervision	7	1	7		Contacts	L				○			○	○	○									○		Power supply
15	Storage pump supervision	7	2	14		Contacts	L				○			○											○		Local and remote supervision
16	Storage pump control	7	4	28				○				○					○										Selection, release, and stop
17	Storage pump wing angle control	7	5	35				○				○					○										Selection, release, increase, decrease, and stop

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (2/14)

Station number	S_1	Station name	Tina Pump Station	2/2

No.	Control item	Number of item			Local					Transmission			Control station																Remarks
		Number of facilities	Number of data items	Total	Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording					
					Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement			
18	Dust remover supervision	7	2	14		Contacts	L				○			○										○				Start and stop
19	Dust remover supervision	7	1	7		Contacts	L				○			○	○	○									○			Fault
20	Dust remover supervision	7	1	7		Contacts	L				○			○	○	○									○			Power supply
21	Line alarm	1	1	1		Contacts	L				○			○	○	○									○			
22	Equipment alarm	1	1	1		Contacts	L				○			○	○	○									○			

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (3/14)

Station number	S_2	Station name	South Tina G.C.D	1/1

No.	Control item	Number of item			Local					Transmission			Control station																Remarks
					Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording						
		Number of facilities	Number of data items	Total	Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement		
1	Water level (main canal)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○						
2	Water level alarm (main canal)	1	1	1		Contacts	L							○	○	○						○			○			Water level meter fault
3	Water level alarm (main canal)	1	2	2		Contacts	L								○	○						○			○			Upper and lower limits
4	Water level (diversion)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○						
5	Water level alarm (diversion)	1	1	1		Contacts	L							○	○	○						○			○			Water level meter fault
6	Water level alarm (diversion)	1	2	2		Contacts	L								○	○						○			○			Upper and lower limits
7	Transient discharge in diversion	1	1	1											D					○			○					H-Q conversion
8	Accumulated discharge in diversion	1	1	1											D						○		○					
9	Diversion gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○						
10	Diversion gate opening alarm	2	1	2		Contacts	L							○	○	○						○			○			Opening gauge fault
11	Diversion gate supervision	2	2	4		Contacts	L				○		○	○	○									○				Full open and full close
12	Diversion gate supervision	2	2	4		Contacts	L				○			○	○	○									○			Fault and power supply
13	Line alarm	1	1	1		Contacts	L				○			○	○	○									○			
14	Equipment alarm	1	1	1		Contacts	L				○			○	○	○									○			

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (4/14)

Station number	S_3	Station name	North Tina G.C.D	1/1

No.	Control item	Number of item			Local					Transmission			Control station															Remarks
		Number of facilities	Number of data items	Total	Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording				
					Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement	
1	Water level (main canal)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○			
2	Water level alarm (main canal)	1	1	1		Contacts	L							○	○	○						○				○	Water level meter fault
3	Water level alarm (main canal)	1	2	2		Contacts	L								○	○						○				○	Upper and lower limits
4	Water level (diversion)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○				
5	Water level alarm (diversion)	1	1	1		Contacts	L							○	○	○						○				○	Water level meter fault
6	Water level alarm (diversion)	1	2	2		Contacts	L								○	○						○				○	Upper and lower limits
7	Transient discharge in diversion	1	1	1											D					○			○				H-Q conversion
8	Accumulated discharge in diversion	1	1	1											D						○		○				
9	Diversion gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○				
10	Diversion gate opening alarm	2	1	2		Contacts	L							○	○	○						○				○	Opening gauge fault
11	Diversion gate supervision	2	2	4		Contacts	L				○		○	○	○									○			Full open and full close
12	Diversion gate supervision	2	2	4		Contacts	L				○			○	○	○										○	Fault and power supply
13	Line alarm	1	1	1		Contacts	L				○			○	○	○										○	
14	Equipment alarm	1	1	1		Contacts	L				○			○	○	○										○	

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (5/14)

Station number	S_4	Station name	Qantra G.C.D	1/1

No.	Control item	Number of item			Local					Transmission			Control station																Remarks
					Sensor		Indication	Control			Carrier		Indication				Control		Processing				Recording						
		Number of facilities	Number of data items	Totoal	Method	Output		Manual	Automatic	Direct	Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement		
1	Water level (main canal)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○					Water level meter fault
2	Water level alarm (main canal)	1	1	1		Contacts	L							○	○	○						○			○			Upper and lower limits
3	Water level alarm (main canal)	1	2	2		Contacts	L								○	○						○			○			
4	Water level (diversion)	1	1	1	Pressur	DC4~20mA	A				○		D		D				○				○					
5	Water level alarm (diversion)	1	1	1		Contacts	L							○	○	○						○			○			Water level meter fault
6	Water level alarm (diversion)	1	2	2		Contacts	L								○	○						○			○			Upper and lower limits
7	Transient discharge in diversion	1	1	1											D					○			○					H-Q conversion
8	Accumulated discharge in diversion	1	1	1											D						○		○					
9	Diversion gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○					
10	Diversion gate opening alarm	2	1	2		Contacts	L							○	○	○						○			○			Opening gauge fault
11	Diversion gate supervision	2	2	4		Contacts	L				○		○	○	○									○				Full open and full close
12	Diversion gate supervision	2	2	4		Contacts	L				○			○	○	○									○			Fault and power supply
13	Line alarm	1	1	1		Contacts	L				○			○	○	○									○			
14	Equipment alarm	1	1	1		Contacts	L				○			○	○	○									○			

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (6/14)

Station number	S_5	Station name	Balouza G.C.D	1/1

No.	Control item	Number of item			Local					Transmission			Control station																Remarks
					Sensor		Indication	Control					Indication				Control		Processing				Recording						
		Number of facilities	Number of data items	Total	Method	Output		Manual	Automatic	Direct	Carrier: Telemetering	Carrier: Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement				
1	Water level (main canal)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○						
2	Water level alarm (main canal)	1	1	1		Contacts	L							○	○	○						○			○				Water level meter fault
3	Water level alarm (main canal)	1	2	2		Contacts	L								○	○						○			○				Upper and lower limits
4	Water level (diversion)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○						
5	Water level alarm (diversion)	1	1	1		Contacts	L							○	○	○						○			○				Water level meter fault
6	Water level alarm (diversion)	1	2	2		Contacts	L								○	○						○			○				Upper and lower limits
7	Transient discharge in diversion	1	1	1											D					○			○						H-Q conversion
8	Accumulated discharge in diversion	1	1	1											D						○		○						
9	Diversion gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○						
10	Diversion gate opening alarm	2	1	2		Contacts	L							○	○	○						○			○				Opening gauge fault
11	Diversion gate supervision	2	2	4		Contacts	L				○		○	○	○									○					Full open and full close
12	Diversion gate supervision	2	2	4		Contacts	L				○			○	○	○									○				Fault and power supply
13	Line alarm	1	1	1		Contacts	L				○			○	○	○									○				
14	Equipment alarm	1	1	1		Contacts	L				○			○	○	○									○				

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (7/14)

Station number	S_6	Station name	Balouza Drainage P.S	1/1

No.	Control item	Number of item			Local					Transmission			Control station																Remarks
		Number of facilities	Number of data items	Totoal	Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording					
					Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement	
1	Water level (intake side)	1	1	1	Float type (Potentiometer)	DC4~20mA	A				○		D		D				○				○			
2	Water level alarm (intake side)	1	1	1			L							○	○	○						○			○	Water level meter fault
3	Water level alarm (intake side)	1	2	2			L								○	○						○			○	Upper and lower limits
4	Water level (discharging side)	1	1	1	Float type (Potentiometer)	DC4~20mA	A				○		D		D				○				○			
5	Water level alarm (discharging side)	1	1	1			L							○	○	○						○			○	Water level meter fault
6	Water level alarm (discharging side)	1	2	2			L								○	○						○			○	Upper and lower limits
7	Discharging pump supervision	3	2	6		Contacts	L				○		○	○	○									○		Start and stop
8	Discharging pump supervision	3	2	6		Contacts	L				○			○	○	○									○	Serious and light faults
9	Discharging pump supervision	3	1	3		Contacts	L				○			○	○	○									○	Power supply
10	Discharging pump supervision	3	2	6		Contacts	L				○			○											○	Local and remote supervision
11	Discharging pump control	3	4	12				○				○					○									Selection, release, start, and stop
12	Line alarm	1	1	1		Contacts	L				○			○		○									○	
13	Equipment alarm	1	1	1		Contacts	L				○			○		○									○	

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (8/14)

Station number	S7	Station name	Balouza Storage P.S	1/2

No.	Control item	Number of item			Local					Transmission			Control station																Remarks
		Number of facilities	Number of data items	Total	Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording					
					Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement		
1	Water level (intake side)	1	1	1	Float type (Potentiometer)	DC4~20mA	A				○		D		D				○				○					Water level meter fault
2	Water level alarm (intake side)	1	1	1		Contacts	L							○	○	○						○			○			Upper and lower limits
3	Water level alarm (intake side)	1	2	2		Contacts	L								○	○						○			○			
4	Storage pump supervision	9	2	18		Contacts	L				○		○	○	○									○				Start and stop
5	Storage pump supervision	9	2	18		Contacts	L				○			○	○	○									○			Serious and light faults
6	Storage pump supervision	9	1	9		Contacts	L				○			○	○	○									○			Power supply
7	Storage pump supervision	9	2	18		Contacts	L				○			○											○			Local and remote supervision
8	Storage pump control	9	4	36				○				○					○											Selection, release, start, and stop
9	Discharging valve opening	9	1	9	Potentiometer	DC4~20mA	A				○			D					○				○					
10	Discharging valve opening alarm	9	1	9		Contacts	L				○			○	○	○						○			○			Opening gauge fault
11	Discharging valve supervision	9	2	18		Contacts	L				○		○	○	○													Full open and full close
12	Discharging valve supervision	9	2	18		Contacts	L				○			○										○				Opening and closing
13	Discharging valve supervision	9	2	18		Contacts	L				○			○	○	○									○			Fault and power supply
14	Discharging valve supervision	9	2	18		Contacts	L				○			○											○			Local and remote supervision
15	Discharging valve control	9	5	45				○				○					○											Selection, release, open, close, and stop

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (9/14)

Station number	S_7	Station name	Balouza Storage P.S	2/2

No.	Control item	Number of item			Local					Transmission			Control station																		Remarks
					Sensor		Indi-cation	Control		Direct	Carrier		Indication				Control		Processing				Recording								
		Number of facili-ties	Number of data items	Totoal	Method	Output		Manual	Auto-matic		Tele-meter-ing	Tele-control	Graphic display panel	Opera-tion console equip-ment	CRT	Alarm	Manual	Setting	Conver-sion	Calcu-lation	Integra-tion	Alarm deci-sion	Hourly and daily reports	Control history	An-nounce-ment						
16	Dust remover supervision	9	2	18		Contacts	L				○			○										○						Start and stop
17	Dust remover supervision	9	1	9		Contacts	L				○			○	○	○									○						Fault
18	Dust remover supervision	9	1	9		Contacts	L				○			○	○	○									○						Power supply
19	Line alarm	1	1	1		Contacts	L				○			○	○	○									○						
20	Equipment alarm	1	1	1		Contacts	L				○			○	○	○									○						

Note : Display type
A : Analog display
D : Digital display
L : Lamp indication

Control Items (10/14)

Station number	S_8	Station name	Qatia G.C.D	1/1

No.	Control item	Number of item			Local					Transmission			Control station																Remarks
		Number of facilities	Number of data items	Total	Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording					
					Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement		
1	Water level (main canal)	2	1	2	Pressure	DC4~20mA	A				○		D		D				○				○					
2	Water level alarm (intake side)	2	1	2		Contacts	L							○	○	○						○			○			Water level meter fault
3	Water level alarm (intake side)	2	2	4		Contacts	L								○	○						○			○			Upper and lower limits
4	Water level (diversion)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○					
5	Water level alarm (diversion)	1	1	1		Contacts	L							○	○	○						○			○			Water level meter fault
6	Water level alarm (diversion)	1	2	2		Contacts	L								○	○						○			○			Upper and lower limits
7	Transient discharge in diversion	1	1	1											D					○			○					H-Q conversion
8	Accumulated discharge in diversion	1	1	1											D						○		○					
9	Main canal gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○					
10	Main canal gate opening alarm	2	1	2		Contacts	L							○	○	○						○			○			Opening gauge fault
11	Main canal gate supervision	2	2	4		Contacts	L				○		○	○	○									○				Full open and full close
12	Main canal gate supervision	2	2	4			L				○			○	○	○									○			Fault and power supply
13	Diversion gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○					
14	Diversion gate opening alarm	2	1	2		Contacts	L							○	○	○						○			○			Opening gauge fault
15	Diversion gate supervision	2	2	4		Contacts	L				○		○	○	○									○				Full open and full close
16	Diversion gate supervision	2	2	4		Contacts	L				○			○		○									○			Fault and power supply
17	Line alarm	1	1	1		Contacts	L				○			○	○	○									○			
18	Equipment alarm	1	1	1		Contacts	L				○			○	○	○									○			

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (11/14)

Station number	S_9	Station name	Hod. Abusamara G.C.D	1/1

No.	Control item	Number of item			Local					Transmission			Control station																		Remarks
		Number of facilities	Number of data items	Total	Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording								
					Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement						
1	Water level (main canal)	2	1	2	Pressure	DC4~20mA	A				○		D		D				○				○								
2	Water level alarm (intake side)	2	1	2		Contacts	L							○	○	○						○			○						Water level meter fault
3	Water level alarm (intake side)	2	2	4		Contacts	L								○	○						○			○						Upper and lower limits
4	Water level (diversion)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○								
5	Water level alarm (diversion)	1	1	1		Contacts	L							○	○	○						○			○						Water level meter fault
6	Water level alarm (diversion)	1	2	2		Contacts	L								○	○						○			○						Upper and lower limits
7	Transient discharge in diversion	1	1	1											D					○			○								H-Q conversion
8	Accumulated discharge in diversion	1	1	1											D						○		○								
9	Main canal gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○								
10	Main canal gate opening alarm	2	1	2		Contacts	L							○	○	○						○			○						Opening gauge fault
11	Main canal gate supervision	2	2	4		Contacts	L				○		○	○	○									○								Full open and full close
12	Main canal gate supervision	2	2	4			L				○			○	○	○									○						Fault and power supply
13	Diversion gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○								
14	Diversion gate opening alarm	2	1	2		Contacts	L							○	○	○						○			○						Opening gauge fault
15	Diversion gate supervision	2	2	4		Contacts	L				○		○	○	○									○								Full open and full close
16	Diversion gate supervision	2	2	4		Contacts	L				○			○		○									○						Fault and power supply
17	Line alarm	1	1	1		Contacts	L				○			○	○	○									○						
18	Equipment alarm	1	1	1		Contacts	L				○			○	○	○									○						

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (12/14)

Station number	S_{10}	Station name	Moraiah P.S	1/1

No.	Control item	Number of item			Local					Transmission			Control station															Remarks
		Number of facilities	Number of data items	Total	Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording			
					Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement	
1	Water level (intake side)	1	1	1	Float type (Potentiometer)	DC4~200mA	A				○		D		D				○				○			
2	Water level alarm (intake side)	1	1	1		Contacts	L							○	○	○						○			○	Water level meter fault
3	Water level alarm (intake side)	1	2	2		Contacts	L								○	○						○			○	Upper and lower limits
4	Storage pump supervision	5	2	10		Contacts	L				○		○	○	○									○		Start and stop
5	Storage pump supervision	5	2	10		Contacts	L				○			○	○	○									○	Serious and light faults
6	Storage pump supervision	5	1	5		Contacts	L				○			○	○	○									○	Power supply
7	Storage pump supervision	5	2	10		Contacts	L				○			○											○	Local and remote supervision
8	Storage pump control	5	4	20				○				○					○									Selection, release, start, and stop
9	Discharging valve opening	5	1	5	Potentiometer	DC4~200mA	A				○			D					○				○			
10	Discharging valve opening alarm	5	1	5		Contacts	L				○			○	○	○						○			○	Opening gauge fault
11	Discharging valve supervision	5	2	10		Contacts	L				○		○	○	○											Full open and full close
12	Discharging valve supervision	5	2	10		Contacts	L				○			○										○		Opening and closing
13	Discharging valve supervision	5	2	10		Contacts	L				○			○	○	○									○	Fault and power supply
14	Discharging valve supervision	5	2	10		Contacts	L				○			○											○	Local and remote supervision
15	Discharging valve con	5	5	25				○				○					○									Selection, release, open, close, and stop
16	Line alarm	1	1	1		Contacts	L				○			○		○									○	
17	Equipment alarm	1	1	1		Contacts	L				○			○		○									○	

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (13/14)

Station number	S_{11}	Station name	October 6 P.S	1/1

No.	Control item	Number of item			Local					Transmission			Control station																		Remarks
		Number of facilities	Number of data items	Totoal	Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording								
					Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement						
1	Water level (intake side)	1	1	1	Float type (Potentiometer)	DC4~20mA	A				○		D		D				○				○							
2	Water level alarm (intake side)	1	1	1			L							○	○	○						○			○					Water level meter fault
3	Water level alarm (intake side)	1	2	2			L								○	○						○			○					Upper and lower limits
4	Water level (discharging side)	1	1	1	Float type (Potentiometer)	DC4~20mA	A				○		D		D				○				○							
5	Water level alarm (discharging side)	1	1	1			L							○	○	○						○			○					Water level meter fault
6	Water level alarm (discharging side)	1	2	2			L								○	○						○			○					Upper and lower limits
7	Discharging pump supervision	3	2	6		Contacts	L				○		○	○	○									○						Start and stop
8	Discharging pump supervision	3	2	6		Contacts	L				○			○	○	○									○					Serious and light faults
9	Discharging pump supervision	3	1	3		Contacts	L				○			○	○	○									○					Power supply
10	Discharging pump supervision	3	2	6		Contacts	L				○			○											○					Local and remote supervision
11	Discharging pump control	3	4	12				○				○					○													Selection, release, start, and stop
12	Line alarm	1	1	1		Contacts	L				○			○		○									○					
13	Equipment alarm	1	1	1		Contacts	L				○			○		○									○					

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

Control Items (14/14)

Station number	S_{12}	Station name	Nigila G.C.D	1/1

No.	Control item	Number of item			Local					Transmission			Control station																Remarks
		Number of facilities	Number of data items	Total	Sensor		Indication	Control		Direct	Carrier		Indication				Control		Processing				Recording					
					Method	Output		Manual	Automatic		Telemetering	Telecontrol	Graphic display panel	Operation console equipment	CRT	Alarm	Manual	Setting	Conversion	Calculation	Integration	Alarm decision	Hourly and daily reports	Control history	Announcement		
1	Water level (main canal)	2	1	2	Pressure	DC4~20mA	A				○		D		D				○				○					
2	Water level alarm (intake side)	2	1	2		Contacts	L							○	○	○						○			○			Water level meter fault
3	Water level alarm (intake side)	2	2	4		Contacts	L								○	○						○			○			Upper and lower limits
4	Water level (diversion)	1	1	1	Pressure	DC4~20mA	A				○		D		D				○				○					
5	Water level alarm (diversion)	1	1	1		Contacts	L							○	○	○						○			○			Water level meter fault
6	Water level alarm (diversion)	1	2	2		Contacts	L								○	○						○			○			Upper and lower limits
7	Transient discharge in diversion	1	1	1											D					○			○					H-Q conversion
8	Accumulated discharge in diversion	1	1	1											D						○		○					
9	Main canal gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○					
10	Main canal gate opening alarm	2	1	2		Contacts	L							○	○	○						○			○			Opening gauge fault
11	Main canal gate supervision	2	2	4		Contacts	L				○		○	○	○									○				Full open and full close
12	Main canal gate supervision	2	2	4			L				○			○	○	○									○			Fault and power supply
13	Diversion gate opening	2	1	2	Potentiometer	DC4~20mA	A				○			D					○				○					
14	Diversion gate opening alarm	2	1	2		Contacts	L							○	○	○						○			○			Opening gauge fault
15	Diversion gate supervision	2	2	4		Contacts	L				○		○	○	○									○				Full open and full close
16	Diversion gate supervision	2	2	4		Contacts	L				○			○		○									○			Fault and power supply
17	Line alarm	1	1	1		Contacts	L				○			○	○	○									○			
18	Equipment alarm	1	1	1		Contacts	L				○			○	○	○									○			

Note : Display type

A : Analog display

D : Digital display

L : Lamp indication

3. EQUIPMENT CONFIGURATION AND SPECIFICATIONS

3.1 Equipment Configuration

Table K-23 shows the equipment configuration of this water control system.

3.2 Equipment Specifications

3.2.1 General Specification

(1) Environmental conditions

Table K-22 shows the ambient conditions of the equipment in the water control system.

Table K-22 Ambient Conditions

Item / Equipment	Temperature (°C)	Relative humidity (%)
Outdoor equipment (measuring instruments)	0 ~ 40	30 ~90
Indoor equipment	0 ~ 40	45 ~ 85
Control station	5 ~ 35	45 ~ 80
Printer	10 ~ 35	45 ~ 80

(2) Power requirements

(a) Control station : 380 or 220V AC, 50Hz

(b) Slave stations : 380 or 220V AC, 50Hz

Table K-23 Equipment Configuration

Master station		Slave stations												
Equipment	Control station	Equipment	Tina pump station	Sourth Tina G.C.D	Norrth Tina G.C.D.	Qantra G.C.D.	Balouza G.C.D.	Balouza drainage pump station	Balouza strage pump station (M.C)	Qatia G.C.D.	H. Abu-samara G.C.D.	Moraiah pump station	October 6 pump station	Nigila G.C.D.
TM/TC equipment (master)	1	TM equipment (slave)		1	1	1	1			1	1			1
Data processing equipment	1	TM/TC equipment (slave)	1					1	1			1	1	
I/O interface equipment	1	Input/output repeater	1	1	1	1	1	1	1	1	1	1	1	1
Graphic display panel	1	Water level meter (intake side)	(1)					(1)	(1)			(1)	(1)	
CRT display equipment	1	Water level meter (intake side)	(1)					(1)					(1)	
Hard copy printer	1	Water level meter (discharging side)		2	2	2	2			3	3			3
Logging printer	1	Water level meter (irrigation canal)	(7)											
Announcement printer	1	Gate opening gauge		(2)	(2)	(2)	(2)			(4)	(4)			(4)
Operation console equipment	1	Discharging valve opening gauge							(9)			(5)		
Terminal board	1	Salinity meter	1											
Distribution board	1	Pump control panel	(7)					(3)					(3)	
CVCF	1	Pump/valve control panel							(9)			(5)		
		Dust remover control panel	(7)						(9)					
		Gate side operation panel		(2)	(2)	(2)	(2)			(4)	(4)			(4)
		Terminal board	1	1	1	1	1	1	1	1	1	1	1	1
		Distribution board	1	1	1	1	1	1	1	1	1	1	1	1
		Back-up generator	(1)					(1)	(1)			(1)	(1)	
		DC power supply	1	1	1	1	1	1	1	1	1	1	1	1

TM : Telemetering
TM/TC : Telemetering/telecontrol
P.S : Pump station
G.C.D : Gate controled division
( ) : Other contract

3.2.2 Control Station

(1) TM/TC equipment (master)

This equipment receives information from the slave stations and transmits information from the control station to the slave stations.

(a) Structure : Indoor enclosed stand-alone type

(b) Configuration

(i) Line switching unit : 1 set
(ii) Modulator/demodulator unit : 1 set
(iii) Telemetering receiver unit : 1 set
(vi) Telecontrol transmitter unit : 1 set
(v) Order wire telephone unit : 1 set
(vi) Power supply unit : 1 set

(c) Reporting system : 1-to-n direct reporting

(d) Transmission system : Cyclic

(e) Coding system : Non-return-to-zero (NRZ)
Equal-length code

(f) Synchronizing system : Word or frame synchronizing system

(g) Error checking system

(i) Measuring and Supervision : Combination of parity checking and inversion-repetition checking, or a checking system with equivalent or higher precision

(ii) Control : Combination of inversion- repetition checking, parity checking, and R-out-of-N code checking, or a checking system with equivalent or higher precision

(iii) Transmission speed : 200 bps

(2) Data processing equipment

The data processing equipment performs various arithmetic and printer control operations.

(a) Structure : Indoor, enclosed, stand-alone type

(b) Configuration

(i)	Arithmetic control unit	: 1 set
(ii)	Memory unit	: 1 set
(iii)	Printer control unit	: 1 set
(iv)	Input/output control unit	: 1 set
(v)	Power supply unit	: 1 set

(c) Arithmetic control unit

(i)	Operation methods	: Fixed-and floating-point arithmetic operations
(ii)	Instructions	: 56 basic instructions
(iii)	Interrupts	: 3 internal and 4 external interrupts

(d) Memory

(i)	Main element	: ICs
(ii)	Word length	: 16 bits or more
(iii)	Capacity	: 1M byte or more

(3) I/O interface equipment

The I/O interface equipment intervenes between the data processing equipment and other equipment in the control station and transfers and converts signals between them.

(a) Structure : Indoor enclosed stand-alone type

(b) Configuration

(i)	TM/TC equipment (master) interface unit	: 1 set
(ii)	Operation console equipment interface unit	: 1 set
(iii)	Data processing equipment interface unit	: 1 set
(vi)	Graphic display panel interface unit	: 1 set
(v)	Power supply unit	: 1 set

(4) Graphic display panel

The graphic display panel provides a mimic diagram of the water system and displays the main information on the water system constantly.

(a) Structure : Indoor, enclosed, stand-alone type

(b) Configuration

(i) Water system mimic diagram : 1 screen (mosaic type)

(ii) Digital display : 1 set

- Water level
- Salinity

(iii) State indicators (lighting symbols) : 1 set

- States of pumps and discharging valves
- States of gates

(5) CRT display equipment

The CRT display equipment displays various data and permits setting of reference values.

(a) Screen size : 20 inches

(b) Display colors : 7

(c) Display functions : Graphic display and alphanumeric character display

(6) Hard copy printer

The hard copy printer prints the CRT display screen image.

(a) Printing system : Dot matrix

(b) Print size : B4

(c) Printing speed : 80 characters per second for alphanumeric characters

(d) Printing colors : 4

(7) Logging printer

The logging printer prints the control history, hourly report, and daily report.

(a) Printing system	:	Dot matrix
(b) Printing speed	:	80 characters per second for alphanumeric characters
(c) Maximum print line length	:	128 characters
(d) Character set	:	JIS or ASCII character set
(e) Printing colors	:	Black

(8) Announcement printer

The announcement printer prints the fault report and state change report. The specifications are the same as the logging printer.

(9) Operation console equipment

The operation console equipment permits supervision and control of the pumps and discharging valves and supervision of the gate, dust removers, and other facilities.

(a) Structure : Indoor, desk type

(b) Display panel configuration

(i) Digital display : 1 set

(ii) Indicator lamps : 1 set

- Pump state indication
- Gate and valve state indication
- Control and slave station equipment state indication
- Transmission line state indication

(c) Control panel configuration

(i) Control switches : 1 set
- Common control switches
- Pump control switches
- Discharging valve control switches

(ii) Order wire telephone
- Station select switches : 1 set
- Handset : 1 set

(d) Equipment in the console
(i) Display control unit : 1 set
(ii) Power supply unit : 1 set

(10) Terminal board

The terminal board interconnects the interior and outdoor wires of the transmission lines.

(a) Structure : Indoor, enclosed, wall type

(b) Configuration
Terminals : 1 set

(11) Distribution board

The distribution board supplies 100V AC power output from the CVCF to each equipment in the station.

(a) Structure : Indoor, enclosed, wall type

(b) Configuration
circuit breaker : 1 set

(12) CVCF

The constant voltage and constant frequency (CVCF) power supply absorbs various disturbances of the commercial power supply and supplies a constant-voltage constant-frequency power to each equipment in the station through the distribution board.

(a) Structure : Indoor, enclosed, stand-alone type

(b) Configuration

(i) Rectifier : 1 set
(ii) Inverter : 1 set
(iii) Batteries : 1 set
(iv) CVCF-direct supply switch : 1 set

(c) Input and output voltages

(i) Input voltage : 380V AC ±15% or 220V AC ±15%
(ii) Output voltage : 100V AC ±15%

(d) Capacity

Table K-24 lists the estimated power consumption of each pieces of equipment in the control station.

Table K-24 Power consumption (Estimation)

Equipment name	Power consumption (VA)
TM/TC equipment (master)	800
Data processing equipment	500
I/O interface equipment	300
Graphic display pane	500
CRT display equipment	300
Hard copy printer	200
Operation console equipment	300
Total	2,400

The power consumption of the no-break equipment is 2.4k VA; however, it is best to estimate the power consumption as 5k VA considering the peak load.

3.2.3 Slave Station

(1) TM/TC equipment (Slave)

This equipment transmits information from the slave station to the control station and receives information from the control station.

(a) Structure : Indoor, enclosed, stand-alone type

(b) Configuration

(i)	Modulator/demodulator unit	: 1 set
(ii)	Telemetering transmitter unit	: 1 set
(iii)	Telecontrol receiver unit	: 1 set
(iv)	Order wire telephone unit	: 1 set
(v)	Power supply unit	: 1 set

The transmission system and other specifications are the same as those listed in (1) Section 3.2.2.

(2) TM equipment (Slave)

This equipment transmits information from the slave station to the control station.

(a) Structure : Indoor, enclosed, stand-alone type

(b) Configuration

(i)	Modulator/demodulator unit	: 1 set
(ii)	Telemetering transmitter unit	: 1 set
(iii)	Telecontrol receiver unit	: 1 set
(iv)	Order wire telephone unit	: 1 set
(v)	Power supply unit	: 1 set

The transmission system and other specifications are the same as those listed in (1) Section 3.2.2.

(3) Input/output repeater

The input/output repeater tranmsfers signals between the TM/TC or TM equipment (slave) and various facilities including the water level meters, pump control panel, and gate side operation panels.

(a) Structure : Indoor, enclosed, stand-alone type

(b) Configuration

(i) Instrumentation arrester : 1 set
(ii) Instrumentation converter : 1 set
(iii) Auxiliary relays : 1 set
(iv) Power supply unit : 1 set

(4) Pressure water level meter

The water level meter measures the water level of the main canal or diversion channel.

(a) Configuration

(i) Detector : 1 set
(ii) Converter : 1 set

(b) Detector precision : ± 1.0% of the full-scale value

(c) Output signal : 4-20mA DC

(d) Power requirement : 100V AC or 24V DC

(5) Salinity meter

(a) Configuration

(i) Salinity meter (500-1500 ppm) : 1 set
(ii) Repeater box : 1 set
(iii) Converter : 1 set

(b) Precision : ± 30 ppm

(c) Output signal : 4-20mA DC

(d) Power requirement : 100V AC

(6) Terminal bard

The terminal board interconnects the interior and outdoor wires of the transmission lines.

(a) Structure : Indoor, enclosed, wall type

(b) Configuration

(i) Terminal : 1 set

(7) Distribution board

The distribution board supplies the -48V DC power to each piece of equipment in the station.

(a) Structure : Indoor, enclosed wall type

(b) Configuration

(i) Circuit breaker : 1 set

(8) DC power supply

(a) Structure : Indoor, enclosed, stand-alone type

(b) Configuration

(i) Ractifier : 1 set
(ii) Barreries : 1 set

(c) Input and output voltages

(i) Input voltage : 380V AC±15%or 220V AC±15%
(ii) Output voltage : -48V DC±10%

(d) Capacity

Table K-25 lists the estimated power consumption of each piece of equipment in the slave stations.

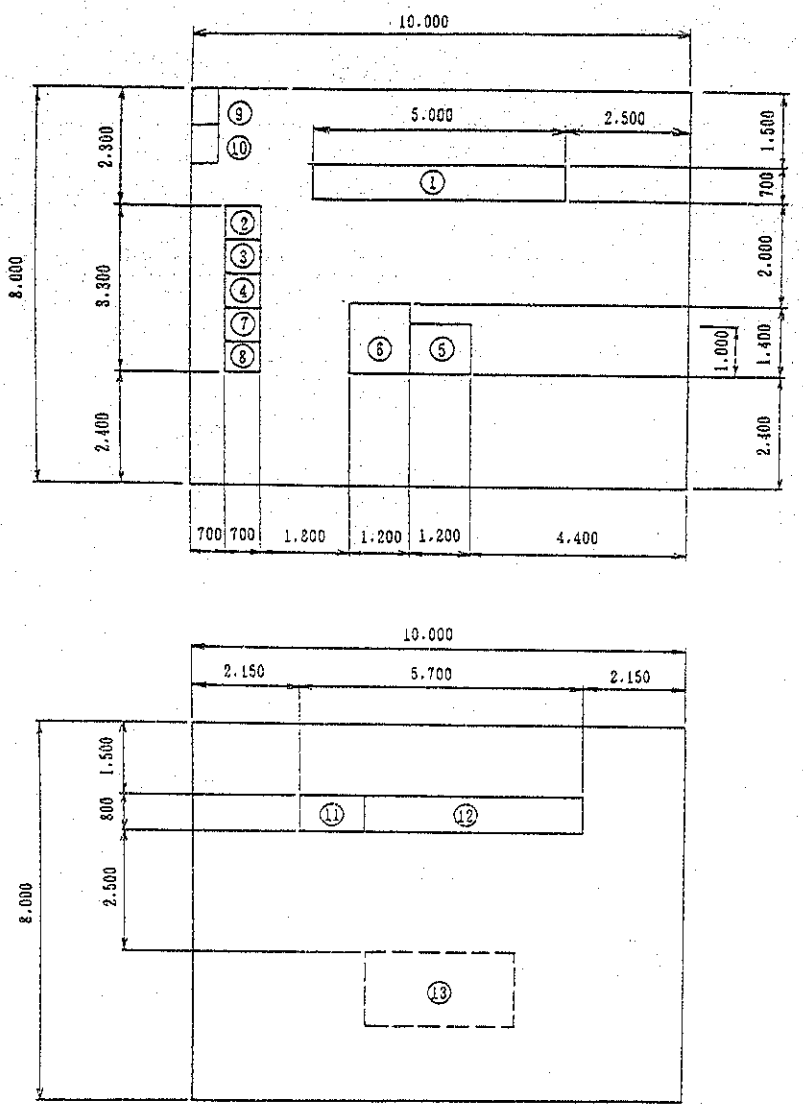
Table K-25 Power Consumption (Estimation)

Equipment name	Power Consumption (W)			
	Pump Staiton		Gate Controlled Division	
	Tina P.S	Other Tina P.S	TYPE-1	TYPE-2
TM/TC equipment (slave)	300	300	-	-
TM equipment (slave)	-	-	200	200
Input/output repeater	300	300	200	200
Water level meter	-	-	x3 300	x2 200
Salinity meter	50	-	-	-
Total	650	600	700	600

TYPE-1 ; Qatla G.C.D, Hod Abusamara G.C.D, Nigila G.C.D.

TYPE-2 ; South Tina G.C.D, North Tina G.C.D, Qantra G.C.D, Balouza G.C.D.

The power consumption of the no-break equipment is 600-700 W (-48 VDC) ; however, the rated current is set to 30A, twice the power consumption, considering the peak load.



NO.	EQUIPMENT	REMARK
①	GRAPHIC DISPLAY PANEL	
②	DATA PROCESSING EQUIPMENT	
③	INPUT/OUTPUT INTERFACE EQUIPMENT	
④	TM/TC EQUIPMENT (MASTER)	
⑤	OPERATION CONSOLE EQUIPMENT	
⑥	CRT DISPLAY EQUIPMENT (KEYBOARD / HARD COPY PRINTER)	
⑦	LOGGING PRINTER	
⑧	ANNOUNCEMENT PRINTER	
⑨	TERMINAL BOARD	
⑩	DISTRIBUTION BOARD	
⑪	CVCF	
⑫	BATTERY FOR CVCF	
⑬	POWER RECEIVER/TRANSFORMER	OTHER CONTRACT

Figure K-12 EQUIPMENT LAYOUT DWG. FOR CONTROL STATION S=1/100

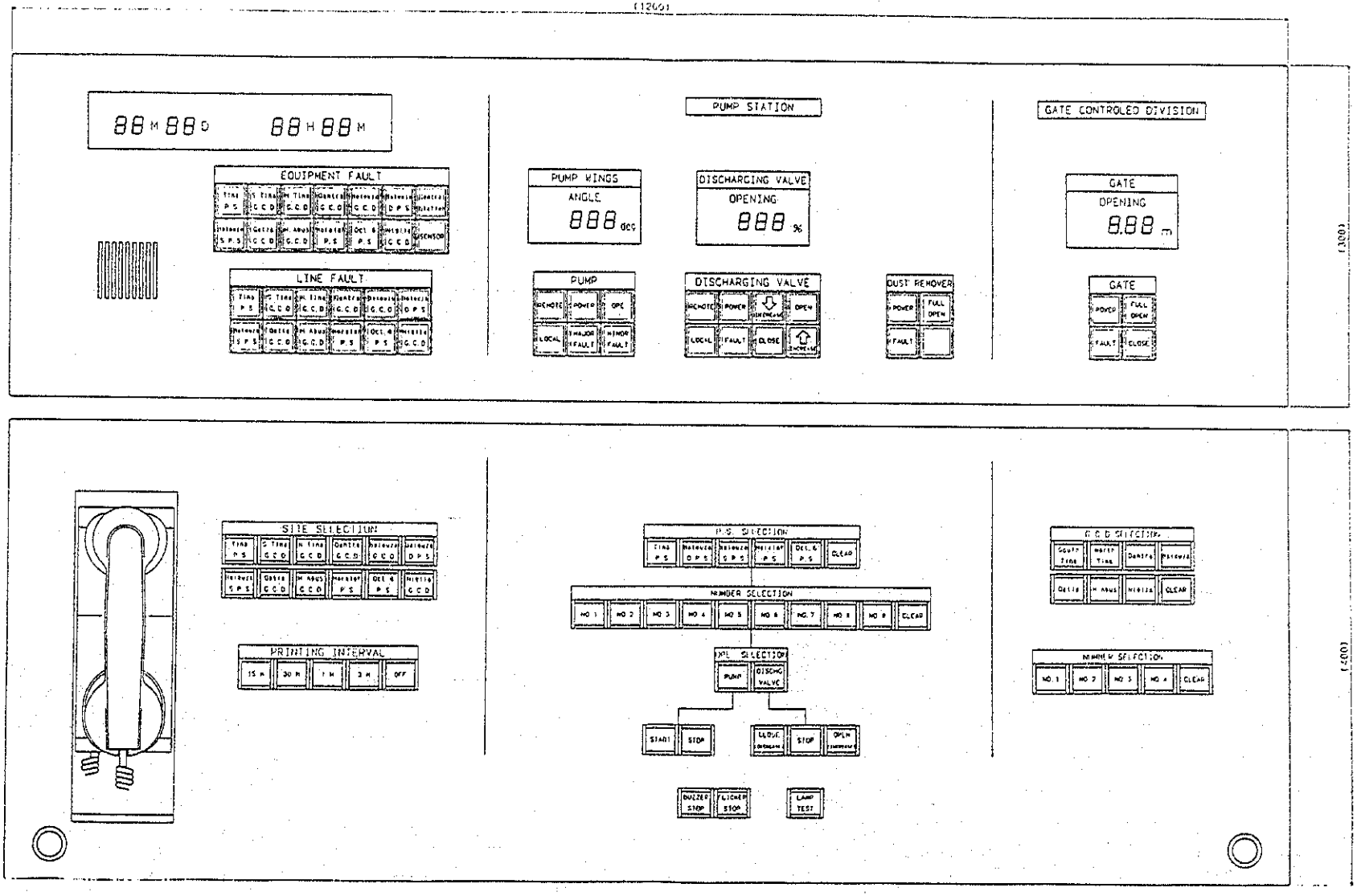


Figure K-13 LAYOUT DWG OF OPERATION CONSOLE DESK PANEL

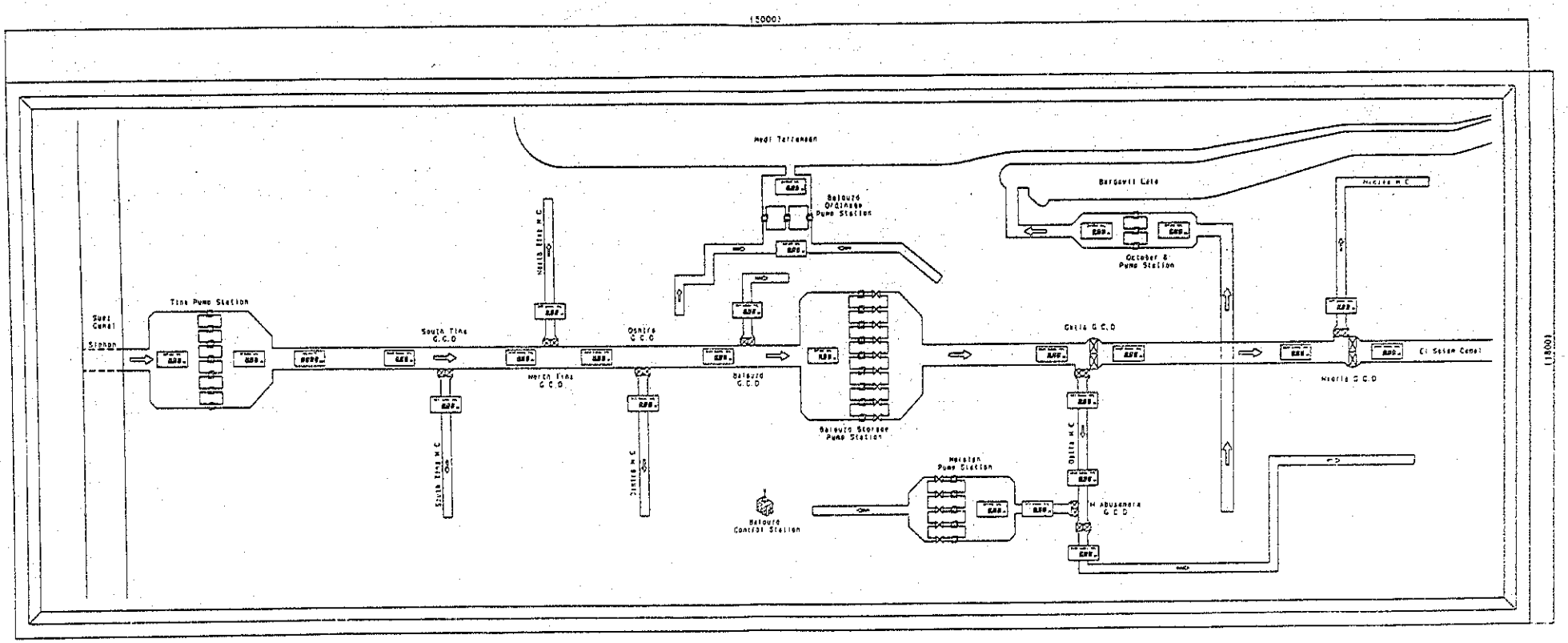


Figure K-14 LAYOUT DWG OF GRAPHIC PANEL

Screen List

NO.	Screen Name
1	Notes and remarks
2	Tina Pump Station condition display
3	South Tina G.C.D condition display
4	North Tina G.C.D condition display
5	Qantra G.C.D condition display
6	Balouza G.C.D condition display
7	Balouza Drainage P.S condition display
8	Balouza Storage P.S condition display
9	Qatia G.C.D condition display
10	Hod Abusamara G.C.D condition display

NO.	Screen Name
11	Moraiah Pump Station condition display
12	October 6 Pump Station condition display
13	Nigila G.C.D condition display
14	Setting table for water level-flow rate(H-Q) conversion constant
15	Setting table for water level alarm constant
16	Announcement display
17	Irrigation date lists display
18	
19	
20	

Figure K-15 CRT SCREEN LIST

APPENDIX-L. Cost Estimate

Table L-1-1 Summary of Project Cost

(Unit : 1,000LE)

Item	Total	Foreign Currency	Local Currency
1. Civil Works			
1.1 El Salam Canal Extension	306,663	223,862	82,801
1.2 Irrigation & Drainage	39,838	21,215	18,623
1.3 Land Reclamation	54,822	32,644	22,178
1.4 On-Farm Facilities	118,362	88,771	29,591
Sub-Total	519,685	366,492	153,193
2. New-Community/Social Infra.	195,000	20,800	174,200
3. Agro-Industry/Marketing	43,120	27,025	16,095
4. Agric. Development Center	20,000	8,577	11,423
5. Engineering Fee	46,500	24,500	22,000
Total of 1.-5.	824,305	447,394	376,911
6. Price Escalation	34,835	-	34,835
Total	859,140	447,394	411,746

Note: 10 % of Contingency is included in items 1.-5.

Table L-1-2 Summary of Project Cost

(Unit: '000 LE)

Item	Total	Foreign	Local
1. Civil Works			
1.1. Siphon under Suez Canal	175,695	137,896	37,799
1.2. El Salam Canal extension */	76,361	44,340	32,021
1.3. Pumping Stations	54,607	41,626	12,981
1.4. Branch Irrigation Canals	33,042	17,553	15,489
1.5. Drainage Canals	6,796	3,662	3,134
1.6. Land Reclamation	54,822	32,644	22,178
1.7. On-Farm Facilities	118,362	88,771	29,591
2. New-Community/Social Infrastructure			
2.1. Buildings	130,822	-	130,822
2.2. Village Roads	17,553	-	17,553
2.3. Water Supply & Sewage	25,100	8,465	16,635
2.4. Electricity & Telephone	21,525	12,335	9,190
3. Agro-Industry/Marketing Facilities			
3.1. Oil Extraction Plant	12,265	5,880	6,385
3.2. Slaughterhouse/Cut Meat	20,687	14,841	5,846
3.3. Marketing Center etc.	10,168	6,304	3,864
4. Agricultural Development Center			
4.1. Buildings & Equipment	16,696	7,333	9,363
4.2. Experimental Field **/	3,304	1,244	2,060
5. Engineering Fee	46,500	24,500	22,000
Sub-Total (1 - 5)	824,305	447,394	376,911
6. Price Escalation	34,835	-	34,835
TOTAL	859,140	447,394	411,746

Note: */ Including a remote control system
**/ Including water resource development (digging well)

10% of contingency is included in items 1 - 5 above.

Table L-2-1 Summary of El Salam Canal (Item 1.1)

(Unit: '000LE)

No.	Description	Total	F.C.	L.C.
1)	Siphon under Suez Canal			
	Drilling	67,560	51,980	15,580
	Shaft/Manhole	31,253	23,592	7,661
	Inlet/Outlet	9,180	5,638	3,542
	Construction Machinery	42,250	42,250	-
	Temporary Works	9,480	1,900	7,580
	Sub-Total	159,723	125,360	34,363
2)	Tina Pump Station			
	Civil Work	3,584	1,754	1,830
	Building	2,592	518	2,074
	Pump Facilities	12,680	12,680	-
	Erection	1,900	870	1,030
	Sub-Total	20,756	15,822	4,934
3)	Balouza Pump Station			
	Civil Work	2,959	1,442	1,517
	Building	2,907	581	2,326
	Pump Facilities	12,940	12,940	-
	Errection	1,940	890	1,050
	Discharge Pond	1,193	831	362
	Pipeline	6,948	5,336	1,612
	Sub-Total	28,887	22,020	6,867
4)	Measurement & Remote Control System			
	Building	320	64	256
	Equipement	5,400	5,400	-
	Sub-Total	5,720	5,464	256

No.	Description	Total	F.C.	L.C.
5)	El Salam Canal			
a.	Tina Plain			
	Canal Type I-A (0 - 2.0 km)	1,480	814	666
	〃 Type I-A (2.0 - 10.0)	9,486	5,235	4,251
	〃 Type I-B (10.0 - 13.5)	3,428	1,893	1,535
	〃 Type I-C (13.5 - 23.3)	7,914	4,375	3,539
		(22,308)	(12,317)	(9,991)
b.	Sandy Area			
	Canal Type II-A (24.4 - 39.4 km)	19,660	10,481	9,179
	〃 Type II-B (39.4 - 45.3 km)	6,016	3,222	2,794
	〃 Type II-C (45.3 - 50.4 km)	4,094	2,138	1,956
	〃 Type II-D (50.4 - 60.7 km)	9,568	5,481	4,087
	Check Gate(Type - A×3)	834	514	320
	〃 (Type - B×3)	703	429	274
	〃 (Type - C)	199	119	80
	Bridge (at 28.5, 50.4 km)	317	144	173
		(41,391)	(22,528)	(18,863)
	Sub-Total	63,699	34,845	28,854
6).	Branch Canal			
	Balouza B.C.	1,443	809	634
	Rumana South B.C.	2,507	1,310	1,197
	Rumana North B.C.	1,733	889	844
	6 October B.C.	1,974	1,023	951
	Rabaa / Qatia B.C.	9,988	5,347	4,641
	Rabaa North B.C.	1,702	874	828
	El Tina B.C.	2,114	1,102	1,012
	El Haswa B.C.	565	290	275
	El Nasr B.C.	2,134	1,097	1,037
	Nigila B.C.	5,878	3,216	2,662
	Sub-Total	30,038	15,957	14,081
	Total of 1) - 6)	308,823	219,468	89,355
	Contingency	30,882	21,947	8,935
	Total	339,705	241,415	98,290

Table L-2-2 Summary of Drainage Canal (Item 1.2)

(Unit: '000LE)

No.	Description	Total	F.C.	L.C.
1)	Tina System			
	Canal (14.3 km)	1,512	842	670
	Pump Station			
	Civil Work	57	27	30
	Building	38	8	30
	P. Facilities	495	495	-
	Erection	74	34	40
	Sub-Total	664	564	100
	Sub-Total	2,176	1,406	770
2)	Rabaa / Qatia System			
	Canal (10.2 km)	3,259	1,303	1,956
	Pump Station			
	Civil Work	68	33	35
	Building	55	11	44
	P. Facilities	539	539	-
	Erection	81	37	44
	Sub-Total	742	620	122
	Sub-Total	4,002	1,923	2,079
	Total of 1) + 2)	6,178	3,329	2,849
Contingency		618	333	285
Total		6,796	3,662	3,134

Table L-2-3 Summary of Land Reclamation (Item 1.3)

(Unit: '000LE)

No.	Description	Total	F.C.	L.C.
1)	C.P.1 Block			
	Earth Work	13,628	12,742	886
	Road Work	3,459	900	2,559
	Planting	7,324	-	7,324
	Sub-Total	24,411	13,642	10,769
2)	C.P.2 Block			
	Earth Work	354	331	23
	Road Work	267	69	198
	Planting	580	-	580
	Leaching	5,280	4,585	695
	Sub-Total	6,481	4,985	1,496
3)	C.P.3 Block			
	Earth Work	2,657	2,484	173
	Road Work	708	184	524
	Planting	1,501	-	1,501
	Sub-Total	4,866	2,668	2,198
4)	C.P.4 Block			
	Earth Work	5,166	4,830	336
	Road Work	923	240	683
	Planting	1,958	-	1,958
	Sub-Total	8,047	5,070	2,977
5)	C.P.5			
	Earth Work	3,296	3,082	214
	Road Work	877	229	648
	Planting	1,860	-	1,860
	Sub-Total	6,033	3,311	2,722
	Total of 1) - 5)	49,838	29,676	20,162
Contingency		4,984	2,968	2,016
Total		54,822	32,644	22,178

Table L-2-4 Summary of On Farm Facilities (Item 1.4)

No.	Description	Total	F.C.	L.C.
1)	C.P.1 Area			
	W/O Drain Area	32,067	24,050	8,017
	W/ Drain Area	11,035	8,276	2,759
	Sub-Total	43,102	32,326	10,776
2)	C.P.2 Area			
	W/O Drain Area	-	-	-
	W/ Drain Area	2,682	2,012	670
	Sub-Total	2,682	2,012	670
3)	C.P.3 Area			
	W/O Drain Area	17,228	12,921	4,307
	W/ Drain Area	673	505	168
	Sub-Total	17,901	13,426	4,475
4)	C.P.4 Area			
	W/O Drain Area	18,747	14,060	4,687
	W/ Drain Area	10,557	7,918	2,639
	Sub-Total	29,304	21,978	7,326
5)	C.P.5 Area			
	W/O Drain Area	13,436	10,077	3,359
	W/ Drain Area	1,177	883	294
	Sub-Total	14,613	10,960	3,653
Total of 1) - 5)		107,602	80,702	26,900
Contingency		10,760	8,070	2,690
Total		118,362	88,772	29,590

Table L-2-5 Summary of Social Facilities (Item 2)

(Unit: '000LE)

No.	Description	Total	F.C.	L.C.
1)	Housing	104,699	-	104,699
2)	Public & Social Facilities	14,230	-	14,230
3)	Village Road Development	15,957	-	15,957
4)	Potable Water Supply	15,980	4,433	11,547
5)	Sewage & Refuse Treatment	6,850	3,288	3,562
6)	Electric Facilities	17,300	9,537	7,763
7)	Telephone Facilities	2,268	1,677	591
	Total of 1) - 7)	177,284	18,935	158,349
	Contingency	17,716	1,865	15,851
	Total	195,000	20,800	174,200

Table L-2-6 Summary of Agriculture Support and Market Facilities (Item 3)

(Unit: '000LE)

No.	Description	Total	F.C.	L.C.
1)	Machinery Center	4,944	3,204	1,740
2)	Marketing Center	3,862	2,424	1,438
3)	Livestock Mating Center	438	103	335
4)	Oil Processing Plant	11,150	5,345	5,805
5)	Slaughter & Cut Meat Center	18,806	13,492	5,314
	Total Of 1) - 5)	39,200	24,568	14,632
	Contingency	3,920	2,457	1,463
	Total	43,120	27,025	16,095

Table L-2-7 Summary of Agriculture Development Center (Item 4)

(Unit : '000LE)

No.	Description	Total	F.C.	L.C.
1)	Main Building			
	Building	1,680	-	1,680
	Office Facilities	240	226	14
	Vehicles	728	682	46
	Research Equip	450	400	50
	Sub-Total	3,098	1,308	1,790
2(	Dormitory	2,400	-	2,400
3)	Work Shop	724	500	224
4)	Office Houses	2,000	-	2,000
5)	Experimental Field	1,629	276	1,353
6)	Agri-Machineries	1,297	1,178	119
7)	Water Resource	1,375	855	520
8)	Electric Facilities	840	800	40
9)	Social facilities	1,600	1,140	460
10)	Others	1,000	15	985
11)	Material	302	-	302
12)	Engineering Fee	1,585	1,585	-
	Total of 1) - 12)	17,850	7,657	10,193
	Contingency	2,150	920	1,230
	Total	20,000	8,577	11,423

Table L-2-8 Summary of Engineering Fee (Item 5)

Direct Cost			
	Design stage	160 M/M (man month)	
	Pre-construction stage	30 M/M	
	Construction stage	560 M/M	
	Sub-Total	750 M/M	
1) F.C.			
	1-1 Remuneration		
	Japanese Engineer	450 M/M x 40,000 =	18,000,000
	Egyptian Engineer	300 M/M x 10,000 =	3,000,000
	Sub-Total		21,000,000
	1-2 Direct Expenses		
	750 M/M x 3,000	=	2,250,000
	1-3 Contingency (5%)		1,250,000
	Total		24,500,000
2) L.C.			
	1-1 Per diem	450 M/M x 30,000 =	13,500,000
	1-2 Local Staff	360 M/M x 2,000 =	720,000
	1-3 Transportation		2,000,000
	1-4 Office Charge (Head & Sites)		2,880,000
	1-5 Miscellaneous		900,000
	Sub-total		20,000,000
	1-6 Contingency (10%)		2,000,000
	Total		22,000,000