CHAPTER 5

SUMMARY OF QUANTITIES

CHAPTER 5 SUMMARY OF QUANTITIES

5.1 Quantities for Main Bridge

Items		Description	Unit	Quantities	Remarks
Pylon Foundation	Concrete	300 kg/cm²	m³	9,032	
	Reinforcing Bar		t	1,866	
Pylon	Concrete	300 kg/cm²	m³	8,825	
		350 kg/m²	m³	2,174	
	Reinforcing Bar		t	2,298	
	Prestressing Tendons	Strands	t	10	
		PC Bars	t	9	
Auxiliary Piers	Pile	ϕ 1.5 m × 15 m	No	100	
	Concrete	240 kg/cm²	m³	13,322	
	Reinforcing Bar		t	1,806	
Main Girder	Steel Girder		t	7,401	
	Stay Cables		t	714	
	Bearings	Pendel Br. End	No	2	27t
		Pendel At Piers	No	4	191t
		Rubber Vertical	No	4	31t
		Horizontal	No	12	19t
		Horizontal	No	4	
	Expansion Joints	L = 20.8m	No	2	
Miscellaneous Works	Guard Rail		lm	1,458	
	Guard Net		lm	1,448	
	Lighting Poles		No	72	
	Lightning Rods		No	4	

Items		Description	Unit	Quantities	Remarks
Miscellaneous Works (continued)	Warning Light for Aviation		No	8	
	Navigation Lights		No	6	
	Wind Speed Gauge		No	1	
	Earthquake Gauge		No	2	
	Side walks		lm	1,460	
	Median		lm	730	
	Pavement		m^2	11,899	
	Inspection gondola		No	1	80t

5.2 Quantities for Approach Bridges

SUMMARY OF QUANTITIES FOR SUPERSTRUCTURE OF APPROACH BRIDGES

THE WEST BANK

ITEM	CLASSIFICATION	UNIT	PRESTRESSED CONCRETE CONTINUOUS BOX GIRDER				PRESTRESSED CONCRETE RIGID FRAME			PRESTRESSED CONCRETE RIGID FRAME		
			BRW1	BRW2	BRW3	BRW4	BRW5	BRW6	Egyptian West Total	BRW7	BRW8	JP Grant Total
CONCRETE		m^3	2,800.7	2,053.1	2,732.4	3,332.7	3,980.2	3,980.2	18,879.3	3,980.2	3,980.2	7,960.4
FORM WORK	OUTSIDE	m^2	5,360.0	3,801.7	5,201.6	3,801.7	5,902.0	7,378.6	31,445.6	7,378.6	7,378.6	14,757.2
	INSIDE	m^2	3,004.4	2,089.6	2,905.9	2,089.6	3,331.3	4,200.1	17,620.9	4,200.1	4,200.1	8,400.2
	END	m^2	57.4	43.0	57.4	43.0	71.7	86.0	358.5	86.0	86.0	172.0
REINFORCING BAR	T22	t	206.021	115.926	201.817	115.926	312.074	248.532	1,200.296	248.532	248.532	497.064
	T18	t	30.971	22.173	29.948	22.173	33.715	87.015	225.994	87.015	87.015	174.029
	T16	t	87.077	82.049	84.201	82.049	112.183	142.826	590.386	142.826	142.826	285.652
	T14	t	179.510	127.177	174.586	127.177	184.104	225.080	1,017.633	222.894	222.894	445.789
	TOTAL	t	503.579	347.325	490.553	347.325	642.076	703.452	3,034.309	701.267	701.267	1,402.534
PRESTRESSING CABLES 12S15.2B (W=13.21kg/m)	LENGTH	m	6,382	4,886	6,190	4,886	9,085	9,364	40,793	9,364	9,364	18,727
	WEIGHT	t	84.306	64.546	81.770	64.546	120.016	123.695	538.879	123.695	123.695	247.390
	ANCHORAGE PRESTRESSING SIDE	Nos.	32	48	32	48	104	48	312	48	48	96
	ANCHORAGE FIXING SIDE	Nos.	32	48	32	48	104	48	312	48	48	96
	ANCHORAGE JOINT SIDE	Nos.	128	84	128	84	160	192	776	192	192	384

THE EAST BANK

ITEM	CLASSIFICATION	UNIT	PRESTRESSED CONCRETE RIGID FRAME					PRESTRESSED CONCRETE RIGID FRAME		
			BRE1	BRE2	BRE3	BRE4	Egyptian East Total	BRE5	BRE6	J.Grant Total
CONCRETE		m^3	2,930.6	2,887.3	2,844.0	3,980.2	12,642.1	3,980.2	3,980.2	7,960.4
FORM WORK	OUTSIDE	m^2	5,297.0	5,297.0	5,297.0	7,378.6	23,269.6	7,378.6	7,378.6	14,757.2
	INSIDE	m^2	3,004.4	3,004.4	3,004.4	4,200.1	13,213.3	4,200.1	4,200.1	22,717.6
	END	m^2	57.4	57.4	57.4	86.0	258.2	86.0	86.0	172.0
REINFORCING BAR	T22	t	239.377	226.038	248.745	248.532	962.691	248.532	248.532	497.064
	T18	t	30.971	30.971	30.971	87.015	179.928	87.015	87.015	669.064
	T16	t	100.834	112.314	86.299	142.826	442.273	142.826	142.826	285.652
	T14	t	178.029	163.810	163.810	222.894	728.543	222.894	222.894	445.789
	TOTAL	t	549.211	533.133	529.825	701.267	2313.436	701.267	701.267	731.441
PRESTRESSING CABLES 12S15.2B (W=13.21kg/m)	LENGTH	m	8,654	7,591	6,785	9,364	32,394	9,364	9,364	18,727
	WEIGHT	t	114.312	100.282	89.632	123.695	427.921	123.695	123.695	247.390
	ANCHORAGE PRESTRESSING SIDE	Nos.	112	80	48	48	288	48	48	96
	ANCHORAGE FIXING SIDE	Nos.	112	80	48	48	288	48	48	96
	ANCHORAGE JOINT SIDE	Nos.	128	128	128	192	576	192	192	384

SUMMARY OF QUANTITIES FOR CONCRETE BARRIER & RAILINGS OF APPROACH BRIDGES

THE WEST BANK

ITEM	CLASSIFICATION	UNIT	PRESTRESSED CONCRETE CONTINUOUS BOX GIRDER				PRESTRESSED CONCRETE RIGID FRAME			PRESTRESSED CONCRETE RIGID FRAME		
			BRW1	BRW2	BRW3	BRW4	BRW5	BRW6	Egyptian West Total	BRW7	BRW8	JP Grant Total
BRIDGE LENGTH		m	200.000	141.000	194.000	141.000	223.500	280.000	1179.500	280.000	280.000	560.000
CONCRETE		m^3	246.6	173.9	239.2	173.9	275.6	345.2	1,454.3	345.2	345.2	690.5
FORM WORK	OUTSIDE	m^2	680.6	479.8	660.2	479.8	760.6	952.8	4,013.8	952.8	952.8	1,905.7
REINFORCING BAR	T18	t	26.200	18.471	25.414	18.471	29.279	36.680	154.515	36.680	36.680	73.360
	T12	t	22.073	15.561	21.411	15.561	24.666	30.902	130.174	30.902	30.902	61.804
	TOTAL	t	48.273	34.032	46.825	34.032	53.945	67.582	284.689	67.582	67.582	135.164
CURB STONE	(H300*B200) LENGTH	m	800	564	776	564	894	1,120	4,718	1,120	1,120	2,240
HAND RAIL	LENGTH	m	800	564	776	564	894	1,120	4,718	1,120	1,120	2,240
PAVEMENT	Asphalt t=7cm	m^3	3,260	2,298	3,162	2,298	3,643	4,564	19,226	4,564	4,564	9,128
EXPANSION JOINT	For Abutment Space 100mm	m	17.300						17.300			
	For Pier Space 200mm	m		17.300	17.300	17.300	17.300	17.300	86.500	17.300	17.300	34.600
BRIDGE BEARINGS	FREE	Nos.	20	8	8	8	8	8	60	8	8	16
	FIXED	Nos.	4	12	12	12			40			

THE EAST BANK

ITEM	CLASSIFICATION	UNIT	PRESTRESSED CONCRETE RIGID FRAME					PRESTRESSED CONCRETE RIGID FRAME		
			BRE1	BRE2	BRE3	BRE4	Egyptian East Total	BRE5	BRE6	J.Grant Total
BRIDGE LENGTH		m	200.000	200.000	200.000	280.000	880.000	280.000	280.000	560.000
CONCRETE		m^3	246.6	246.6	246.6	345.2	1,085.0	345.2	345.2	690.5
FORM WORK	OUTSIDE	m^2	680.6	680.6	680.6	952.8	2,994.6	952.8	952.8	1,905.7
REINFORCING BAR	T18	kg	26.200	26.200	26.200	36.680	115.280	36.680	36.680	73.360
	T12	kg	22.073	22.073	22.073	30.902	97.120	30.902	30.902	61.804
	TOTAL	kg	48.273	48.273	48.273	67.582	212.400	67.582	67.582	135.164
CURB STONE	LENGTH	m	800	800	800	1,120	3,520	1,120	1,120	2,240
HAND RAIL	LENGTH	m	800	800	800	1,120	3,520	1,120	1,120	2,240
PAVEMENT	Asphalt t=7cm	m^3	3,260	3,260	3,260	4,564	14,344	4,564	4,564	9,128
EXPANSION JOINT	For Abutment Space 100mm	m	17.300				17.300			
	For Pier Space 200mm	m		17.300	17.300	17.300	51.900	17.300	17.300	34.600
BRIDGE BEARINGS	FREE	Nos.	8	8	8	8	32	8	8	16
	FIXED	Nos.								

LIST OF QUANTITIES (THE WEST BANK NO.1)

Pier No.	CONCRETE							FORM WORK										
	Footing	Column					TOTAL	Footing	Column-INSIDE				Column-OUTSIDE				Top-INSIDE	TOTAL
		H<5m	5<H<30m	30<H<70m	70<H<160m	Sub-Total			H<4m	4<H<30m	30m<H	Sub-Total	H<4m	4<H<30m	30m<H	Sub-Total		
	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)
AW 1	236.6	162.9	19.8	0.0	0.0	182.7	419.4	76.0	0.0	0.0	0.0	0.0	220.7	156.5	0.0	377.2	0.0	453.2
PW 1	353.4	157.5	0.3	0.0	0.0	157.8	511.2	96.9	0.0	0.0	0.0	0.0	128.0	32.3	0.0	160.3	0.0	257.2
PW 2	353.4	157.5	41.9	0.0	0.0	199.4	552.8	96.9	0.0	0.0	0.0	0.0	128.0	74.6	0.0	202.6	0.0	299.4
PW 3	470.5	157.5	83.5	0.0	0.0	241.0	711.4	106.4	0.0	0.0	0.0	0.0	128.0	116.8	0.0	244.8	0.0	351.2
PW 4	353.4	157.5	125.1	0.0	0.0	282.6	636.0	96.9	0.0	0.0	0.0	0.0	128.0	159.0	0.0	287.0	0.0	383.9
PW 5	353.4	157.5	150.9	0.0	0.0	308.4	661.8	96.9	0.0	0.0	0.0	0.0	128.0	185.3	0.0	313.3	0.0	410.1
PW 6	860.0	157.5	166.9	0.0	0.0	324.4	1184.3	156.1	0.0	0.0	0.0	0.0	128.0	201.5	0.0	329.5	0.0	485.6
PW 7	687.1	157.5	205.3	0.0	0.0	362.8	1049.8	144.7	0.0	0.0	0.0	0.0	128.0	240.5	0.0	368.5	0.0	513.2
PW 8	860.0	157.5	250.0	0.0	0.0	407.5	1267.5	156.1	0.0	0.0	0.0	0.0	128.0	286.0	0.0	414.0	0.0	570.1
PW 9	353.4	157.5	313.2	0.0	0.0	470.7	824.1	96.9	0.0	0.0	0.0	0.0	128.0	350.2	0.0	478.2	0.0	575.0
PW 10	687.1	157.5	337.8	0.0	0.0	495.3	1182.4	144.7	0.0	0.0	0.0	0.0	128.0	375.2	0.0	503.2	0.0	647.9
PW 11	687.1	157.5	378.1	0.0	0.0	535.6	1222.7	144.7	0.0	0.0	0.0	0.0	128.0	416.1	0.0	544.1	0.0	688.8
PW 12	860.0	157.5	418.5	0.0	0.0	576.0	1435.9	156.1	0.0	0.0	0.0	0.0	128.0	457.1	0.0	585.1	0.0	741.2
PW 13	353.4	157.5	474.5	0.0	0.0	632.0	985.5	96.9	0.0	0.0	0.0	0.0	128.0	514.1	0.0	642.1	0.0	738.9
PW 14	470.5	157.5	514.9	0.0	0.0	672.4	1142.8	106.4	0.0	0.0	0.0	0.0	128.0	555.0	0.0	683.0	0.0	789.4
PW 15	687.1	157.5	530.8	0.0	0.0	688.3	1375.4	144.7	0.0	0.0	0.0	0.0	128.0	571.3	0.0	699.3	0.0	844.0
PW 16	687.1	157.5	572.4	0.0	0.0	729.9	1417.0	144.7	0.0	0.0	0.0	0.0	128.0	613.5	0.0	741.5	0.0	886.2
PW 17	687.1	157.5	614.0	0.0	0.0	771.5	1458.5	144.7	0.0	0.0	0.0	0.0	128.0	655.7	0.0	783.7	0.0	928.4
PW 18	581.4	157.5	497.0	0.0	0.0	654.5	1235.8	130.7	0.0	204.0	0.0	204.0	128.0	687.9	0.0	815.9	8.3	1158.8
PW 19	1039.5	157.5	514.2	0.0	0.0	671.7	1711.2	175.1	0.0	233.5	0.0	233.5	128.0	727.3	0.0	855.3	8.3	1272.1
PW 20	860.0	157.5	531.4	0.0	0.0	688.9	1548.8	156.1	0.0	263.0	0.0	263.0	128.0	766.6	0.0	894.6	8.3	1321.9
PW 21	860.0	157.5	548.6	0.0	0.0	706.1	1566.1	156.1	0.0	292.5	0.0	292.5	128.0	806.0	0.0	934.0	8.3	1390.8
PW 22	860.0	157.5	552.7	13.1	0.0	723.3	1583.3	156.1	0.0	322.0	0.0	322.0	128.0	832.0	13.3	973.3	8.3	1459.6
PW 23	860.0	157.5	531.2	51.8	0.0	740.5	1600.5	156.1	0.0	351.5	0.0	351.5	128.0	832.0	52.6	1012.6	8.3	1528.5
PW 24	687.1	157.5	501.0	106.3	0.0	764.7	1451.8	144.7	0.0	393.0	0.0	393.0	128.0	832.0	108.0	1068.0	8.3	1613.9
PW 25	687.1	157.5	469.1	163 6	0.0	790.2	1477.3	144.7	0.0	436.7	0.0	436.7	128.0	832.0	166.2	1126.2	8.3	1715.8
PW 26	581.4	157.5	446.0	205.2	0.0	808.7	1390.0	130.7	0.0	468.3	0.0	468.3	128.0	832.0	208.4	1168.4	8.3	1775.7
PW 27	581.4	157.5	422.9	246.8	0.0	827.2	1408.5	130.7	0.0	500.0	0.0	500.0	128.0	832.0	250.7	1210.7	8.3	1849.7
PW 28	581.4	157.5	399.8	288.4	0.0	845.7	1427.0	130.7	0.0	531.7	0.0	531.7	128.0	832.0	292.9	1252.9	8.3	1923.6
PW 29	687.1	157.5	376.7	329.9	0.0	864.1	1551.2	144.7	0.0	563.4	0.0	563.4	128.0	832.0	335.2	1295.2	8.3	2011.5
PW 30	687.1	157.5	353.6	371.5	0.0	882.6	1569.7	144.7	0.0	595.1	0.0	595.1	128.0	832.0	377.4	1337.4	8.3	2085.4
Eg.West	19553.2	4887.9	11342.1	1776.5	0.0	18006.5	37559.7	4107.4	0.0	5154.4	0.0	5154.4	4060.7	16436.5	1804.7	22302.0	107.3	31671.0
PW 31	687.1	157.5	350.0	386.6	0.0	894.1	1581.1	144.7	0.0	600.0	14.7	614.7	128.0	832.0	403.6	1363.6	8.3	2131.3
PW 32	687.1	157.5	350.0	412.1	0.0	919.6	1606.6	144.7	0.0	600.0	58.4	658.4	128.0	832.0	461.9	1421.9	8.3	2233.3
PW 33	581.4	157.5	350.0	430.6	0.0	938.1	1519.4	130.7	0.0	600.0	90.1	690.1	128.0	832.0	504.1	1464.1	8.3	2293.2
PW 34	581.4	157.5	350.0	449.0	0.0	956.5	1537.9	130.7	0.0	600.0	121.8	721.8	128.0	832.0	546.4	1506.4	8.3	2367.1
PW 35	581.4	157.5	350.0	467.5	0.0	975.0	1556.4	130.7	0.0	600.0	153.5	753.5	128.0	832.0	588.6	1548.6	8.3	2441.0
PW 36	687.1	157.5	350.0	486.0	0.0	993.5	1680.5	144.7	0.0	600.0	185.1	785.1	128.0	832.0	630.8	1590.8	8.3	2528.9
PW 37	687.1	157.5	350.0	504.5	0.0	1012.0	1699.0	144.7	0.0	600.0	216.8	816.8	128.0	832.0	673.1	1633.1	8.3	2602.9
PW 38	687.1	157.5	350.0	516.0	0.0	1023.5	1710.5	144.7	0.0	600.0	236.5	836.5	128.0	832.0	699.3	1659.3	8.3	2648.8
PW 39	687.1	157.5	350.0	541.4	0.0	1048.9	1736.0	144.7	0.0	600.0	280.2	880.2	128.0	832.0	757.6	1717.6	8.3	2750.7
PW 40	581.4	157.5	350.0	559.9	0.0	1067.4	1648.8	130.7	0.0	600.0	311.9	911.9	128.0	832.0	799.8	1759.8	8.3	2810.6
PW 41	581.4	157.5	350.0	578.4	0.0	1085.9	1667.2	130.7	0.0	600.0	343.5	943.5	128.0	832.0	842.0	1802.0	8.3	2884.5
PW 42	581.4	157.5	350.0	596.9	0.0	1104.4	1685.7	130.7	0.0	600.0	375.2	975.2	128.0	832.0	884.3	1844.3	8.3	2958.5
PW 43	687.1	157.5	350.0	615.4	0.0	1122.9	1809.9	144.7	0.0	600.0	406.9	1006.9	128.0	832.0	926.5	1886.5	8.3	3046.4
PW 44	687.1	157.5	350.0	633.8	0.0	1141.3	1828.4	144.7	0.0	600.0	438.6	1038.6	128.0	832.0	968.8	1928.8	8.3	3120.3
J.Grant	8984.5	2205.0	4900.0	7178.0	0.0	14283.0	23267.5	1941.8	0.0	8400.0	3233.2	11633.2	1792.0	11648.0	9686.9	23126.9	115.5	36817.4
TOTAL	28537.7	7092.9	16242.1	8954.6	0.0	32289.6	60827.2	6049.2	0.0	13554.4	3233.2	16787.6	5852.7	28084.5	11491.6	45428.9	222.8	68488.4

LIST OF QUANTITIES (THE EAST BANK NO.1)

Pier No.	CONCRETE							FORM WORK										
	Footing	Column					TOTAL	Footing	Column-INSIDE				Column-OUTSIDE				Top-INSIDE	TOTAL
		H<5m	5<H<30m	30<H<70m	70<H<160m	Sub-Total			H<4m	4<H<30m	30m<H	Sub-Total	H<4m	4<H<30m	30m<H	Sub-Total		
	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)	(m^2)
AE 1	236.6	162.9	19.8	0.0	0.0	182.7	419.4	76.0	0.0	0.0	0.0	0.0	220.7	156.5	0.0	377.2	0.0	453.2
PE 1	1039.5	157.5	374.7	0.0	0.0	532.2	1571.7	175.1	0.0	0.0	0.0	0.0	128.0	412.6	0.0	540.6	0.0	715.7
PE 2	687.1	157.5	416.2	0.0	0.0	573.7	1260.8	144.7	0.0	0.0	0.0	0.0	128.0	454.8	0.0	582.8	0.0	727.5
PE 3	687.1	157.5	457.8	0.0	0.0	615.3	1302.4	144.7	0.0	0.0	0.0	0.0	128.0	497.1	0.0	625.1	0.0	769.8
PE 4	860.0	157.5	499.4	0.0	0.0	656.9	1516.9	156.1	0.0	0.0	0.0	0.0	128.0	539.3	0.0	667.3	0.0	823.4
PE 5	470.5	157.5	541.0	0.0	0.0	698.5	1169.0	106.4	0.0	0.0	0.0	0.0	128.0	581.6	0.0	709.6	0.0	815.9
PE 6	860.0	157.5	582.6	0.0	0.0	740.1	1600.0	156.1	0.0	0.0	0.0	0.0	128.0	623.8	0.0	751.8	0.0	907.9
PE 7	687.1	157.5	624.1	0.0	0.0	781.6	1468.7	144.7	0.0	0.0	0.0	0.0	128.0	666.0	0.0	794.0	0.0	938.7
PE 8	687.1	157.5	665.7	0.0	0.0	823.2	1510.3	144.7	0.0	0.0	0.0	0.0	128.0	708.3	0.0	836.3	0.0	981.0
PE 9	860.0	157.5	707.3	0.0	0.0	864.8	1724.8	156.1	0.0	0.0	0.0	0.0	128.0	750.5	0.0	878.5	0.0	1034.6
PE 10	470.5	157.5	542.8	0.0	0.0	700.3	1170.8	106.4	0.0	282.6	0.0	282.6	128.0	792.8	0.0	920.8	8.3	1317.9
PE 11	860.0	157.5	558.4	3.0	0.0	718.8	1578.8	156.1	0.0	314.3	0.0	314.3	128.0	832.0	3.0	963.0	8.3	1441.6
PE 12	687.1	157.5	535.3	44.5	0.0	737.3	1424.3	144.7	0.0	345.9	0.0	345.9	128.0	832.0	45.2	1005.2	8.3	1504.1
PE 13	687.1	157.5	512.2	86.1	0.0	755.8	1442.8	144.7	0.0	377.6	0.0	377.6	128.0	832.0	87.5	1047.5	8.3	1578.1
PE 14	687.1	157.5	489.1	127.7	0.0	774.3	1461.3	144.7	0.0	409.3	0.0	409.3	128.0	832.0	129.7	1089.7	8.3	1652.0
PE 15	687.1	157.5	483.5	137.8	0.0	778.7	1465.8	144.7	0.0	417.0	0.0	417.0	128.0	832.0	140.0	1100.0	8.3	1669.9
PE 16	687.1	157.5	451.6	195.1	0.0	804.2	1491.3	144.7	0.0	460.7	0.0	460.7	128.0	832.0	198.2	1158.2	8.3	1771.8
PE 17	581.4	157.5	428.5	236.7	0.0	822.7	1404.0	130.7	0.0	492.3	0.0	492.3	128.0	832.0	240.4	1200.4	8.3	1831.7
PE 18	581.4	157.5	405.4	278.3	0.0	841.2	1422.5	130.7	0.0	524.0	0.0	524.0	128.0	832.0	282.7	1242.7	8.3	1905.7
PE 19	581.4	157.5	382.3	319.9	0.0	859.7	1441.0	130.7	0.0	555.7	0.0	555.7	128.0	832.0	324.9	1284.9	8.3	1979.6
PE 20	687.1	157.5	359.2	361.4	0.0	878.1	1565.2	144.7	0.0	587.4	0.0	587.4	128.0	832.0	367.2	1327.2	8.3	2067.5
PE 21	687.1	157.5	350.0	389.1	0.0	896.6	1583.7	144.7	0.0	600.0	19.1	619.1	128.0	832.0	409.4	1369.4	8.3	2141.4
Eg.East	14958.5	3470.4	10386.8	2179.6	0.0	16036.8	30995.2	3072.0	0.0	5366.7	19.1	5385.8	2908.7	15335.4	2228.3	20472.3	99.0	29029.1
PE 22	687.1	157.5	350.0	386.6	0.0	894.1	1581.1	144.7	0.0	600.0	14.7	614.7	128.0	832.0	403.6	1363.6	8.3	2131.3
PE 23	687.1	157.5	350.0	412.1	0.0	919.6	1606.6	144.7	0.0	600.0	58.4	658.4	128.0	832.0	461.9	1421.9	8.3	2233.3
PE 24	581.4	157.5	350.0	430.6	0.0	938.1	1519.4	130.7	0.0	600.0	90.1	690.1	128.0	832.0	504.1	1464.1	8.3	2293.2
PE 25	581.4	157.5	350.0	449.0	0.0	956.5	1537.9	130.7	0.0	600.0	121.8	721.8	128.0	832.0	546.4	1506.4	8.3	2367.1
PE 26	581.4	157.5	350.0	467.5	0.0	975.0	1556.4	130.7	0.0	600.0	153.5	753.5	128.0	832.0	588.6	1548.6	8.3	2441.0
PE 27	687.1	157.5	350.0	486.0	0.0	993.5	1680.5	144.7	0.0	600.0	185.1	785.1	128.0	832.0	630.8	1590.8	8.3	2528.9
PE 28	687.1	157.5	350.0	504.5	0.0	1012.0	1699.0	144.7	0.0	600.0	216.8	816.8	128.0	832.0	673.1	1633.1	8.3	2602.9
PE 29	687.1	157.5	350.0	516.0	0.0	1023.5	1710.5	144.7	0.0	600.0	236.5	836.5	128.0	832.0	699.3	1659.3	8.3	2648.8
PE 30	687.1	157.5	350.0	541.4	0.0	1048.9	1736.0	144.7	0.0	600.0	280.2	880.2	128.0	832.0	754.4	1714.4	8.3	2747.5
PE 31	581.4	157.5	350.0	559.9	0.0	1067.4	1648.8	130.7	0.0	600.0	311.9	911.9	128.0	832.0	799.8	1759.8	8.3	2810.6
PE 32	581.4	157.5	350.0	578.4	0.0	1085.9	1667.2	130.7	0.0	600.0	343.5	943.5	128.0	832.0	842.0	1802.0	8.3	2884.5
PE 33	581.4	157.5	350.0	596.9	0.0	1104.4	1685.7	130.7	0.0	600.0	375.2	975.2	128.0	832.0	881.1	1841.1	8.3	2955.3
PE 34	687.1	157.5	350.0	615.4	0.0	1122.9	1809.9	144.7	0.0	600.0	406.9	1006.9	128.0	832.0	926.5	1886.5	8.3	3046.4
PE 35	687.1	157.5	350.0	633.8	0.0	1141.3	1828.4	144.7	0.0	600.0	438.6	1038.6	128.0	832.0	968.8	1928.8	8.3	3120.3
J.Grant	8984.5	2205.0	4900.0	7178.0	0.0	14283.0	23267.5	1941.8	0.0	8400.0	3233.2	11633.2	1792.0	11648.0	9680.5	23120.5	115.5	36811.0
TOTAL	23943.0	5675.4	15286.8	9357.6	0.0	30319.8	54262.8	5013.8	0.0	13766.7	3252.2	17019.0	4700.7	26983.4	11908.8	43592.9	214.5	65840.1

List of Quamtities (TOTAL Reinforcing Bars for Column)

The West Bank

Pier No.	Reinforcing Bars for Column									
	T12 (tf)	T15 (tf)	T18 (tf)	T20 (tf)	T25 (tf)	T28 (tf)	T32 (tf)	T35 (tf)	T40 (tf)	sub-total (tf)
AW 1				0.190				38.740		38.930
PW 1				0.164	5.801			6.421		12.386
PW 2				0.207	7.272			6.678		14.158
PW 3				0.251	8.743			19.273		28.267
PW 4				0.294	10.214			7.069		17.577
PW 5				0.321	11.685			3.452		15.458
PW 6				0.337	11.692			107.556		119.586
PW 7				0.377	13.163			37.273		50.813
PW 8				0.424	14.634			129.369		144.427
PW 9				0.490	16.870			3.528		20.888
PW 10				0.515	17.703			81.799		100.017
PW 11				0.557	19.093			40.130		59.780
PW 12				0.599	20.483			74.984		96.066
PW 13				0.657	22.430			32.440		55.527
PW 14				0.699	23.820			2.138		26.657
PW 15				0.716	24.384			119.487		144.587
PW 16				0.759	25.855			47.849		74.463
PW 17				0.802	27.326			128.711		156.839
PW 18				0.681	28.448			50.100		79.228
PW 19				0.699	30.351			155.402		186.451
PW 20				0.716	31.697			111.463		143.876
PW 21				0.734	33.042			115.710		149.487
PW 22				0.752	34.388			119.961		155.102
PW 23				0.770	35.734			153.273		189.777
PW 24				0.795	37.080			64.266		102.141
PW 25				0.822	39.108			111.451		151.381
PW 26				0.841	40.579			107.032		148.452
PW 27				0.860	42.050			110.063		152.973
PW 28				0.879	43.521			113.330		157.730
PW 29				0.899	44.992			116.360		162.250
PW 30				0.918	46.463			119.464		166.845
Eg.West				18.727	768.620			2296.033		3122.120
PW 31				0.930	52.442			96.323		149.695
PW 32				0.956	60.450			128.607		190.013
PW 33				0.976	62.040			129.952		192.968
PW 34				0.995	63.556			133.351		197.902
PW 35				1.014	65.068			147.817		213.899
PW 36				1.033	66.812			143.712		211.557
PW 37				1.052	68.042			146.445		215.540
PW 38				1.064	62.588			195.814		259.467
PW 39				1.091	89.440			245.170		335.701
PW 40				1.110	91.070			231.790		323.970
PW 41				1.129	93.232			237.571		331.932
PW 42				1.149	95.314			243.346		339.808
PW 43				1.168	97.970			267.639		366.777
PW 44				1.187	100.132			273.991		375.310
J.Grant				14.854	1068.156			2621.526		3704.537
TOTAL	0.000	0.000	0.000	52.308	1836.776	0.000	0.000	4917.559	0.000	6826.657

The East Bank

Pier No.	Reinforcing Bars for Column									
	T12 (tf)	T15 (tf)	T18 (tf)	T20 (tf)	T25 (tf)	T28 (tf)	T32 (tf)	T35 (tf)	T40 (tf)	sub-total (tf)
AE 1				0.190				38.740		38.930
PE 1				0.553	17.154			127.666		145.374
PE 2				0.597	18.625			59.534		78.755
PE 3				0.640	20.096			62.175		82.910
PE 4				0.683	21.566			106.660		128.910
PE 5				0.726	23.037			39.700		63.464
PE 6				0.770	24.508			116.208		141.486
PE 7				0.813	25.979			72.985		99.777
PE 8				0.856	27.450			75.630		103.936
PE 9				0.899	28.921			90.075		119.895
PE 10				0.728	30.392			49.857		80.978
PE 11				0.748	31.863			140.609		173.219
PE 12				0.767	33.334			97.633		131.733
PE 13				0.786	34.805			97.723		133.314
PE 14				0.805	36.275			97.892		134.973
PE 15				0.810	37.746			66.619		105.176
PE 16				0.836	39.217			114.817		154.871
PE 17				0.856	40.688			110.398		151.942
PE 18				0.875	42.159			113.431		156.465
PE 19				0.894	43.630			116.696		161.220
PE 20				0.913	45.101			119.724		165.738
PE 21				0.932	46.572			122.834		170.339
Eg.East				16.678	669.119			1998.868		2723.405
PE 22				0.930	52.442			96.323		149.695
PE 23				0.956	60.450			128.607		190.013
PE 24				0.976	62.040			129.952		192.968
PE 25				0.995	63.556			133.351		197.902
PE 26				1.014	65.068			147.817		213.899
PE 27				1.033	66.812			143.712		211.557
PE 28				1.052	68.042			147.716		216.811
PE 29				1.064	62.588			195.814		259.467
PE 30				1.091	89.440			245.170		335.701
PE 31				1.110	91.070			231.790		323.970
PE 32				1.129	93.232			237.571		331.932
PE 33				1.149	95.314			243.346		339.808
PE 34				1.168	97.970			267.639		366.777
PE 35				1.187	100.132			273.991		375.310
J.Grant				14.854	1068.156			2622.798		3705.808
TOTAL	0.000	0.000	0.000	48.211	1737.275	0.000	0.000	4621.665	0.000	6429.213

List of Quamtities (Reinforcing Bars for Footing)

The West Bank

Pier No.	Reinforcing Bars for Footing									
	T12 (tf)	T15 (tf)	T18 (tf)	T20 (tf)	T25 (tf)	T28 (tf)	T32 (tf)	T35 (tf)	T40 (tf)	sub-total (tf)
AW 1						2.516		15.917	10.222	28.654
PW 1						2.516		26.970	15.268	44.754
PW 2						2.516		26.970	15.268	44.754
PW 3						2.997		53.683	20.324	77.004
PW 4						2.997		26.489	15.268	44.754
PW 5						2.516		26.970	15.268	44.754
PW 6						2.516		138.834	37.150	178.500
PW 7						2.997		62.458	29.681	95.136
PW 8						2.997		138.353	37.150	178.500
PW 9						2.516		26.970	15.268	44.754
PW 10						2.516		62.868	29.681	95.065
PW 11						2.997		62.387	29.681	95.065
PW 12						2.997		99.964	37.150	140.111
PW 13						2.997		36.625	15.268	54.890
PW 14						2.516		61.066	20.324	83.906
PW 15						2.516		62.744	29.681	94.940
PW 16						2.997		62.263	29.681	94.940
PW 17						2.997		62.263	29.681	94.940
PW 18						2.516		61.841	25.114	89.472
PW 19						2.516		166.689	44.906	214.112
PW 20						2.997		99.964	37.150	140.111
PW 21						2.997		99.964	37.150	140.111
PW 22						2.997		99.964	37.150	140.111
PW 23						2.516		134.505	37.150	174.171
PW 24						2.516		62.868	29.681	95.065
PW 25						2.516		62.868	29.681	95.065
PW 26						2.997		53.502	25.114	81.613
PW 27						2.997		53.502	25.114	81.613
PW 28						2.997		53.502	25.114	81.613
PW 29						2.516		62.868	29.681	95.065
PW 30						2.516		62.868	29.681	95.065
Eg.West						85.211		2128.699	844.697	3058.607
PW 31						51.180		23.899	29.681	104.759
PW 32						2.516		62.868	29.681	95.065
PW 33						2.997		53.502	25.114	81.613
PW 34						2.997		53.502	25.114	81.613
PW 35						2.997		53.502	25.114	81.613
PW 36						2.516		62.868	29.681	95.065
PW 37						2.516		71.784	29.681	103.981
PW 38						2.516		62.868	29.681	95.065
PW 39						2.516		53.983	29.681	86.179
PW 40						2.997		53.502	25.114	81.613
PW 41						2.997		53.502	25.114	81.613
PW 42						2.997		62.387	25.114	90.499
PW 43						2.516		62.868	29.681	95.065
PW 44						2.516		62.868	29.681	95.065
J.Grant						86.774		793.903	388.130	1268.807
TOTAL	0.000	0.000	0.000	0.000	0.000	171.985	0.000	2922.602	2077.525	4327.414

The East Bank

Pier No.	Reinforcing Bars for Footing									
	T12 (tf)	T15 (tf)	T18 (tf)	T20 (tf)	T25 (tf)	T28 (tf)	T32 (tf)	T35 (tf)	T40 (tf)	sub-total (tf)
AE 1						2.516		15.917	10.222	28.654
PE 1						2.516		166.689	44.906	214.112
PE 2						2.516		62.868	29.681	95.065
PE 3						2.997		62.387	29.681	95.065
PE 4						2.997		143.038	37.150	183.185
PE 5						2.516		59.666	20.324	82.506
PE 6						2.516		134.505	37.150	174.171
PE 7						2.997		62.387	29.681	95.065
PE 8						2.997		62.387	29.681	95.065
PE 9						2.997		99.964	37.150	140.111
PE 10						2.516		83.413	20.324	106.253
PE 11						2.516		134.505	37.150	174.171
PE 12						2.997		62.387	29.681	95.065
PE 13						2.997		62.387	29.681	95.065
PE 14						2.997		62.387	29.681	95.065
PE 15						2.516		62.868	29.681	95.065
PE 16						2.516		62.868	29.681	95.065
PE 17						2.997		53.502	25.114	81.613
PE 18						2.997		53.502	25.114	81.613
PE 19						2.997		53.502	25.114	81.613
PE 20						2.516		62.868	29.681	95.065
PE 21						2.516		62.868	29.681	95.065
Eg.East						60.643		1686.868	646.205	2393.716
PE 22						51.180		23.899	29.681	104.759
PE 23						2.516		62.868	29.681	95.065
PE 24						2.997		53.502	25.114	81.613
PE 25						2.997		53.502	25.114	81.613
PE 26						2.997		53.502	25.114	81.613
PE 27						2.516		62.868	29.681	95.065
PE 28						2.516		62.868	29.681	95.065
PE 29						2.516		71.784	29.681	103.981
PE 30						2.516		62.868	29.681	95.065
PE 31						2.997		53.502	25.114	81.613
PE 32						2.997		53.502	25.114	81.613
PE 33						2.997		53.502	25.114	81.613
PE 34						2.516		62.868	29.681	95.065
PE 35						2.516		62.868	29.681	95.065
J.Grant						86.774		793.903	388.130	1268.807
TOTAL	0.000	0.000	0.000	0.000	0.000	147.417	0.000	2480.771	1680.540	3662.524

List of Pile Quantities for Approach Bridges on the East Bank

Pier No.	Number of Piles per Pier (Nos.)	Design Length of Pile (m/pile)	Total Pile Length per Pier (m/pier)	Excavation Length per Pile (m/pile)	Excavation Volume (m^3)	Backfilling (m^3)	Remaining (m^3)	Concrete (m^3)	Reinforcing Bars																					
									Re-bar per pile												Re-bar per pier										
									T12 (tf)	T16 (tf)	T18 (tf)	T20 (tf)	T25 (tf)	T28 (tf)	T32 (tf)	T35 (tf)	T40 (tf)	sub-total (tf)	T12 (tf)	T16 (tf)	T18 (tf)	T20 (tf)	T25 (tf)	T28 (tf)	T32 (tf)	T35 (tf)	T40 (tf)	sub-total (tf)
AE 1	8	15.1	120.8	16.6	234.7	0.0	234.7	213.5	0.010	0.033	0.562	1.375						1.980	0.080	0.264	4.496	11.000						15.840
PE 1	30	15.1	453.0	16.6	880.0	0.0	880.0	800.5	0.010	0.033	0.562	1.375						1.980	0.300	0.990	16.860	41.250						59.400
PE 2	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.375						1.980	0.200	0.660	11.240	27.500						39.600
PE 3	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
PE 4	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.562			2.057				2.662	0.250	0.825	14.050			51.425				66.550
PE 5	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562	1.375						1.980	0.160	0.528	8.992	22.000						31.680
PE 6	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.562	1.375						1.980	0.250	0.825	14.050	34.375						49.500
PE 7	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
PE 8	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
PE 9	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.562			2.057				2.662	0.250	0.825	14.050			51.425				66.550
PE 10	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562	1.375						1.980	0.160	0.528	8.992	22.000						31.680
PE 11	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.562	1.375						1.980	0.250	0.825	14.050	34.375						49.500
PE 12	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
PE 13	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
PE 14	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
PE 15	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.375						1.980	0.200	0.660	11.240	27.500						39.600
PE 16	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.375						1.980	0.200	0.660	11.240	27.500						39.600
PE 17	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562			2.057				2.662	0.160	0.528	8.992			32.912				42.592
PE 18	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562			2.057				2.662	0.160	0.528	8.992			32.912				42.592
PE 19	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562			2.057				2.662	0.160	0.528	8.992			32.912				42.592
PE 20	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.375						1.980	0.200	0.660	11.240	27.500						39.600
PE 21	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.375						1.980	0.200	0.660	11.240	27.500						39.600
Eg.East	438	332.2	6613.8	365.2	12848.2916	0	12848.292	11687.3	0.22	0.726	12.364	15.125	0	22.627	0	0	0	51.062	4.38	14.45	246.156	302.5	0	448.426	0	0	0	841.412
PE 22	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.375						1.980	0.200	0.660	11.240	27.500						39.600
PE 23	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.624						2.229	0.200	0.660	11.240	32.480						44.580
PE 24	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562					3.275		3.880	0.160	0.528	8.992					52.400		62.080
PE 25	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562					3.275		3.880	0.160	0.528	8.992					52.400		62.080
PE 26	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562					3.275		3.880	0.160	0.528	8.992					52.400		62.080
PE 27	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.624						2.229	0.200	0.660	11.240	32.480						44.580
PE 28	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.624						2.229	0.200	0.660	11.240	32.480						44.580
PE 29	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
PE 30	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
PE 31	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562					3.275		3.880	0.160	0.528	8.992							9.680
PE 32	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562					3.275		3.880	0.160	0.528	8.992							9.680
PE 33	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562					3.275		3.880	0.160	0.528	8.992							9.680
PE 34	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
PE 35	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662	0.200	0.660	11.240			41.140				53.240
J.Grant	256	211.4	3865.6	232.4	7509.50375	0	7509.5038	6830.93	0.14	0.462	7.868	6.247	0	8.228	0	19.65	0	42.595	2.56	8.448	143.872	124.94	0	164.56	0	157.2	0	758.78
TOTAL	694	543.6	10479.4	597.6	20357.7953	0	20357.795	18518.2	0.36	1.188	20.232	21.372	0	30.855	0	19.65	0	93.657	6.94	22.9	390.028	427.44	0	612.986	0	157.2	0	1600.192

List of Pile Quantities for Approach Bridges on the West Bank

Pier No.	Number of Piles per Pier (Nos.)	Design Length of Pile (m/pile)	Total Pile Length per Pier (m/pier)	Excavation Length per Pile (m/pile)	Excavation Volume (m^3)	Backfilling (m^3)	Remaining (m^3)	Concrete (m^3)	Reinforcing Bars											
									Re-bar per pile											
									T12 (tf)	T15 (tf)	T18 (tf)	T20 (tf)	T25 (tf)	T28 (tf)	T32 (tf)	T35 (tf)	T40 (tf)	sub-total (tf)		
AW 1	8	15.1	120.8	16.6	234.7	0.0	234.7	213.5	0.010	0.033	0.562	1.375						1.980		
PW 1	12	15.1	181.2	16.6	352.0	0.0	352.0	320.2	0.010	0.033	0.562	1.375						1.980		
PW 2	12	15.1	181.2	16.6	352.0	0.0	352.0	320.2	0.010	0.033	0.562	1.375						1.980		
PW 3	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562			2.057				2.662		
PW 4	12	15.1	181.2	16.6	352.0	0.0	352.0	320.2	0.010	0.033	0.562			2.057				2.662		
PW 5	12	15.1	181.2	16.6	352.0	0.0	352.0	320.2	0.010	0.033	0.562	1.375						1.980		
PW 6	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.562	1.375						1.980		
PW 7	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562			2.057				2.662		
PW 8	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.562			2.057				2.662		
PW 9	12	15.1	181.2	16.6	352.0	0.0	352.0	320.2	0.010	0.033	0.562	1.375						1.980		
PW 10	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.375						1.980		
PW 11	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662		
PW 12	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.562			2.057				2.662		
PW 13	12	15.1	181.2	16.6	352.0	0.0	352.0	320.2	0.010	0.033	0.562			2.057				2.662		
PW 14	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562	1.375						1.980		
PW 15	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562	1.375						1.980		
PW 16	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.562			2.057				2.662		
PW 17	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.562			2.057				2.662		
PW 18	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581	1.375						1.999		
PW 19	30	15.1	453.0	16.6	880.0	0.0	880.0	800.5	0.010	0.033	0.581	1.375						1.999		
PW 20	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.581			2.135				2.759		
PW 21	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.581			2.135				2.759		
PW 22	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.581			2.135				2.759		
PW 23	25	15.1	377.5	16.6	733.3	0.0	733.3	667.1	0.010	0.033	0.581	1.375						1.999		
PW 24	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581	1.375						1.999		
PW 25	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581	1.375						1.999		
PW 26	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581			2.135				2.759		
PW 27	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581			2.135				2.759		
PW 28	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581			2.135				2.759		
PW 29	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581	1.375						1.999		
PW 30	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581	1.375						1.999		
Eg.West	573	468.1	8652.3	514.6	16808.3814	0	16808.381	15289.6	0.31	1.023	17.669	22	0	31.323	0	0	0	72.325		
PW 31	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581	1.375						1.999		
PW 32	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581		1.686					2.310		
PW 33	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581					3.395		4.019		
PW 34	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581					3.395		4.019		
PW 35	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581					3.395		4.019		
PW 36	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581		1.686					2.310		
PW 37	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581		1.686					2.310		
PW 38	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581			2.135				2.759		
PW 39	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581			2.135				2.759		
PW 40	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581					3.395		4.019		
PW 41	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581					3.395		4.019		
PW 42	16	15.1	241.6	16.6	469.3	0.0	469.3	426.9	0.010	0.033	0.581					3.395		4.019		
PW 43	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581			2.135				2.759		
PW 44	20	15.1	302.0	16.6	586.7	0.0	586.7	533.7	0.010	0.033	0.581			2.135				2.759		
J.Grant	256	211.4	3865.6	232.4	7509.50375	0	7509.5038	6830.93	0.14	0.462	8.134	1.375	5.058	8.54	0	20.37	0	44.079		
TOTAL	829	679.5	12517.9	747	24317.8852	0	24317.885	22120.5	0.45	1.485	25.803	23.375	5.058	39.863	0	20.37	0	116.404		

Pier No.	Reinforcing Bars																			
	Re-bar per pier																			
	T12 (tf)	T15 (tf)	T18 (tf)	T20 (tf)	T25 (tf)	T28 (tf)	T32 (tf)	T35 (tf)	T40 (tf)	sub-total (tf)										
AW 1	0.080	0.264	4.496	11.000						15.840										
PW 1	0.120	0.396	6.744	16.500						23.760										
PW 2	0.120	0.396	6.744	16.500						23.760										
PW 3	0.160	0.528	8.992			32.912				42.592										
PW 4	0.120	0.396	6.744			24.684				31.944										
PW 5	0.120	0.396	6.744	16.500						23.760										
PW 6	0.250	0.825	14.050	34.375						49.500										
PW 7	0.160	0.528	8.992			32.912				42.592										
PW 8	0.250	0.825	14.050			51.425				66.550										
PW 9	0.120	0.396	6.744	16.500						23.760										
PW 10	0.200	0.660	11.240	27.500						39.600										
PW 11	0.200	0.660	11.240			41.140				53.240										
PW 12	0.250	0.825	14.050			51.425				66.550										
PW 13	0.120	0.396	6.744			24.684				31.944										
PW 14	0.160	0.528	8.992	22.000						31.680										
PW 15	0.200	0.660	11.240	27.500						39.600										
PW 16	0.160	0.528	8.992			32.912				42.592										
PW 17	0.200	0.660	11.240			41.140				53.240										
PW 18	0.160	0.528	9.296	22.000						31.984										
PW 19	0.300	0.990	17.430	41.250						59.970										
PW 20	0.250	0.825	14.525			53.375				68.975										
PW 21	0.250	0.825	14.525			53.375				68.975										
PW 22	0.250	0.825	14.525			53.375				68.975										
PW 23	0.250	0.825	14.525	34.375						49.975										
PW 24	0.200	0.660	11.620	27.500						39.980										
PW 25	0.200	0.660	11.620	27.500						39.980										
PW 26	0.160	0.528	9.296			34.160				44.144										
PW 27	0.160	0.528	9.296			34.160				44.144										
PW 28	0.160	0.528	9.296			34.160				44.144										
PW 29	0.200	0.660	11.620	27.500						39.980										
PW 30	0.200	0.660	11.620	27.500						39.980										
Eg.West	5.73	18.91	327.232	396	0	595.839	0	0	0	1166.758										
PW 31	0.200	0.660	11.620	27.500						39.980										
PW 32	0.200	0.660	11.620		33.720					46.200										
PW 33	0.160	0.528	9.296					54.320		64.304										
PW 34	0.160	0.528	9.296					54.320		64.304										
PW 35	0.160	0.528	9.296					54.320		64.304										
PW 36	0.200	0.660	11.620		33.720					46.200										
PW 37	0.200	0.660	11.620		33.720					46.200										
PW 38	0.200	0.660	11.620			42.700				55.180										
PW 39	0.200	0.660	11.620			42.700				55.180										
PW 40	0.160	0.528	9.296					54.320		64.304										
PW 41	0.160	0.528	9.296					54.320		64.304										
PW 42	0.160	0.528	9.296					54.320		64.304										
PW 43	0.200	0.660	11.620			42.700				55.180										
PW 44	0.200	0.660	11.620			42.700				55.180										
J.Grant	2.56	8.448	148.736	27.5	101.16	170.8	0	325.92	0	785.124										
TOTAL	8.29	27.36	475.968	423.5	101.16	766.639	0	325.92	0	1951.882										

LIST OF QUANTITIES (Crushed stone, Leveling concrete, Scaffolding, Earth work)

The West Bank

Pier No.	Crushed Stone t=20cm	Blinding Concrete		Scaffolding			Earth Work		
		Concrete t=10cm	Form Work	Footing	Column	Sub-total	Excavation	Backfilling	Remainig
	(m^3)	(m^3)	(m^2)	(m^2)	(m^2)	(m^2)	(m^3)	(m^3)	(m^3)
AW 1	28.0	14.0	5.4	121.6	370.3	491.9	153.5	44.2	109.3
PW 1	33.7	16.8	5.3	149.0	220.4	369.4	175.4	43.2	132.2
PW 2	33.7	16.8	5.3	149.0	278.5	427.5	175.4	43.2	132.2
PW 3	45.6	22.8	6.0	168.0	336.6	504.6	228.3	49.1	179.2
PW 4	33.7	16.8	5.3	149.0	394.7	543.7	175.4	43.2	132.2
PW 5	33.7	16.8	5.3	149.0	430.8	579.8	175.4	43.2	132.2
PW 6	67.7	33.9	7.4	241.2	453.1	694.3	326.4	59.2	267.2
PW 7	53.7	26.9	6.6	218.4	506.7	725.1	265.0	53.4	211.6
PW 8	67.7	33.9	7.4	241.2	569.2	810.4	326.4	59.2	267.2
PW 9	33.7	16.8	5.3	149.0	657.5	806.5	175.4	43.2	132.2
PW 10	53.7	26.9	6.6	218.4	691.9	910.3	265.0	53.4	211.6
PW 11	53.7	26.9	6.6	218.4	748.2	966.6	265.0	53.4	211.6
PW 12	67.7	33.9	7.4	241.2	804.5	1045.7	326.4	59.2	267.2
PW 13	33.7	16.8	5.3	149.0	882.9	1031.9	175.4	43.2	132.2
PW 14	45.6	22.8	6.0	168.0	939.2	1107.2	228.3	49.1	179.2
PW 15	53.7	26.9	6.6	218.4	961.5	1179.9	265.0	53.4	211.6
PW 16	53.7	26.9	6.6	218.4	1019.6	1238.0	265.0	53.4	211.6
PW 17	53.7	26.9	6.6	218.4	1077.6	1296.0	265.0	53.4	211.6
PW 18	45.6	22.8	6.0	201.6	1121.9	1323.5	228.3	49.1	179.2
PW 19	81.7	40.8	8.1	264.0	1176.0	1440.0	387.8	65.1	322.7
PW 20	67.7	33.9	7.4	241.2	1230.1	1471.3	326.4	59.2	267.2
PW 21	67.7	33.9	7.4	241.2	1284.2	1525.4	326.4	59.2	267.2
PW 22	67.7	33.9	7.4	241.2	1338.3	1579.5	326.4	59.2	267.2
PW 23	67.7	33.9	7.4	241.2	1392.4	1633.6	326.4	59.2	267.2
PW 24	53.7	26.9	6.6	218.4	1468.5	1686.9	265.0	53.4	211.6
PW 25	53.7	26.9	6.6	218.4	1548.5	1766.9	265.0	53.4	211.6
PW 26	45.6	22.8	6.0	201.6	1606.6	1808.2	228.3	49.1	179.2
PW 27	45.6	22.8	6.0	201.6	1664.7	1866.3	228.3	49.1	179.2
PW 28	45.6	22.8	6.0	201.6	1722.8	1924.4	228.3	49.1	179.2
PW 29	53.7	26.9	6.6	218.4	1780.9	1999.3	265.0	53.4	211.6
PW 30	53.7	26.9	6.6	218.4	1838.9	2057.3	265.0	53.4	211.6
Eg.West	1596.4	798.2	199.0	6294.4	30516.9	36811.3	7898.7	1611.7	6286.9
PW 31	53.7	26.9	6.6	218.4	1875.0	2093.4	265.0	53.4	211.6
PW 32	53.7	26.9	6.6	218.4	1955.1	2173.5	265.0	53.4	211.6
PW 33	45.6	22.8	6.0	201.6	2013.2	2214.8	228.3	49.1	179.2
PW 34	45.6	22.8	6.0	201.6	2071.3	2272.9	228.3	49.1	179.2
PW 35	45.6	22.8	6.0	201.6	2129.3	2330.9	228.3	49.1	179.2
PW 36	53.7	26.9	6.6	218.4	2187.4	2405.8	265.0	53.4	211.6
PW 37	53.7	26.9	6.6	218.4	2245.5	2463.9	265.0	53.4	211.6
PW 38	53.7	26.9	6.6	218.4	2281.6	2500.0	265.0	53.4	211.6
PW 39	53.7	26.9	6.6	218.4	2361.7	2580.1	265.0	53.4	211.6
PW 40	45.6	22.8	6.0	201.6	2419.7	2621.3	228.3	49.1	179.2
PW 41	45.6	22.8	6.0	201.6	2477.8	2679.4	228.3	49.1	179.2
PW 42	45.6	22.8	6.0	201.6	2535.9	2737.5	228.3	49.1	179.2
PW 43	53.7	26.9	6.6	218.4	2594.0	2812.4	265.0	53.4	211.6
PW 44	53.7	26.9	6.6	218.4	2652.1	2870.5	265.0	53.4	211.6
J.Grant	703.1	351.6	89.0	2956.8	31799.5	34756.3	3489.9	721.6	2768.3
TOTAL	2299.6	1149.8	288.0	9251.2	62316.4	71567.6	11388.6	2333.3	9055.2

The East Bank

Pier No.	Crushed Stone t=20cm	Blinding Concrete		Scaffolding			Earth Work		
		Concrete t=10cm	Form Work	Footing	Column	Sub-total	Excavation	Backfilling	Remainig
	(m^3)	(m^3)	(m^2)	(m^2)	(m^2)	(m^2)	(m^3)	(m^3)	(m^3)
AE 1	28.0	14.0	5.4	121.6	370.3	491.9	153.5	44.2	109.3
PE 1	81.7	40.8	8.1	264.0	743.3	1007.3	387.8	65.1	322.7
PE 2	53.7	26.9	6.6	218.4	801.4	1019.8	265.0	53.4	211.6
PE 3	53.7	26.9	6.6	218.4	859.5	1077.9	265.0	53.4	211.6
PE 4	67.7	33.9	7.4	241.2	917.6	1158.8	326.4	59.2	267.2
PE 5	45.6	22.8	6.0	168.0	975.7	1143.7	228.3	49.1	179.2
PE 6	67.7	33.9	7.4	241.2	1033.7	1274.9	326.4	59.2	267.2
PE 7	53.7	26.9	6.6	218.4	1091.8	1310.2	265.0	53.4	211.6
PE 8	53.7	26.9	6.6	218.4	1149.9	1368.3	265.0	53.4	211.6
PE 9	67.7	33.9	7.4	241.2	1208.0	1449.2	326.4	59.2	267.2
PE 10	45.6	22.8	6.0	168.0	1266.1	1434.1	228.3	49.1	179.2
PE 11	67.7	33.9	7.4	241.2	1324.1	1565.3	326.4	59.2	267.2
PE 12	53.7	26.9	6.6	218.4	1382.2	1600.6	265.0	53.4	211.6
PE 13	53.7	26.9	6.6	218.4	1440.3	1658.7	265.0	53.4	211.6
PE 14	53.7	26.9	6.6	218.4	1498.4	1716.8	265.0	53.4	211.6
PE 15	53.7	26.9	6.6	218.4	1512.5	1730.9	265.0	53.4	211.6
PE 16	53.7	26.9	6.6	218.4	1592.5	1810.9	265.0	53.4	211.6
PE 17	45.6	22.8	6.0	201.6	1650.6	1852.2	228.3	49.1	179.2
PE 18	45.6	22.8	6.0	201.6	1708.7	1910.3	228.3	49.1	179.2
PE 19	45.6	22.8	6.0	201.6	1766.8	1968.4	228.3	49.1	179.2
PE 20	53.7	26.9	6.6	218.4	1824.9	2043.3	265.0	53.4	211.6
PE 21	53.7	26.9	6.6	218.4	1882.9	2101.3	265.0	53.4	211.6
Eg.East	1199.3	599.7	145.8	4693.6	28001.2	32694.8	5903.7	1178.9	4724.8
PE 22	53.7	26.9	6.6	218.4	1875.0	2093.4	265.0	53.4	211.6
PE 23	53.7	26.9	6.6	218.4	1955.1	2173.5	265.0	53.4	211.6
PE 24	45.6	22.8	6.0	201.6	2013.2	2214.8	228.3	49.1	179.2
PE 25	45.6	22.8	6.0	201.6	2071.3	2272.9	228.3	49.1	179.2
PE 26	45.6	22.8	6.0	201.6	2129.3	2330.9	228.3	49.1	179.2
PE 27	53.7	26.9	6.6	218.4	2187.4	2405.8	265.0	53.4	211.6
PE 28	53.7	26.9	6.6	218.4	2245.5	2463.9	265.0	53.4	211.6
PE 29	53.7	26.9	6.6	218.4	2281.6	2500.0	265.0	53.4	211.6
PE 30	53.7	26.9	6.6	218.4	2357.3	2575.7	265.0	53.4	211.6
PE 31	45.6	22.8	6.0	201.6	2419.7	2621.3	228.3	49.1	179.2
PE 32	45.6	22.8	6.0	201.6	2477.8	2679.4	228.3	49.1	179.2
PE 33	45.6	22.8	6.0	201.6	2531.5	2733.1	228.3	49.1	179.2
PE 34	53.7	26.9	6.6	218.4	2594.0	2812.4	265.0	53.4	211.6
PE 35	53.7	26.9	6.6	218.4	2652.1	2870.5	265.0	53.4	211.6
J.Gramt	703.1	351.6	89.0	2956.8	31790.7	34747.5	3489.9	721.6	2768.3
TOTAL	1902.4	951.2	234.8	7650.4	59791.9	67442.3	9393.7	1900.6	7493.1

5.3 Quantities for Approach Roads

LIST OF QUANTITIES, JAPANESE GRANT AID PORTION

Items		Description	Unit	Quantities	Remarks
Earthworks	Clearing and Grubbing		m^2	63,706	
	Road Excavation	(Cut)	m^3	0	
	Borrow Excavation	(Embankment)	m^3	44,343	
Side Slopes	Embankment		m^2	5,196	
	Cut		m^2	1,990	
Culverts	Box Culvert	2,700×7,000	lm	0	
	Box Culvert	3,500×3,400	lm	0	
	Box Culvert	3,500×6,500	lm	0	
	Pipe Culvert	ϕ 1,800	lm	36.7	
Pavement	Carriage Way	On Earthwork	m^2	0	
	Maintenance Road	Beneath Bridges	m^2	11,019	
Median	Median Strip	W = 1,000	lm	1,850	

LIST OF QUANTITIES, JAPANESE GRANT AID PORTION

Items		Description	Unit	Quantities	Remarks
Traffic Control Facilities	Lighting Poles		No	185	
	Guard Rails	H = 1,000	lm	0	
	Concrete Barrier	H = 1,350	lm	0	
Miscellaneous Work	Boundary Stakes		No	185	
	Relocated Road		lm	0	
	Access Bridges		m^2	0	
Land Acquisition	Land				
	Desert		m^2	43,236	
	Military Area		m^2	40,649	
	Military Area		m^2	0	
	School Area		m^2	0	
	Compensation				
	Houses		No	0	
	Military Facilities		No	0	
	School		No	0	

LIST OF QUANTITIES, EGYPTIAN PORTION - THE WEST BANK

Items		Description	Unit	Quantities	Remarks
Earthworks	Clearing and Grubbing		m^2	116,088	
	Road Excavation	(Cut)	m^3	0	
	Borrow Excavation	(Embankment)	m^3	213,149	
Side Slopes	Embankment		m^2	34,737	
	Cut		m^2	0	
Culverts	Box Culvert	2,700×7,000	m	25.0	
	Box Culvert	3,500×3,400	m	25.0	
	Box Culvert	3,500×6,500	m	25.0	
	Pipe Culvert	ϕ 1,800	m	34.2	
Pavement	Carriage Way	On Earthwork	m^2	32,777	
	Maintenance Road	Beneath Bridges	m^2	8,330	
Median	Median Strip	W = 1,000	m	1,428	

LIST OF QUANTITIES, EGYPTIAN PORTION - THE WEST BANK

Items		Description	Unit	Quantities	Remarks
Traffic	Lighting Poles		No	305	
Control	Guard Rails	H = 1,000	lm	2,880	
Facilities	Concrete Barrier	H = 1,350	lm	514	
	Boundary Stakes		No	296	
Miscellaneous	Relocated Road	W = 6~7m	lm	692.5	
Work	Access Bridges		m^2	406.8	
	Land				
	Desert		m^2	0	
	Military Area		m^2	123,334	
Land	Military Area		m^2	4,629	
Acquisition	School Area		m^2	11,560	
	Compensation				
	Houses		No	3	
	Military Facilities		No	3	
	School		No	2	

LIST OF QUANTITIES, EGYPTIAN PORTION - THE EAST BANK

Items		Description	Unit	Quantities	Remarks
Earthwork	Clearing and Grubbing		m^2	208,140	
	Road Excavation	(Cut)	m^3	25,118	
	Borrow Excavation	(Embankment)	m^3	542,874	
Slope	Embankment		m^2	68,155	
	Cut		m^2	3,454	
Culvert	Box Culvert	2,700×7,000	m	0	
	Box Culvert	3,500×3,400	m	0	
	Box Culvert	3,500×6,500	m	0	
	Pipe Culvert	ϕ 1,800	m	95.1	
Pavement	Carriage Way	On Earthwork	m^2	73,696	
	Maintenance Road	Beneath Bridges	m^2	6,807	
Median	Median Strip	W = 1,000	m	1,437	

LIST OF QUANTITIES, EGYPTIAN PORTION - THE EAST BANK

Items		Description	Unit	Quantities	Remarks
Traffic Control Facility	Lighting Poles		No	480	
	Guard Rails	H = 1,000	No	0	
	Concrete Barrier	H = 1,350	lm	1,186	
Miscellaneous Work	Boundary Stakes		No	471	
	Relocated Road		lm	0	
	Access Bridges		m^2	0	
Land Acquisition	Land				
	Desert		m^2	242,146	
	Military Area		m^2	0	
	Military Area		m^2	0	
	School Area		m^2	0	
	Compensation				
	Houses		No	0	
	Military Facilities		No	0	
	School		No	0	

CHAPTER 6

CONSTRUCTION PLAN

CHAPTER 6 CONSTRUCTION PLAN

6.1 Construction Conditions of Project Site

6.1.1 General Description

There is a very big difference in the topography for the construction of bridges and roads on the east side and the west side of the Canal. On the west side of the Suez Canal there are roads and railroads running parallel to the Suez Canal with the Trunk Highway of the Ismailiya-Port Said Highway crossing and the Abassah irrigation canal. There are developed areas along the proposed route alignment with farm lands and scattered residences. These will restrict the entry into construction work site areas and establishment of work spaces. In contrast to this, on the east side of the Canal, the area consists of desert land and marshy salt flats with little to restrict the establishment of work site areas at any chosen location.

Existing Canal crossing facilities near the proposed site are the Qantara Ferry 1.5 km to the north, which transports light vehicles but pedestrians but would not be suitable for construction purposes. To transport any general materials and equipment of value it would be necessary to use the Ferdan Ferry 18 km to the south of the proposed crossing point. In order to undertake any construction, it would be necessary to employ a dedicated vessel with docking facilities on both sides of the Canal to haul the materials and equipment together with the project personnel.

Large volumes of water will be required in connection with the project, and it should be possible to supply water from the existing water mains on both banks.

6.1.2 Construction Conditions

(1) Conditions

The Project proposes to construct a long span Cable-Stayed bridge over the Suez Canal. The Construction Plan has been made under the following conditions.

- In consideration of the various constraints and to keep the construction costs as low as possible the maximum construction period for any portion is planned to be 42 months.

- In order to keep the construction costs low, it is proposed to reuse the bridge erection equipment, general construction equipment and temporary materials to the greatest extent. Local construction materials will be procured where their quality is satisfactory, and their quantities procured are sufficient.

- Since there is limited experience in Egypt of a large bridge construction project similar to this and the cable stayed bridge requires high level accuracy in design and construction, it is planned to dispatch a group of specialists and experienced engineers from Japan in order to assure accuracy and smooth running of the Project.

- Since the bridge construction will be performed over the Suez Canal, construction methods will be selected to permit the actual construction time over the canal to be as short as possible.

- The length of the approach bridge to be constructed by the Japanese side will be 1,120 m, and the length to be constructed by the Egyptian side will be 2,043 m, and the construction methods selected will be of a type that will permit the construction times for the superstructure and the substructures to be kept as short as possible.

- In the course of organizing for the construction supervision, the construction Program management will be formulated in order to cope with any problems, on the whole Project which might occur due to differences of financial sources and contractors.

(2) Points to keep in Mind when executing the Works

A main feature of this project is that the construction of the Cable-Stayed bridge over the Suez Canal will be carried out at a height of 70 meters. The Egyptian side does have experience in the use of Movable Falsework, but it must be borne in mind that their normal cycle time is 30 to 40 days which is relatively slow.

The points to keep in mind are as follows:

- During the construction of the main bridge, the steel girder sections will be loaded on flat barges , and will cross the Suez Canal. Therefore it will be necessary to maintain close coordination with the Suez Canal Authority for the safety of the canal traffic.
- As the actual bridge construction will take place over the Canal, close attention must be paid to the prevention of objects and personnel falling into the water, and strict standards of safety must be observed.
- As construction operations will take place at high levels, the highest being 150 meters, safety procedures on the work site must be strictly enforced .

- The Project has been divided into three sections, the Main Bridge and the Approach Bridges on the East and West Banks, implemented under the Japanese Grant Aid, and the Approach Bridges and Approach Roads on the East and West Banks, constructed by the Egyptian side. These consist of 3 contract construction areas, therefore close control of the construction programming for the whole Project must be maintained to ensure smooth progress of the Works.

- If the steel box girders and other specialized materials are to be manufactured in a foreign factory and transported to Egypt, the import procedures process must be arranged by the Egyptian authorities beforehand in order to prevent delays to the construction works.

6.1.3 Temporary Construction Facilities

It will be necessary to construct temporary work facilities on both sides of the Canal for the bridge construction. As described previously, there will be restrictions in establishing any work facilities on the west side of the Canal and therefore it is recommended that the principal work facilities are established on the East side with secondary facilities on the West side.

The temporary works facilities will be divided into three separate areas, for each of the following activities :

- Bridge materials temporary storage yard and preliminary assembly yard (East Bank only)
- Works and general materials storage yard (East and West)
- Site Management Offices and Welfare Administration Offices (East and West)

All site facilities will be provided with fencing for security and safety, and will be provided with security guards on a continuous basis.

(1) Temporary Facilities on the East Bank

The temporary work facilities will have to be set up at the beginning of the project. Access to the East Bank Site Offices Area will be from the New Central Highway and the Canal Road along the Canal. The planned temporary main access from the existing New Central Highway to the East Bank works site should be planned to become part of the permanent access road. All temporary work yards and shops should be near the canal.

The temporary works will consist of the following main items. The space to be provided for temporary works has been estimated to be 84,000 m^2, and plans of the yard facilities are shown in Figs. 6.1.1 and 6.1.2

- Temporary storage yard for bridge components, assembly and ship out
- Construction equipment storage yard
- Industrial water storage facilities
- Concrete and mortar batching plant yard
- Storage yard for sand and washed gravel
- Construction materials storage yard and sheds
- Electric generator and air compressor sheds
- Equipment repair shops and fuel storage facilities
- Site offices parking lots, worker's camps, recreation facilities, and first aid station
- Ferry pier and access ramp

(2) Temporary Facilities on West Bank

The west side temporary facilities will be located between the Ismailiya-Port Said Highway and the Irrigation Canal. Access roads to the temporary works facilities and Project Site can be made by utilizing the Highways, Irrigation Monitoring Roads, and the local roads.

The temporary facilities will be generally similar to the east side facilities as shown in Fig. 6.1.2, but there will be smaller equipment/material storage facilities, site office, repair shop facilities, and recreational facilities provided.

The area of this temporary facility is estimated to be 30,000 m^2, each on West Bank.

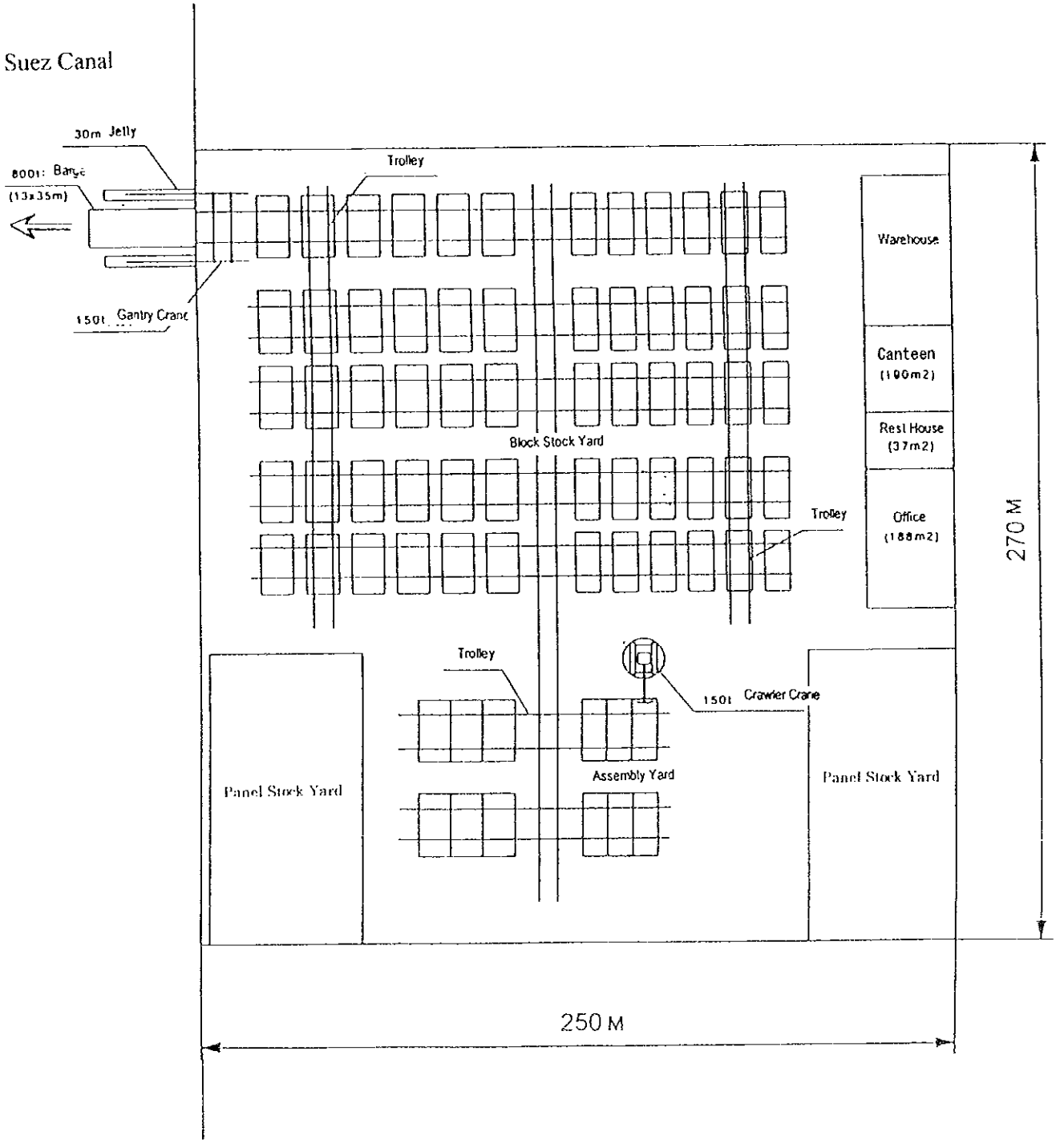


Fig. 6.1.1 Steel Girder Assembly Yard (East Bank)

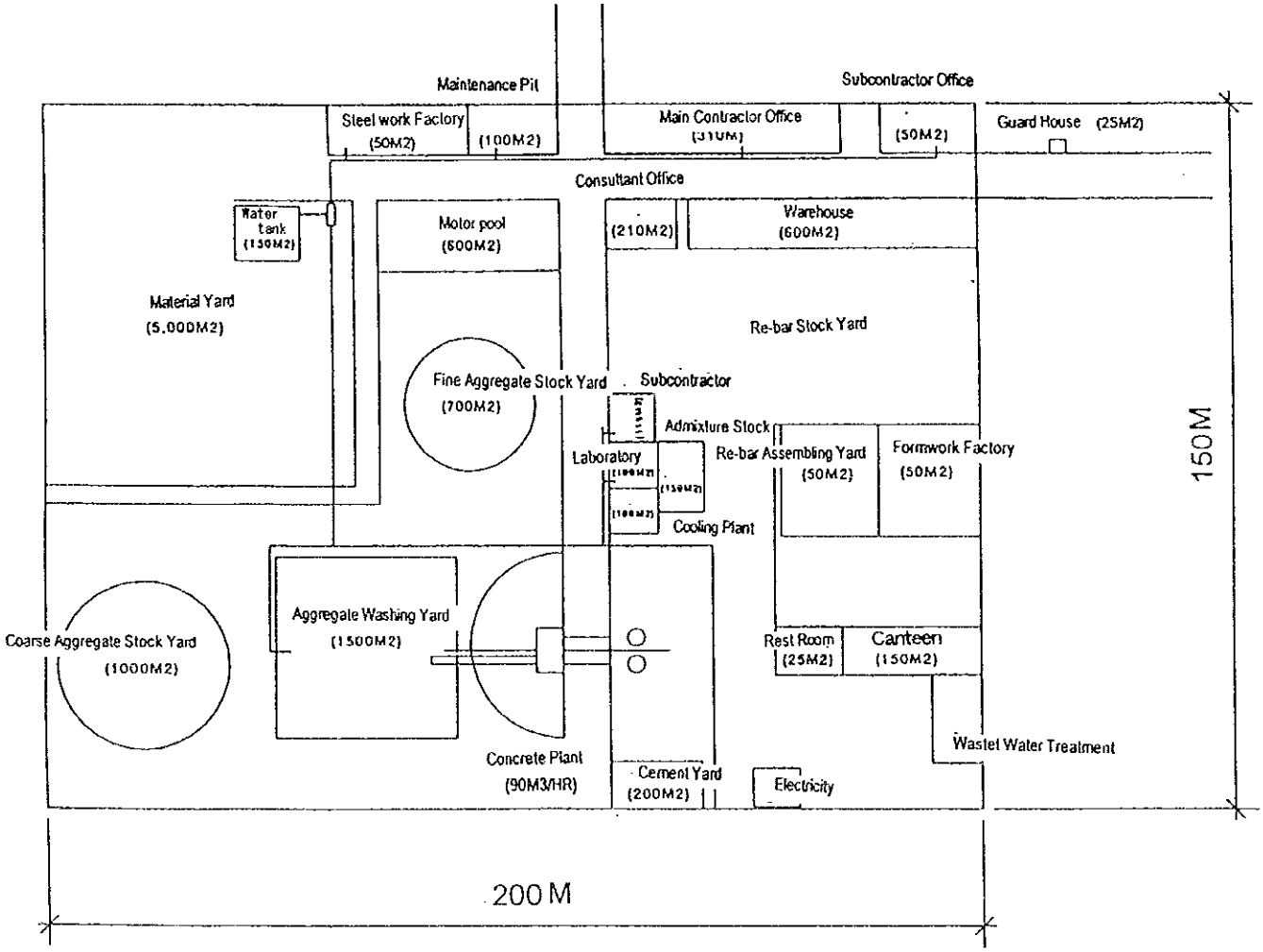


Fig. 6.1.2 Ordinary Temporary Facilities

6.2 Construction Method for Main Bridge

6.2.1 Construction Conditions

(1) The Conditions for Use of the Canal

The cable stayed bridge will be designed, keeping the method of erection of the main girder in mind. The construction of the main girder of the bridge will be performed by suspending the girder with the stay cables, while cantilevering in incremental erection stages. The girder will be extended from the pylon on to the side span, then to the main span thus keeping both sides in balance, and temporary supports will be used in this operation.

The canal will be kept in full use during construction under the following conditions.

i) The navigation clearance during construction

The navigational clearance during construction shall be 70 m at high water level for the navigation width of 270 m, and outside this width to the crest of both banks for a range of 57 m, shall be 68 m at high water level.

ii) Dedicated use of canal water surface during construction

During the period when the convoys are switching their north to south movements at Qantara, i.e. nine hours between 05:30- 9:30 and 20:00- 01:00, the water surface of the canal can be used. However when considering dangerous and expensive night work, normal permitted working hours for the Main Bridge shall be four hours between 05:30 to 9:30.

The canal surface for 30 m from the crests can be used at all times.

In the future the east side of the canal waterway is planned to be widened, and this water surface can be used if available.

The hours of convoy operation may be changed, and during the implementation stage it will be necessary to hold meetings with the Suez Canal Authority about actual bridge construction schedules.

6.2.2 Foundations

Following further studies a concrete diaphragm wall has been selected as the foundation type for the pylons of the Main Bridge. The advantages of concrete diaphragm wall construction compared with the open caisson type method are as follows:

i) The disturbance to soil around the foundation is very limited.

ii) Construction period is much less than that for the caisson type.
- Concrete diaphragm wall = 4.5 month/ea.
- Caisson including bottom and top slabs = 10 month/ea.

The conceptual drawing of diaphragm wall is shown in Fig. 6.2.1.

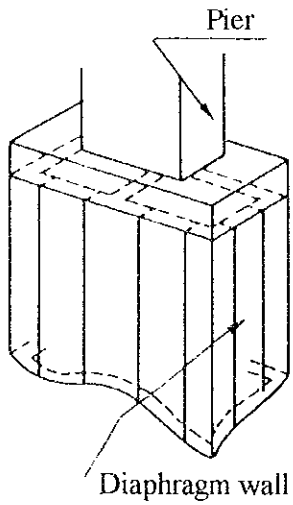
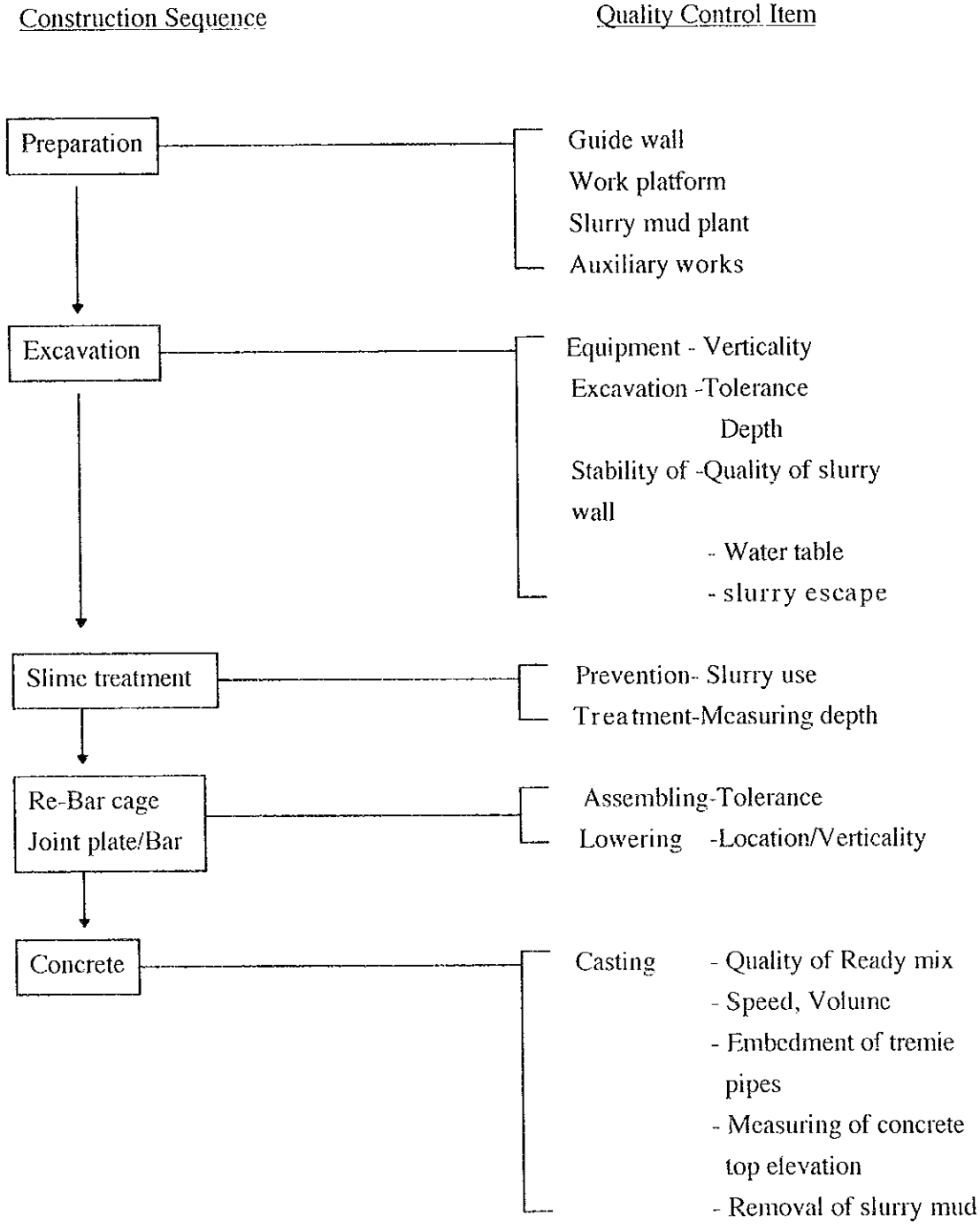


Fig. 6.2.1 Diaphragm Wall

Phases of construction for the diaphragm wall with corresponding quality control items are shown in Table 6.2.1.

Table 6.2.1. Phases of Construction for Diaphragm Wall



6.2.3 Pylons

The pylon will be constructed with reinforced concrete using climbing forms. Elevators will be provided for the vertical movement of the materials and laborers. For the lifting of reinforcing steel, concrete and other construction materials, one tower crane with a capacity of 192 tm will be provided. This crane can be used not only for the construction of the pylons, but can be used to install the stay cables and hoisting materials.

For the casting of concrete at superstructure deck level, generally a concrete skip (bucket) will be used.

Conceptual construction method for pylons is shown in Fig. 6.2.2.

6.2.4 Auxiliary Piers in Side Spans

After the cast in situ 1.5 m dia. concrete piles have been constructed, and the pile cap cast, a pair of auxiliary piers of rectangular box shape will be constructed with climbing forms and a tower crane (90 tm). These piers extend approximately to 65 m high.
This work will be performed prior to the main girder for the main bridge coming to the location.
The method of auxiliary pier construction is shown in Fig. 6.2.3.

6.2.5 Superstructure

The main girder for the main bridge will be manufactured in the factory in segments and divided into 10 different elements of 12 m (for the center span) and 10 m (for the side spans) for ease of transportation to the bridge site. The component segments will be pre-assembled and welded into segments at the steel girder assembly yard. One segment will weigh approximately 120 tonnes. The pre-assembly yard will only be located on the East Bank, as shown previously in Fig. 6.1.1.

The erection sequence and method for the main girder and cables are as follows: (See Fig. 6.2.4)

i) In order to hold the first main girder segment in place temporarily, a working platform and temporary support on a diagonal bent will be provided on both sides of the pylons.

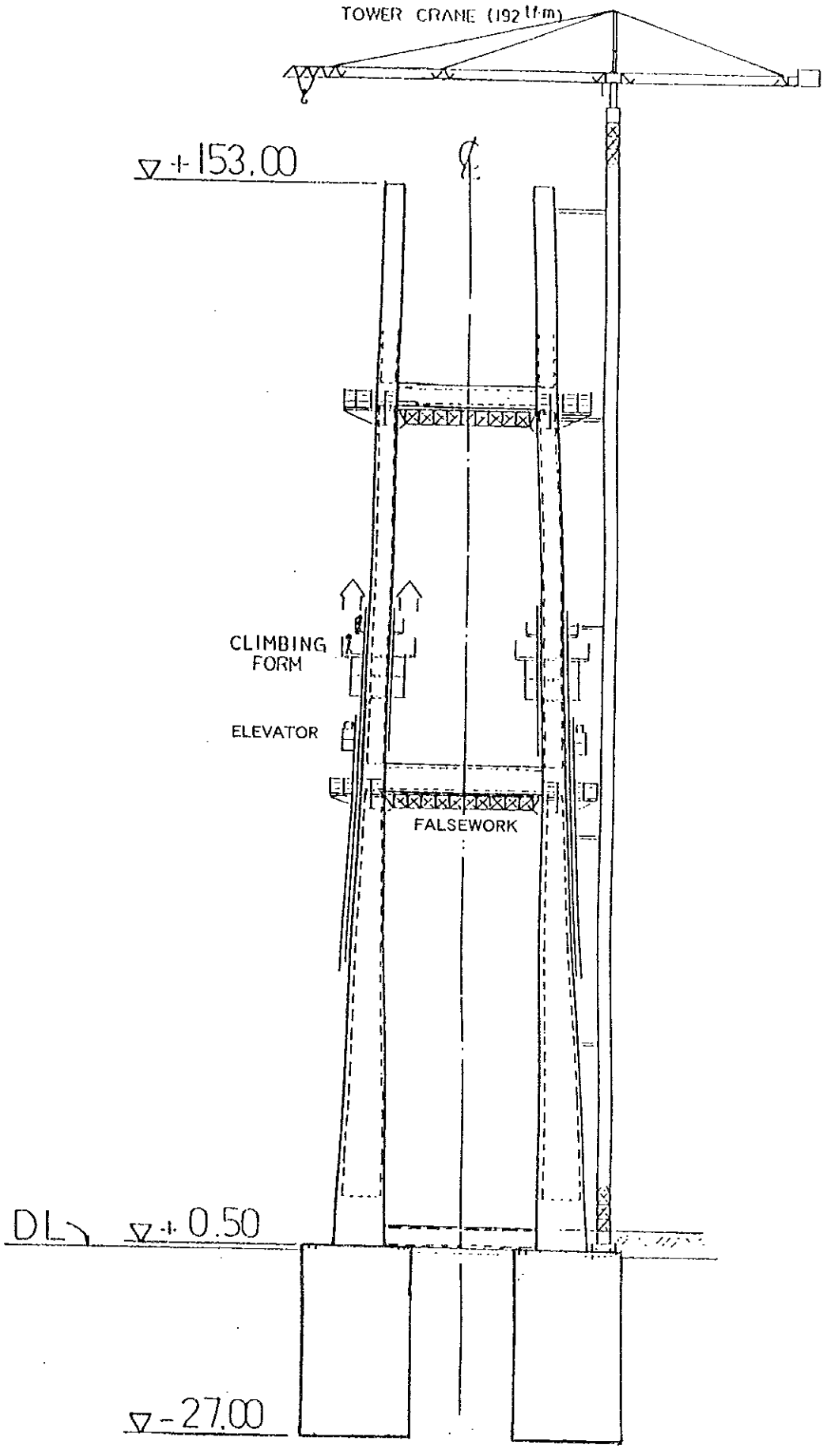


Fig. 6.2.2 Construction of Pylons

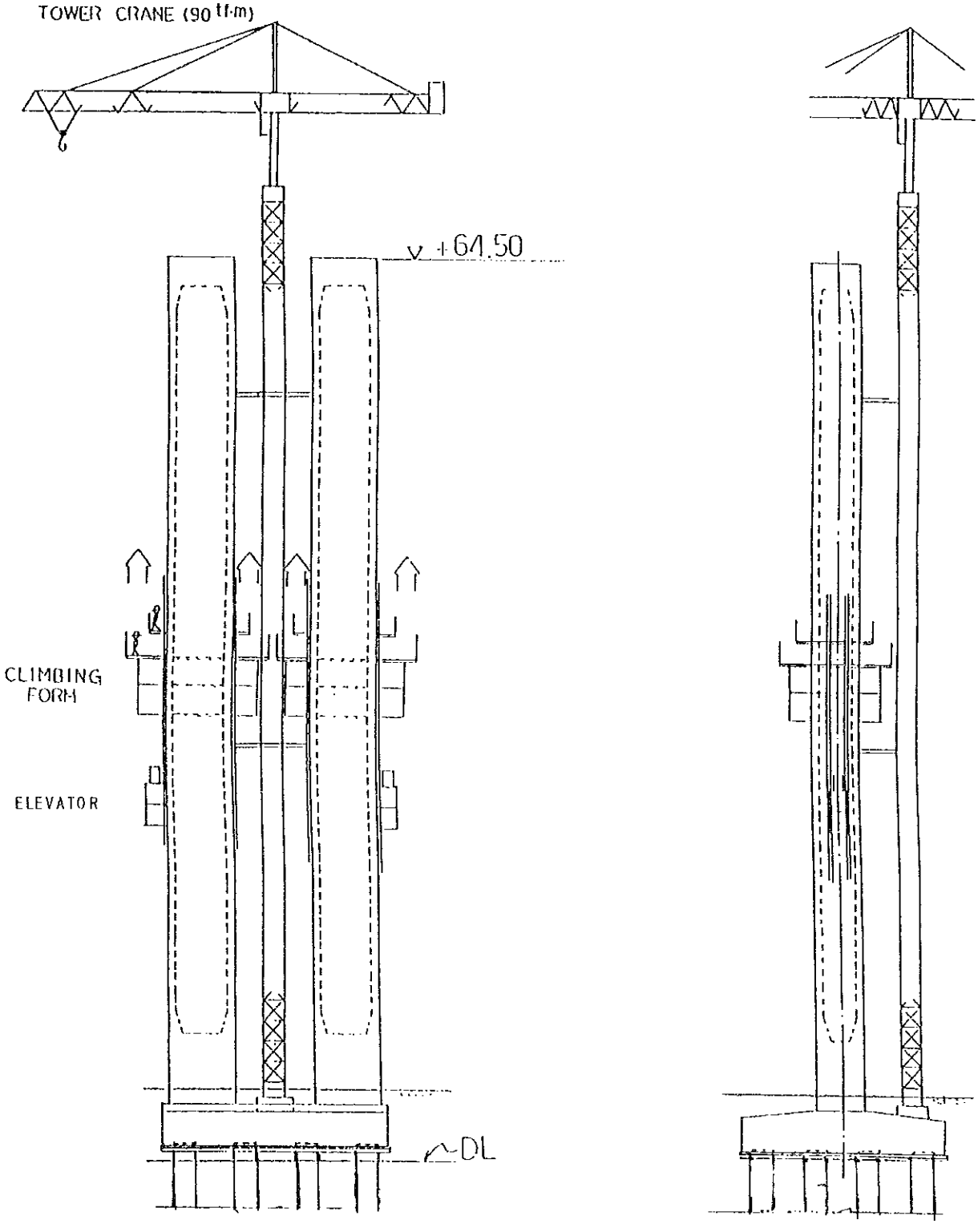
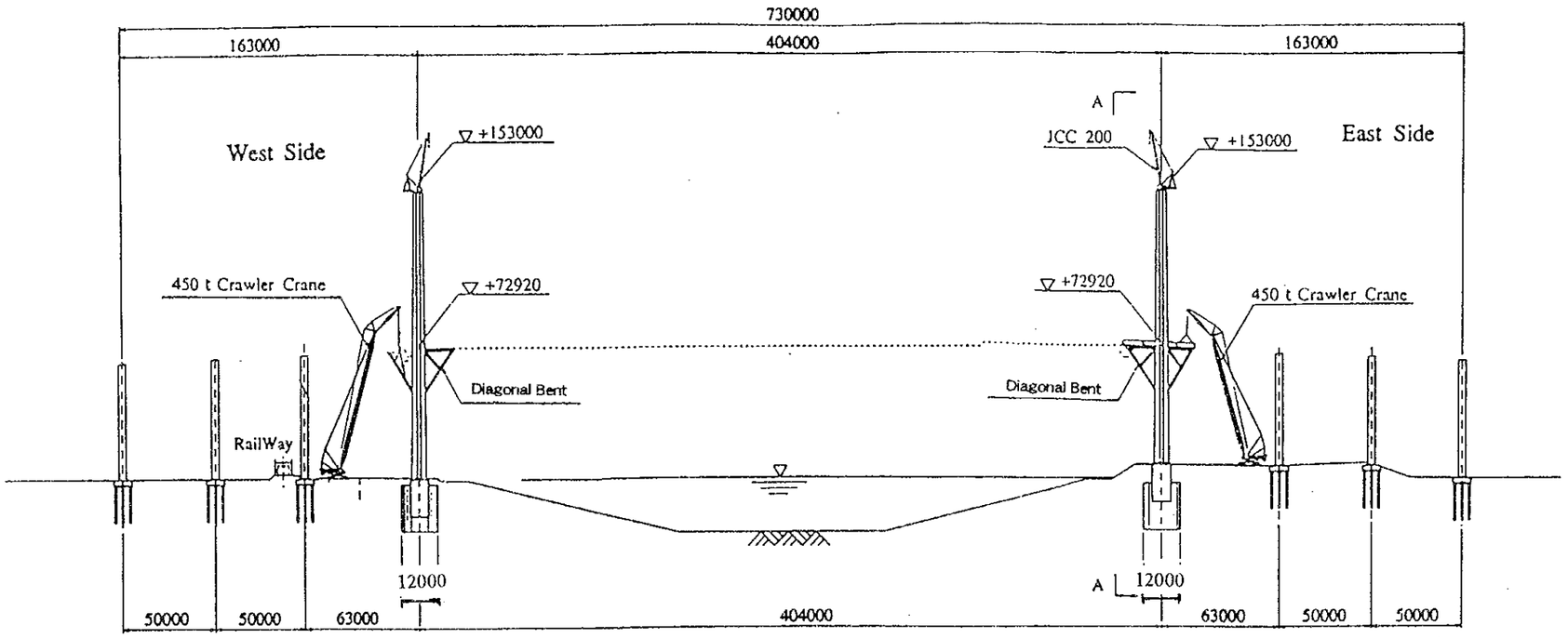


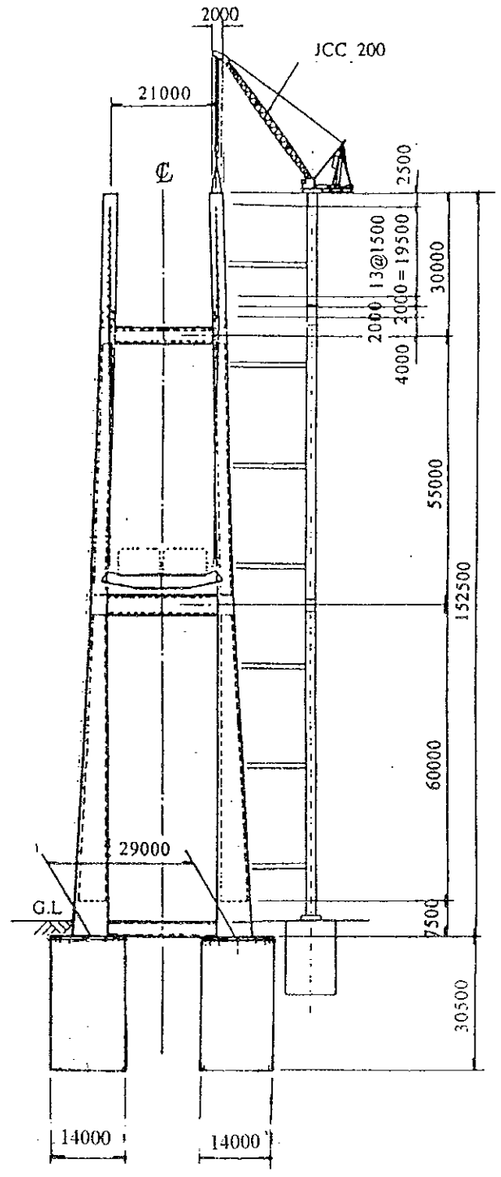
Fig. 6.2.3 Construction of Auxiliary Piers

Stage 1. Preparation Work

Side View (1) S=1:1500



A—A Section S=1:600



Stage 2. Balanced Cantilever Erection

Side View (2) S=1:1500

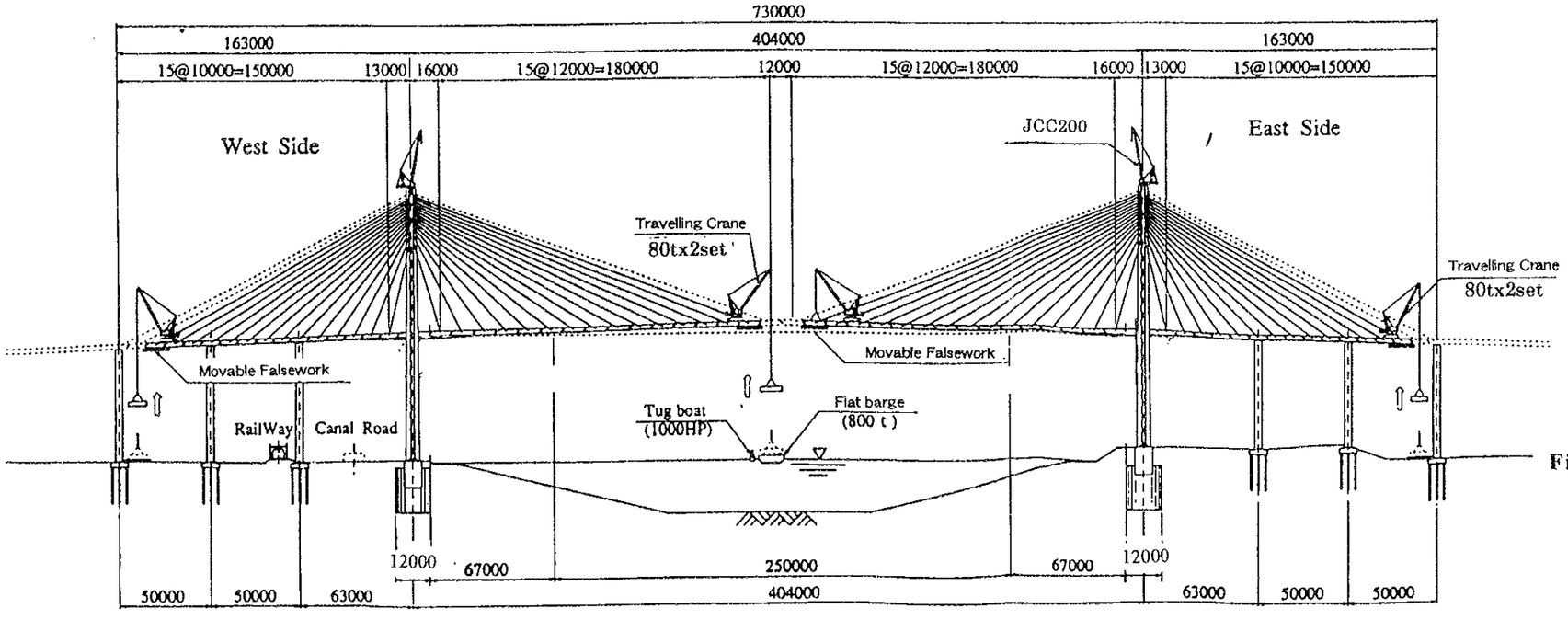


Fig. 6.2.4 Conceptual Construction Sequence for Cable Stayed Bridge

ii) A main girder segment will be temporarily held in place using the crawler crane on the temporary support at the cross beam of the pylon.

iii) The travelling crane (derrick crane) for the side span girder will be assembled on the erected main girder. The first segment of the side span will be hoisted in place with this crane.

iv) The segment of the center span will be erected in a similar manner. The pre-assembled segment will be towed into place with a flat barge in the Canal under the bridge and then hoisted into position.

v) The next segment for the center span and side spans can be hoisted into place and connected to the main girder using the stay cables from the pylon to hold the girder in position.

vi) The subsequent segments for the center span and side spans will be erected into place in a similar manner alternately, while performing the operation on each side. During this operation the main girders will be erected and installed.

vii) At the end of the cantilevering procedure a closure segment will be connected at the center of the center span, completing the main girder.

The girders under construction will be provided with a camber, and stay cable lengths will be calculated beforehand, so that girders are positioned in the correct position. For the side spans, when the girder reaches the auxiliary pier, in order to adjust the camber and cable prestressing, the members will be secured temporarily in a higher position but in order to stabilize the structure, connections will be made to the piers.

The most important feature in the construction of cable stayed bridge is to finish the profile of the girder to the shape called for in the design, while simultaneously making the stay cables and the girder match the designed stress called for. In order to meet with this requirement, the girders being installed should not only be calculated for their final position but calculations of the adjustments made in the field to match their differences.

Conceptual drawing of the erection of stay cables is shown in Fig. 6.2.5.

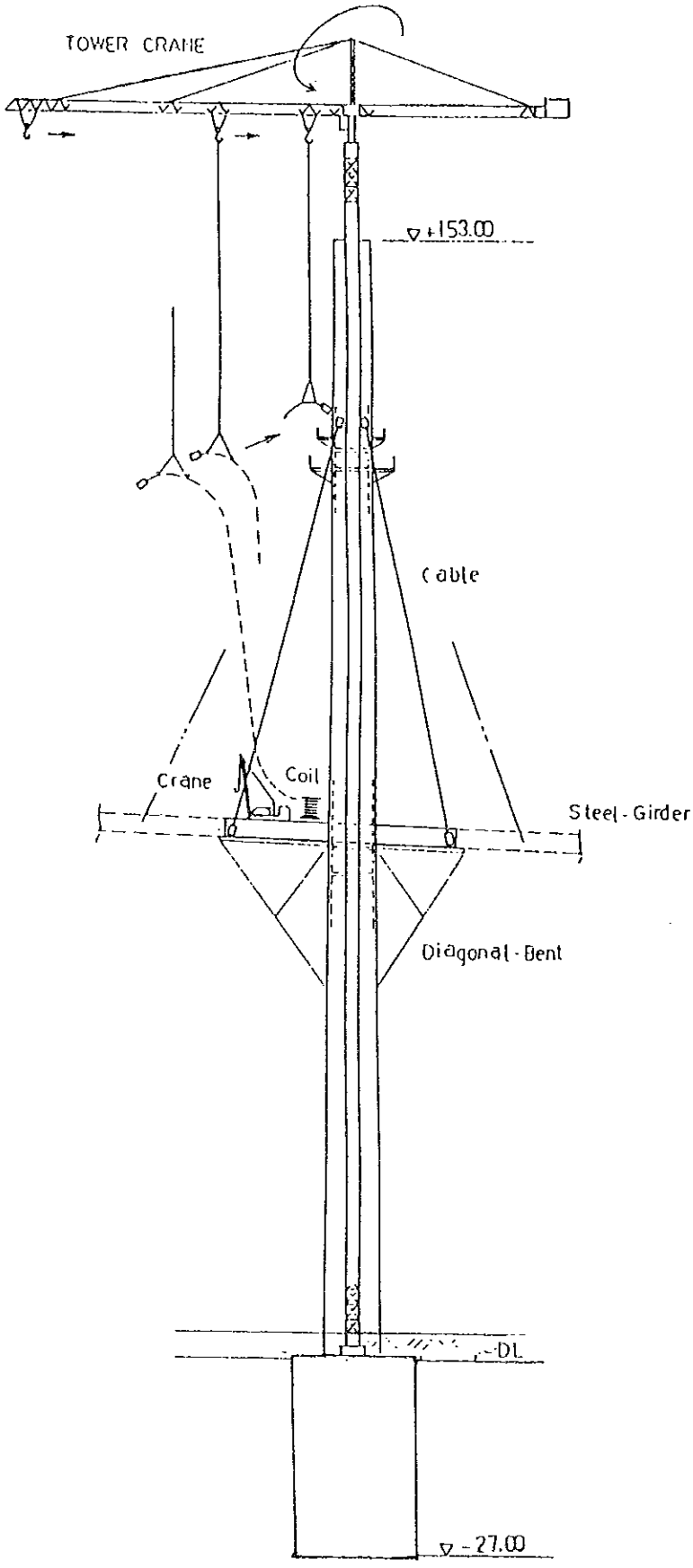


Fig. 6.2.5 Erection of Stay Cables

Maintaining safe navigation in the Canal during construction operations must be ensured, and the entire construction works must be protected with safety netting to prevent objects falling on to the vessels passing below.

6.3 Construction Method of Approach Bridges

6.3.1 Construction Requirements

Since the approach bridges in the Japanese Grant Aid Portion and Egyptian Portions (East Bank and west Bank) have uniform span lengths of 40 m, and extremely high piers, the following points should be considered in the construction planning.

i) Uniform span length and high elevation of girders

In construction planning consideration of the safety of the works is essential. Due to the uniform span length of 40 m, construction with Movable Falsework is recommended and has been selected for this Project.

ii) High piers

The height of the approach bridge piers will range up to approximately 65 m. The dimensions of the piers are uniform. Therefore the use of climbing forms has been recommended for safety and quality control reasons, and selected for the Project.

6.3.2 Foundations

The foundations for the approach bridges will be cast in situ concrete piles of 1.5 m dia. The bearing strata for the entire construction area will consist of hard fine sand layers extending from the surface to a depth of approximately 7 to 10 m. It is expected that a bearing strata can be obtained at a comparatively shallow depth. However, the pile length has been planned as the bearing (friction bearing) of a long pile, with a length of 10 times the pile diameter (1.5 m), giving a length of 15 m.

The fully cased method (Benoto pile method) will be used for construction. Each segment (6 m long) of the casing will be screwed together and pressed down into the ground. Excavation inside the casings will be carried out with a hammer grab, which is efficient in solid and hardened sand layers. With this method bentonite slurry is not required, since

the whole pile length is protected by casing. When the concrete is cast, the casing will be extracted without any shock.

Conceptual drawing of this method is shown in Fig. 6.3.1.

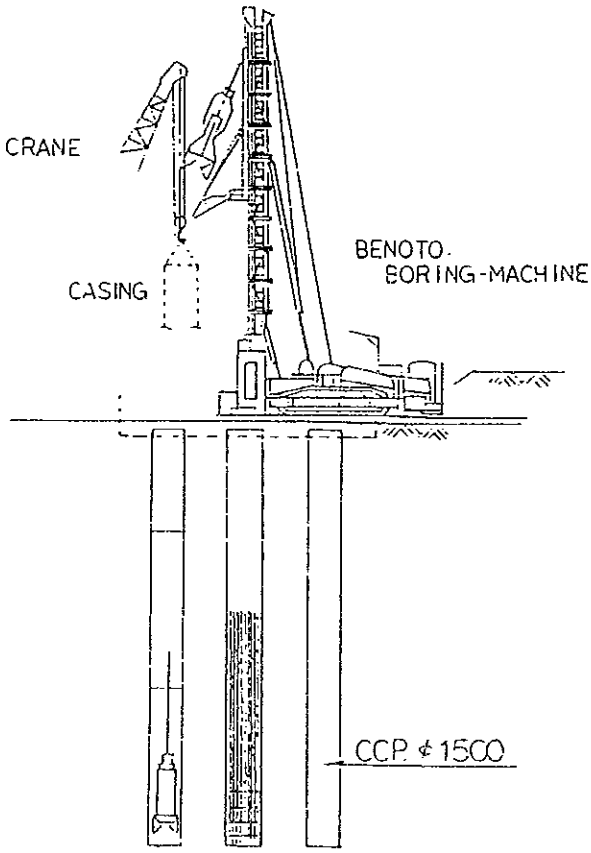


Fig. 6.3.1 Conceptual Drawing for Cased Piling Method

When all piles are cast, and pile tops are trimmed, a pile cap will be constructed.

6.3.3 Substructures

The bridge piers will vary in height from approximately 43 m to 62 m in the Japanese Grant Aid Portion, and 43 m to 7 m in the Egyptian Portions. The construction of the bridge piers will be carried out using a tower crane (90 tm) and climbing forms. Same methods as for the auxiliary piers of the Main Bridge will be used.

6.3.4 Superstructures

The superstructure for the 7 span continuous of girder bridge will comprise cast in situ concrete PSC box girders on high piers spaced 40 m apart. As the work location is very high, heavy duty Movable Falsework will be used. The method of construction is shown in Fig. 6.3.2. The lowest span height in the Japanese Grant Aid Portion will be constructed using the shoring system from ground level for safety and work efficiency reasons. After the first span is constructed, the heavy duty Movable Falsework will be assembled on top of the PSC girder. A conceptual drawing of the Movable Falsework method is shown in Fig. 6.3.3. The Movable Falsework will be launched as the work progresses, and the cast in situ PSC girder is constructed. After completion of the main girders, the Movable Falsework will be returned to its starting position and be slid to the bridge of another bound, and continue with its girder construction work. After the construction work is completed, the Movable Falsework will be dismantled.

6.3.5 Miscellaneous Structures

On the approach bridges the following miscellaneous structures will be constructed.

-Concrete Barrier
-Hand Rail on Concrete Barrier
-Road lighting poles
-Cables for lighting and communications
-Others

As soon as the PSC girders to be constructed with the Movable Falsework have been completed, concrete barriers works will commence, and hand rails and other works will follow. The works will be executed in accordance with the drawings and the specifications, and also the instructions issued by the Engineer.

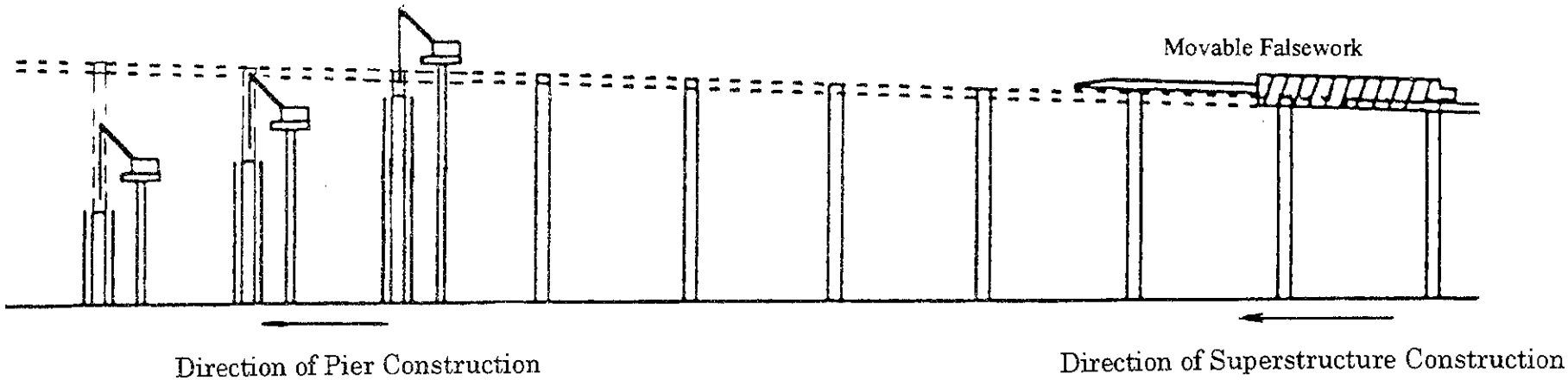


Fig. 6.3.2 Construction System with Movable Falsework

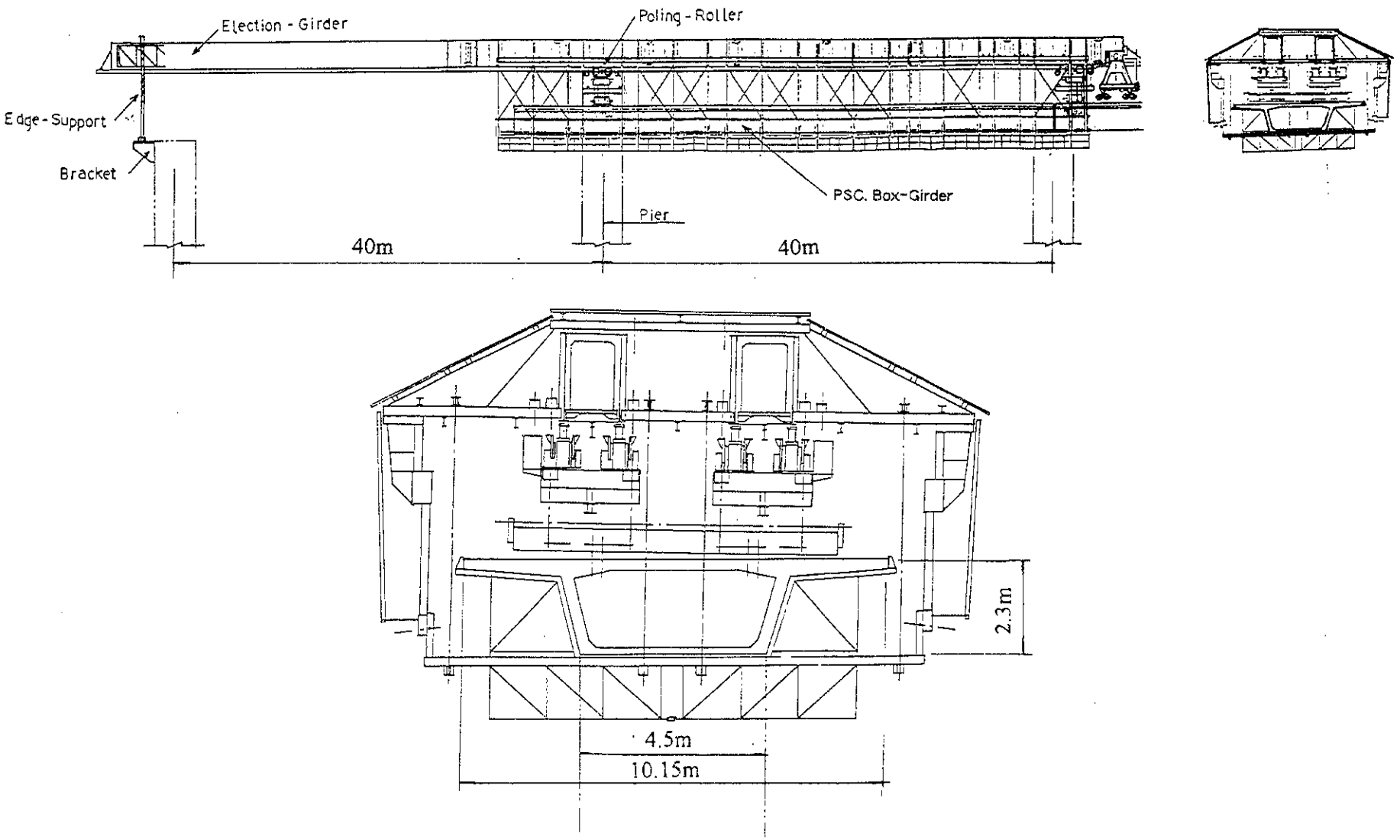


Fig. 6.3.3 Movable Falsework

6.4 Construction Method for Approach Roads and Access Roads

6.4.1 Construction Requirements

On the West Bank the farm land in the Project sites has been developed for many years and it is not economical to acquire this established farm land, while on the East Bank there is only desert land. For the above reasons the following maximum embankment heights were selected.

For the East Bank -- 20 m based on the embankment stability
For the West Bank --10 m to minimize land use

6.4.2 Embankments

1) Materials

The approach embankment will be constructed using local sand from around the Canal. However, high quality materials delivered from the specified quarry will be required in order to maintain the stability of the high embankment. The sand to be used for approach embankment will be selected, tested and approved by the Engineer.
In order to ensure the stability of the approach embankments, an internal angle of friction of 35 degrees is required in the lower levels of the embankments. Therefore, unscreened gravel and gravely soil of fine sand from a specified quarry will be used for this critical section of the embankment, such as the toes and surface of slopes, as described previously in Chapter 4, 4.5.2 Embankment stability.

2) Preparation

Prior to placing any embankment materials, all clearing and grubbing operations will have been completed.

3) Embankment

The placing of fill material will be carried out in successive layers of full width and in such lengths as are suitable for the water sprinkling and compaction method utilized. The layers will not exceed 30 cm thickness.

When necessary, each layer, before being compacted, will be treated as required to bring the moisture content sufficiently close to the optimum to enable its compaction to the required density.

Each layer of material will be compacted uniformly by use of adequate and appropriate compaction equipment in order to obtain the required density.

Samples to determine the compaction will be taken regularly as directed by the Engineer. During the settlement period the embankment will be continuously maintained and more fill material added, if necessary to achieve the required section and grade.
At the end of the settlement period all excess fill above the design subgrade level will be excavated and disposed of as directed by the Engineer.

4) Slope Protection

Slope protection for preventing surface erosion and weathering will be required. Stone pitching will be used to protect the surface of the embankment after taking into account the local climate and embankment materials

6.4.3 Access Roads

The access roads are the roads which connect the Suez Canal Bridge and Approach Roads with the existing road network. The access roads will be constructed on low embankment of approx. 1.5 m above the ground level.

The access roads on the East Bank will be used for access to the construction work shops and yards and work will be started as soon as the Project contracts have been awarded. On the West Bank there will be a section of access road to be closed down in order to install a box culvert for the local road, and to construct a bridge over an irrigation canal, and these structures will be started early in the project.

6.4.4 Pavement

The standard total thickness of pavement in Egypt is 70 cm as described previously in Chapter 4, 4.3.3 Pavement Design.

Surface	: 5 cm
Binder Course	: 5 cm
Base Course (Crushed Stone for mechanical compaction	: 25 cm
Subbase(Crusher run)	: 35 cm

1) Preparation of Subgrade

The subgrade swill be profiled and compacted prior to Subbase work.

2) Subbase

Immediately after the subbase material has been spread and profiled satisfactorily, it will be compacted with suitable and adequate compaction equipment. Rolling operations will begin from the outer edge of roadbed toward the center, gradually in a longitudinal direction. Materials will contain the optimum moisture for required density.

3) Asphalt Concrete Pavement and Road Marking

Asphaltic concrete pavement and road marking will be carried out in accordance with the specifications and instructions given by the Engineer.

6.4.5 Road Facilities

The following road facilities are included in the Project.

-Drainage
-Lighting System
-Traffic Safety Facilities (Traffic Barrier and Traffic Management Facilities)

These facilities will be manufactured and installed or provided in accordance with the specifications and instructions given by the Engineer.

6.5 Construction Materials

1) Basic Policy

Of the materials required, the items that can be procured locally will as a general rule be obtained from local sources. If the item can be easily obtained on the local market, the items scheduled for import will then be procured locally. If there are any problems concerning their quality, or procurement period, the item will be procured from Japan or other countries.

2) Materials Procurement Plan

The means of procurement for the major materials for this project will be in accordance with the results of the local procurement investigation as shown in "Table 6.5.1 Procurement Plan for Principal Construction Materials".

- Cement

Cement can be obtained locally from cement factories such as the Alexandria Cement Co.

- Reinforcing Bar

Deformed reinforcing bars up to 29 ϕmm are manufactured in Alexandria in accordance with British Standards Specifications. Reinforcing bars of 35 ϕmm can be obtained if ordered in sufficient quantities.

- Stay Cable, PC Tendon and Related Products

Stay cables for cable-stayed bridges, PC stranded wires, PC tendon anchors, PC wire sheaths, and other related accessories are not manufactured in Egypt, and will have to be procured from other countries.

- Steel Girders and Structural Steel

It will be possible to procure structural steel angles 100 x 100 mm, channels 200 x 75 mm, H-beams 200 x 200 mm, steel tubing up to 1m dia. from local sources in Egypt. However, structural steel sections not manufactured in Egypt will be procured from sources abroad.

- Concrete Formwork

Almost all lumber and waterproof plywood are imported and available in Egypt. So concrete formwork will be procured locally from imported sources. Structural steel formwork also will be procured locally from imported sources.

- Sands, Aggregates

Sands and aggregates of good quality are available from Fanar approximately 10 km west of Ismailiya. Also good quality crushed rock aggregates are available from Ataqa approximately 20 km west of Suez. Thus sand and aggregates will be procured from local sources.

- Asphalt Concrete Hot Mix

This will be procured locally.

Table 6.5.1 Procurement Plan for Principal Construction Materials

Name of Material	Egypt	Japan	Third Country	Remarks
Embankment Fill	O			
Aggregates	O			
Sands	O			
Asphalt Emulsions	O			
Portland Cement	O			
Admixtures	O			
Reinforcing Steel	O			
Plywood (Formwork)	O			
PC Stranded Wire			O	12 T, 15.2
PC Wire Sheath			O	
PC Tendon Anchors			O	12 T, 15.2 Use
Stay Cable			O	
Steel Pipe			O	
Bearing			O	
Expansion Joints			O	
Asphalt Hot Mix	O			

6.6 Construction Plant and Equipment

1) Basic Policy

The procurement policy for the construction equipment will be similar to the policy for the construction materials. And they will be procured locally to the greatest extent. Construction equipment for regular use will basically be procured locally, and equipment for large scale activities, will be basically imported from Japan or other countries in order to minimize breakdowns and malfunctions. This will be necessary as the schedule and progress of the work could be greatly affected especially in the case of the cable-stayed bridge.

2) Procurement Plan for Construction Equipment

The procurement plan for the major construction equipment required for this project will be in accordance with the local investigation result as shown in "Table 6.6.1 Procurement Plan for the Major Construction Equipment".

- Earth Moving Equipment

It will be possible to procure earth moving equipment such as bulldozers, backhoes, pile-drivers, vibro-hammers, and similar equipment locally.

- Pile Foundation Equipment

It is planned to employ local contractors for the cast-in-place concrete pile work.

- Freight handling and Transportation Equipment

Regular transport such as cargo trucks, tip trucks, trailer trucks are easily procured locally. Mobile cranes and tower cranes are commonly used by local contractors. But heavy capacity crawler cranes and traveler cranes are not readily available so that they will be brought in from Japan or other countries.

- Movable Falsework

Main girders will be manufactured locally. But the hydraulic and electric control drives and monitors related to Movable Falsework will be procured from other countries.

(3) Transport Routes for Materials and Equipment

1) Marine Transport

The port of delivery of goods by sea will be Alexandria.

2) Inland Transport

The materials and equipment procured from abroad and from Cairo and other countries will be delivered to Qantara via inland routes.

Table 6.6.1 Procurement Plan for the Major Construction Equipment

Description	Specification	Egypt	Japan	3rd Country	Remarks
Bulldozer	3 t, 15 t	O			
Backhoe	0.35 m^3, 0.6 m^3	O			
Tractor Shovel	1.2 m^3, 2.1 m^3	O			
Clamshell	0.8 m^3			O	
Dump Truck	8 t, 20 t	O			
Trailer Truck	Low-bed	O			
Motor Grader	3.1 m	O			
Road Roller	10 ~ 12 t	O			
Tire Roller	8 ~ 20 t	O			
Vibrating Roller	0.8 ~ 1.1 t	O			
Auger Borer	ϕ1.5 m	O			Steel Casing
Vibro-Hammer	40 KVA	O			
Mobile Crane	Hydraulic, 20, 30, 40 t	O			
Mobile Crane	Mechanical, 135 t	O			
Mobile Crane	Mechanical, 150 t			O	
Mobile Crane	Hydraulic, 160 t			O	
Crawler Crane	45 t	O			
Crawler Crane	150 t			O	
Crawler Crane	450 t		O		
Tower Crane	90 tm (pier)	O			
Tower Crane	192 tm(pylon)			O	
Flat Barge	800 t	O			
Tug Boat	1,000 HP	O			
Movable Falsework	Main Girder	O			
Movable Falsework	Elec., Hydr.			O	
Concrete Plant	1.5 m^3 Batch			O	
Agitator Truck	4.5 m^3	O			
Concrete Pump Truck	w/Boom, 30 m^3/h			O	
Cooling Plant	200 JRT			O	
Generator	125 KVA			O	
Generator	450 KVA			O	
Air Compressor	3.7, 7.6 m^3/min			O	

6.7 Construction Time Schedule

6.7.1 General Description

The project is divided into 3 construction sections as follows:

1) Main Bridge and Approach Bridges (higher portion more than FL 49.5 m)
2) Approach Bridge and Approach Road (East) (lower portion less than FL 49.5 m)
3) Approach Bridge and Approach Road (West)(lower portion less than FL 49.5 m)

The construction period of the main bridge and higher approach bridges (Japanese Grant Aid Portion) is 3 years and 6 months (42 months), and that of the lower approach bridges and roads (Egyptian Sections) is for 3 years and 1 month (37 months), East Bank, and for 3 years and 6 months (42 months), West Bank.

Since the construction of the main bridge governs the whole construction period, various ways to shorten the construction period have been studied. The construction period was analyzed in accordance with the cycle time of each stage of works and with the following characteristics being taken into consideration:

i) Standard working conditions such as working hours and labor efficiency were adopted.

ii) Safety and uniform and required quality of construction are prioritized.

iii) Economical selection of heavy equipment (capacity, type and quantity) and economical construction method have been employed.

The following characteristics of the main bridge construction were taken into consideration to set up the time schedule.

i) Superstructure works of center span will be executed over the Suez Canal and be at the high elevation of approximately 70 m above the water. The crane on the ground can be used only at the limited area, such as near pylons.

ii) Hoisting of the steel girder segment of the center span have to be carried out during a very limited time, of only 4 hours a day. Welding and bolting works to connect the steel girder segments will be carried out at the high elevations with full attention and care. During this work vessels will transit the Canal.

iii) Adjusting of the stay cables stress is needed at every stage of the cantilever erection of the cable stayed bridge and will probably to be carried out during a limited period in the day time.
This is the difference between a suspension bridge and a steel truss bridge.

iv) Since reinforced concrete pylons have been selected in this project, a longer construction period is required than that for steel towers.

6.7.2 Japanese Grant Aid Portion

The construction time schedule for the Japanese Grant Aid Portion is shown in Figs. 6.11 to 6.7.4.

CONSTRUCTION SCHEDULE

MAIN BRIDGE (JAPANESE GRANT AID PORTION)

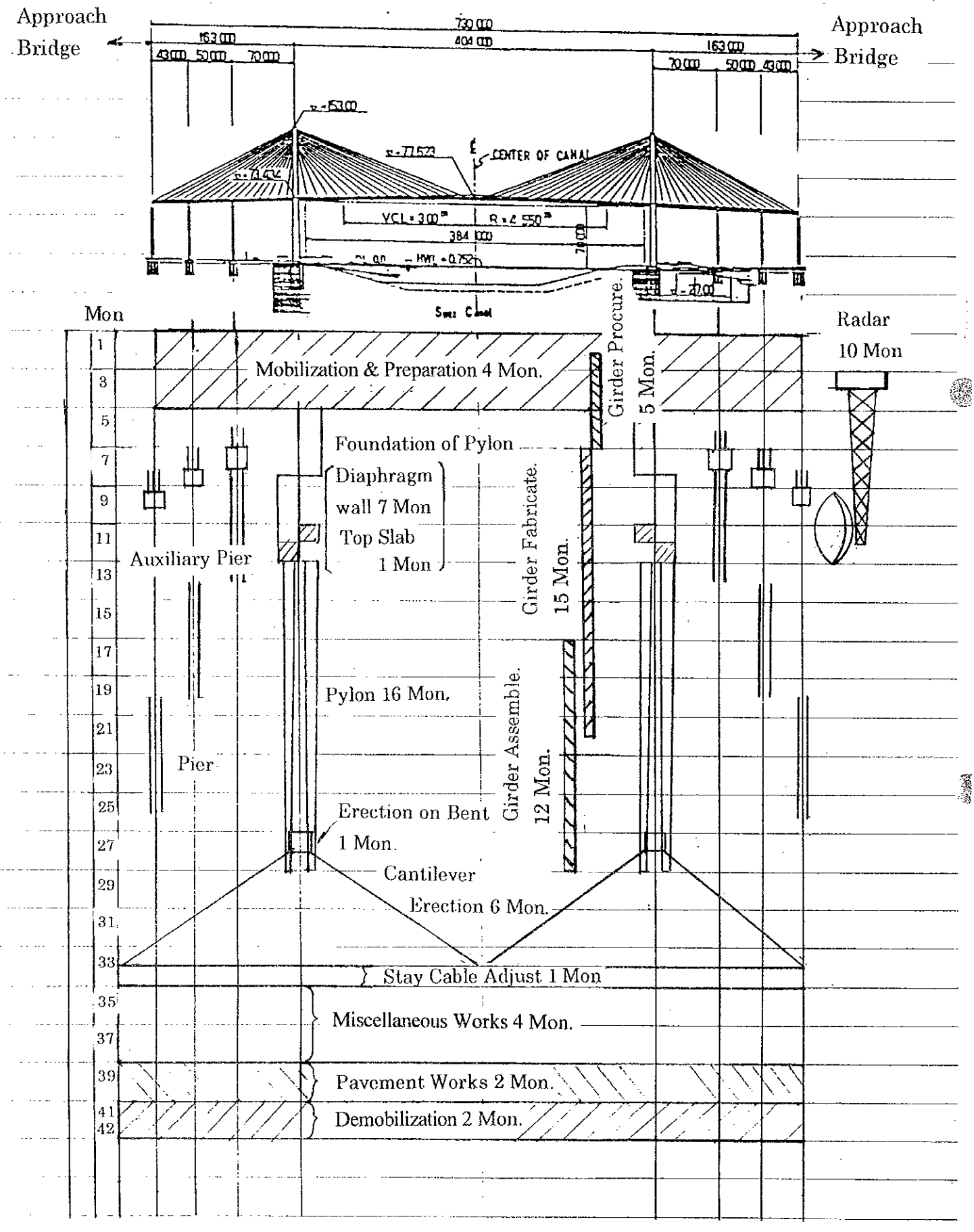


Fig. 6.7.1 Construction Schedule, Main bridge (Japanese Grant Aid Portion)

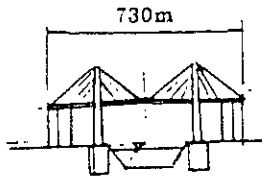


FIG. 6.7.2 CONSTRUCTION SCHEDULE (1/4)

Japanese Grant Portion	1st Year						2nd Year						3rd Year						4th Year						5th Year						6th Year						Remarks
Main Bridge (730 m)	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	
Contract											▽																										
Mobilization & Preparation											4 m																										
a) Pylon Foundation													(N) 7 m (S)																								3.5 m/each
Diaphragm Wall															1 m		1 m																				1 m/each
Top Slab																			16 m																		12 d/4 m
b) Main Pylon																					1 m		1 m														
Column(38 lifts)																																					
Cross Beams														3 m																							
c) Auxiliary Pier															3 m																						
Foundation																6 m				6 m			6 m														
Pile Cap																																					
Pier																																					
d) Steel Girder																																					
Procurement													5 m																								
Fabricate/Transport																			15 m																		
Site Assembly																									12 m												
Erection On bent																																					
Cantilever																																					
Stay Cable Adjust																																					
e) Miscellaneous Works.																																					
f) Pavement Works																																					
g) Demobilization																																					

1 m
1 m
6 m
1 m
4 m
2 m
2 m
42 mon. (3yr. 6 mon.)

9 d/12 m
(16 blocks)

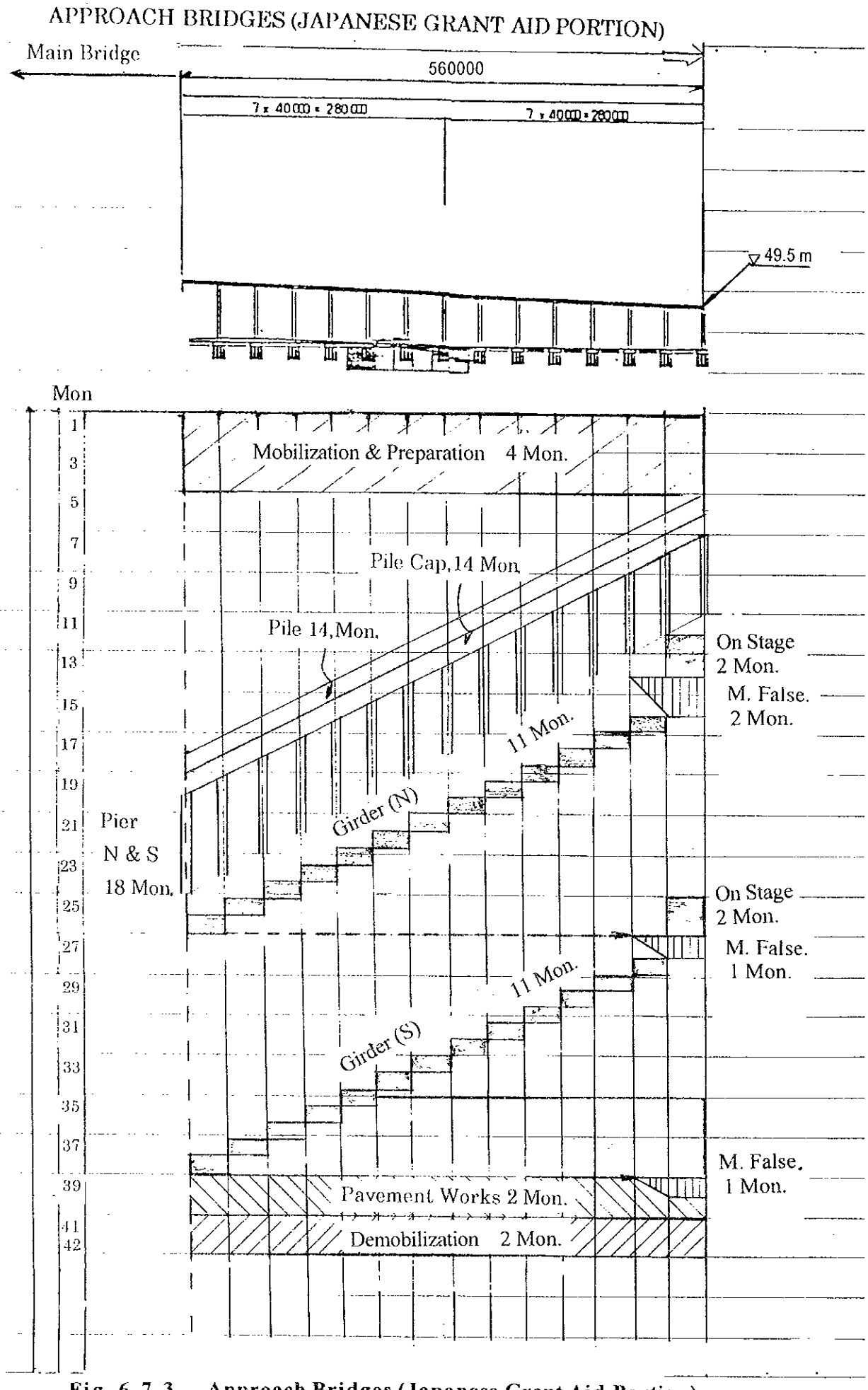


Fig. 6.7.3 Approach Bridges (Japanese Grant Aid Portion)

FIG. 6.7.4 CONSTRUCTION SCHEDULE (2/4)

Japanese Grant Portion Approach Bridge (560 mea.)	1st Year						2nd Year						3rd Year						4th Year						5th Year						6th Year						Remarks
	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	
Contract											▽																										
Mobilization & Preparation											4 m																										
a) Foundation													14 m																								1.6 d/each, 1set
b) Pile Cap													14 m																								1 set
c) Pier													18 m																								10 sets
d) PSC Girder																																					M. Falsework 2 sets
1st span on stage																3 m (N)							3 m (S)														
Assemble																			2 m																		
Construction (N)																							11 m (N)														25 d/span
Shift, Assemble																									1 m												
Construction (S)																													11 m (S)							
Dismantle																															0.5 m					
e) Miscellaneous Works																															4 m						Conc. Rail
f) Pavement Works																																2 m					
g) Demobilization																																	2 m				
											42 mon. (3yr. 6 mon.)																											

6.7.3 Egyptian Portion (East)

The construction time schedule for Egyptian Portion (East) is shown in Figs. 6.7.5 and 6.7.6.

6.7.4 Egyptian Portion (West)

The construction time schedule for Egyptian Portion (West) is shown in Figs. 6.7.7 and 6.7.8.

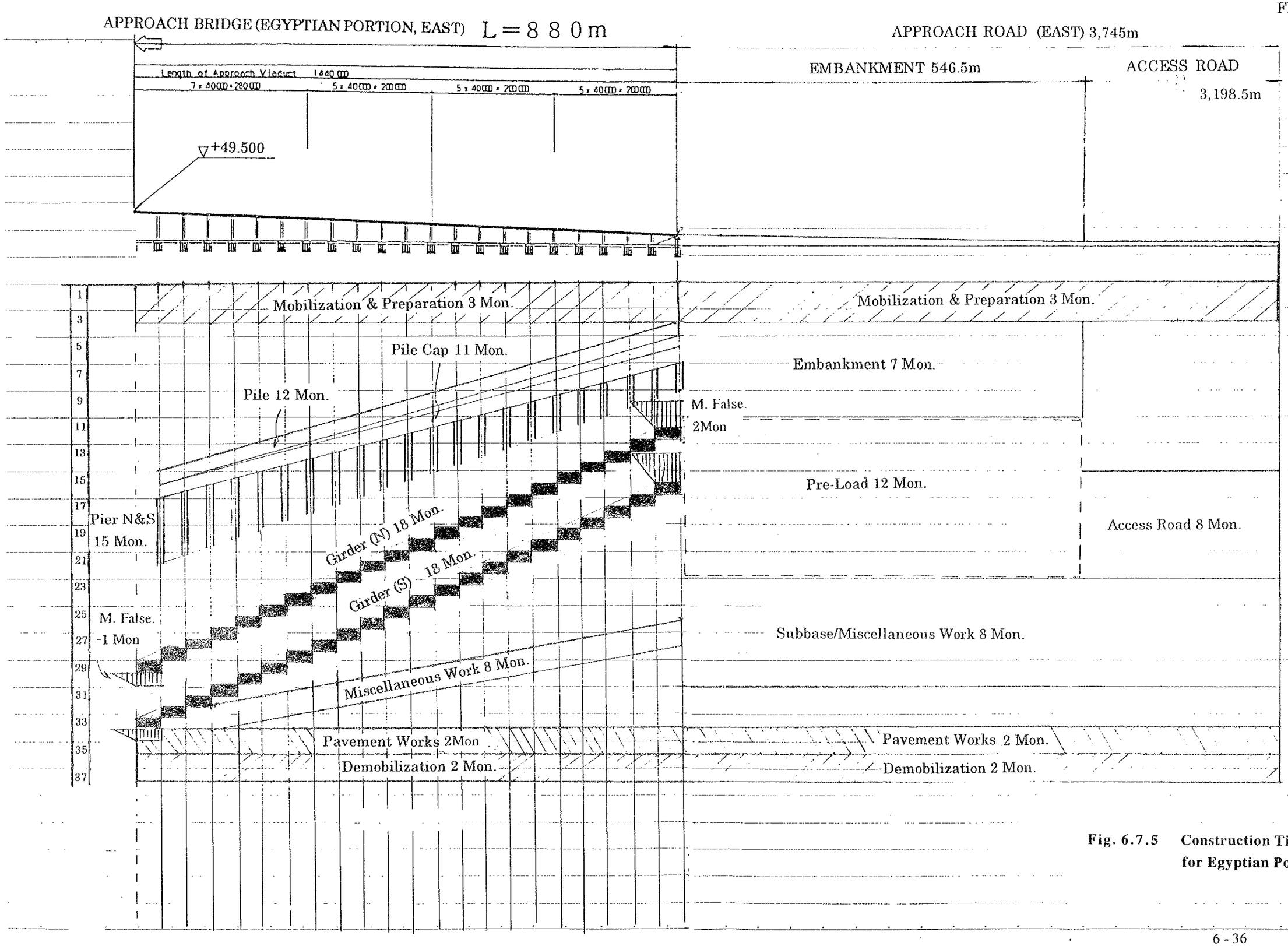


Fig. 6.7.5 Construction Time Schedule for Egyptian Portion (East)

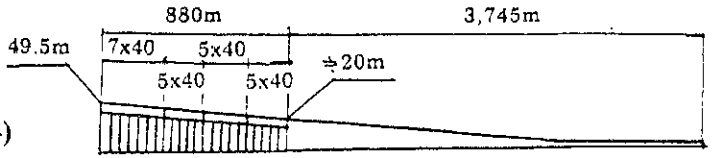


FIG. 6.7.6 CONSTRUCTION SCHEDULE (3/4)

Egyptian Portion	1st Year						2nd Year						3rd Year						4th Year						5th Year						6th Year						Remarks
	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	1	3	5	7	9	11	
Contract								▽																													
[East Bank]																																					
• Approach Bridge (880 m)																																					
Mobilization									3 m																												
Foundation													12 m																								1.6 d/each, 2 sets
Pile Cap													11 m																								2 sets
Pier													15 m (N & S)																								10 sets
PC Girder 1st span on stage (None)																																					M.Falsework
(N) Assemble													2 m																								2 sets
Construction																			18 m (N)																		25 d/span
(S) Assemble															2 m																						
Construction)																									18 m (S)												
Dismantle																											1 m			1 m							
Miscellaneous																												8 m									
Pavement Works																															2 m						
Demobilization																																2 m					
																															37 m (3 yr.1 mon.)						
• Approach Road (3,745 m)																																					
Embankment										7 m			12 m (pre load)																								
Access Road																8 m																					
Subbase/Miscellaneous																						8 m														
Pavement Works																															2 m						

APPROACH ROAD (WEST) 1,562.1m

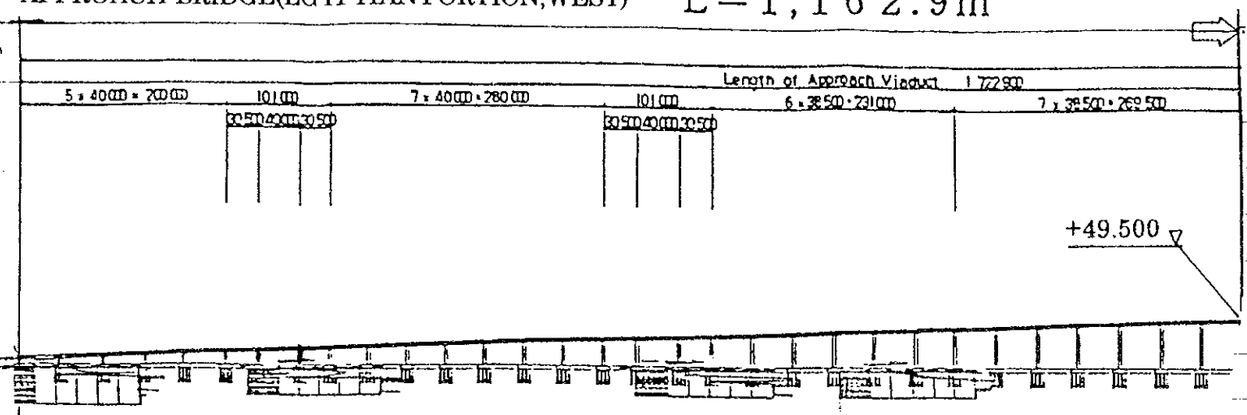
ACCESS ROAD 1,343.9m

〃

EMBANKMENT

218.2m

APPROACH BRIDGE(EGYPTIAN PORTION,WEST) L＝1,162.9m



Mobilization & Preparation 3 Mon.

Mobilization & Preparation 3 Mon

Pile 11 Mon.

Pile Cap 11 Mon.

Embankment 5 Mon.

Pre-Load 12 Mon.

Pier N&S 16 Mon.

Girder (N) 25 Mon.

Girder (S) 25 Mon.

Access Road 4 Mon.

Subbase/Miscellaneous Works 6 Mon.

Miscelaneous Work 10 Mon.

Pavement Works 2 Mon

Demobilization 2 Mon.

Pavement Work 2Mon

Demobilization 2 Mon

1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 42

Fig. 6.7.7 Construction Time Schedule for Egyptian Portion (West)

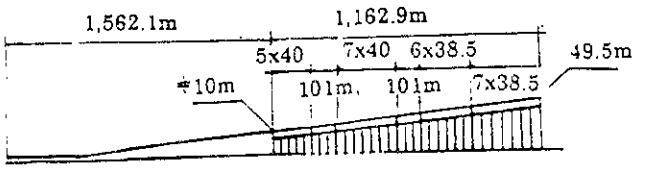


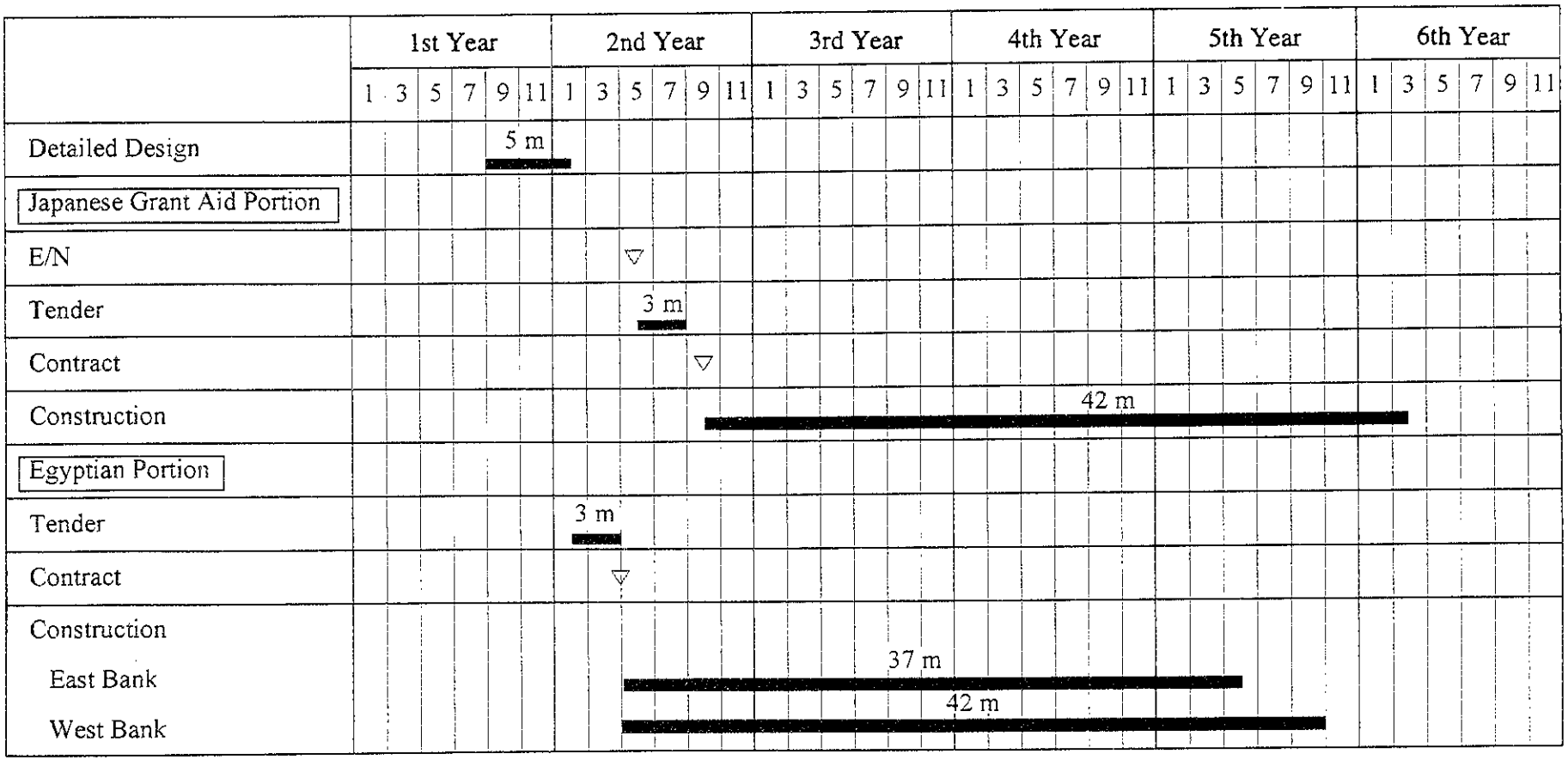
FIG. 6.7.8 CONSTRUCTION SCHEDULE (4/4)

Egyptian Portion	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	Remarks
	1 3 5 7 9 11	1 3 5 7 9 11	1 3 5 7 9 11	1 3 5 7 9 11	1 3 5 7 9 11	1 3 5 7 9 11	
Contract		▽					
[West Bank]							
• Approach Bridge (1,162.9 m)							
Mobilization		3 m					1.6 d/each. 2 sets
Foundation		11 m					2 sets
Pile Cap		11 m					10 sets
Pier		16 m (N&S)					M. Falsework
PSC Girder 1 st span on stage (None)							2 sets
(N) Assemble		2 m					25 d/span
Construction			25 m (N)				
(S) Assemble			2m				
Construction				25 m (S)			
Dismantle					1 m 1 m		
Miscellaneous					10 m		
Pavement Works						2 m	
Demobilization						2 m	
		42 m (3 yr. 6 mon.)					
• Approach Road (1,562.1 m)			12 m (pre load)				
Embankment			5 m				
Access Road				4 m			
Subbase/Miscellaneous				6 m			
Pavement Works						2 m	

6.7.5 Complete Project

The construction time schedule for the complete project is shown in Fig. 6.7.9.

FIG. 6.7.9 CONSTRUCTION SCHEDULE



6.7.6 Cycle Time

In order to obtain appropriate construction time schedule, the following cycle time of each activity has been carefully examined and selected.

- Mobilization and Preparation Works
- Main Bridge (Japanese Grant Aid Portion)
  - · Foundation, concrete diaphragm wall
  - · Pylon
  - · Steel Girder
  - · Radar
- Approach Bridge(Japanese Grant Aid Portion)
  - · Cast in situ pile
  - · Pile cap
  - · Pier
  - · Girder constructed with Movable Falsework
- Miscellaneous Works

  Fairing, Protection Net, Guard Rail for Main Bridge, Concrete Barrier, Hand Rail for Approach Bridges, etc.
- Pavement
- Demobilization
- Approach Bridges (Egyptian Portion, East and West)
  - · Cast in situ pile
  - · Pile cap
  - · Pier
  - · Girder constructed with Movable Falsework
- Approach Road (Egyptian Portion, East and West)
  - · Embankment
  - · Pre-Load Period
  - · Access Road
  - · Subbase/Miscellaneous Works
  - · Miscellaneous Works, such as concrete barrier

SCHEDULE OF MOBILIZATION AND PREPARATORY WORKS

		Item	1	2	3	4	5	Remarks
1	.	**Preparatory works in Japan** (start immediately after contract)						
	-	Establishment of detailed implementation program, such as:						2 M
		- Manning						3 W
		- Financing						3 W
		- Material & Equipment						5 W
		- Labor						3 W
	-	Overall implementation program & expenditure schedule						
2	.	**Preparatory works in Egypt** (start 1 month after contract)						
	-	Establishment of procurement of local materials						
	-	Establishment of procurement of equipment						
	-	Negotiation and contracting with sub-contractors for labor and works						
	-	Negotiation and contracting with suppliers						
3	.	Site Facilities (Concrete batching plant)						
	-	Base concrete (Plant foundation)						
	-	Partition wall of stock pile						
	-	Water connection, water tank & Electricity connection						
	-	Installation of Mixer, cement silo and admixture dispensers						
	-	Trial concrete mixing						
4	.	Other Facilities (start 1 month after contract)						
	-	Site clearing, access roads, site office, laboratory, canteen, material storage, re-bar assembly yard, form work factory, steel work factory, repair shop, waste water treatment, etc.						not critical
5	.	**Procurement of Material and Equipment** from Japan and Third Countries (start after contract)						
	-	Procurement plan						not
	-	Contract negotiation						critical
	-	Purchase order						
	-	Manufacturing and delivery						
	-	Custom clearance & inland transportation						
TOTAL								4 months

Main Bridge (Japan Grant Aid Portion)

1. Foundation, Concrete Diaphragm Wall 8 Mon (Reinforced Concrete)

Outside14m x 12m

Wall Width 1.2m

Depth 26.5m

Concrete Volume 1,682m^3/ each

3.5 Mon./ Ea. x 2= 7 Mon

Top slab (Reinforced Concrete) 1 Mon. each

14m x 12m x 4m thick, Concrete Volume 576m^3

Excavation, Dewater , Re-Bar, Formwork 1 Mon. each

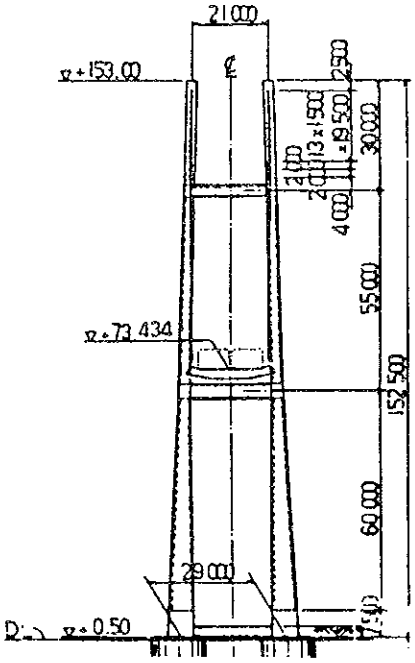
2. Pylon 16 Mon

152.5m high 10m height solid sect. , 142.5m height void section

Solid Section 1.5 Mon.

Concrete Volume 8mx10mx10mx2 ea.=1,600m^3(Approx.)

Void Section 4 m lift



Cycle time

	1	3	5	7	9	11
Slide Climb. Form						
Form Inside						
Re-Bar / Cable Socket						
Form Outside						
Concrete						
Cure						

12 days/ cycle, 4 m lift

Concrete Volume 2 x 55 = 110m^3

Re-Bar 2 x 11 = 22t

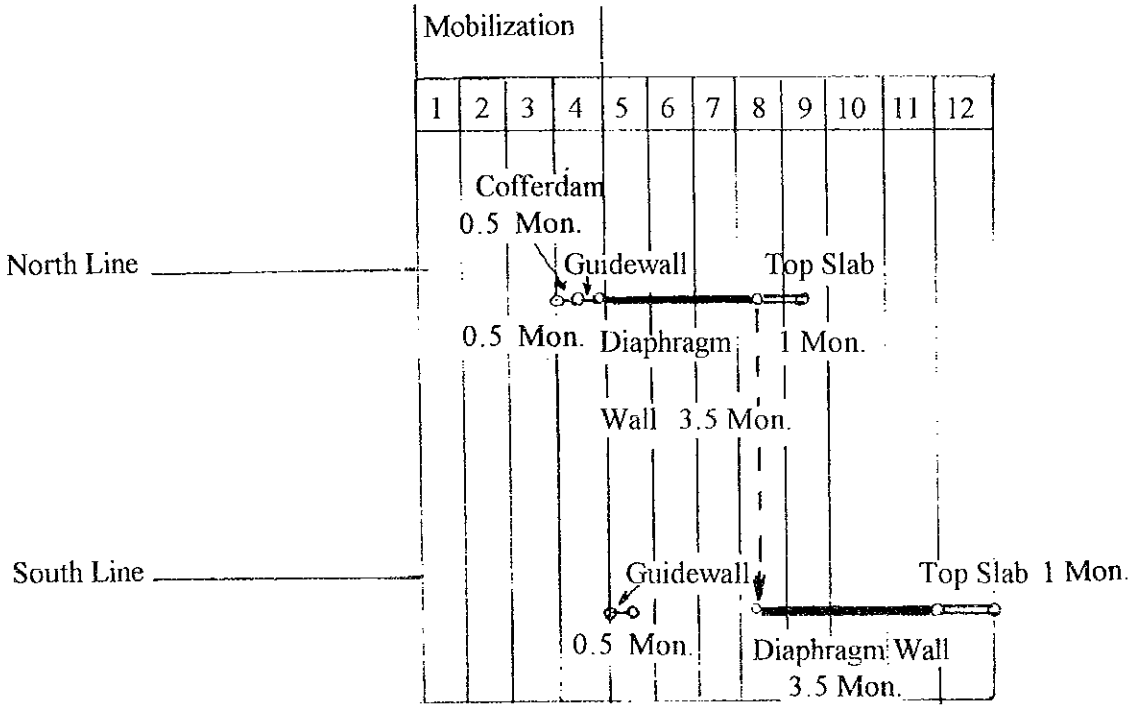
Formwork 2 x114 = 228m²

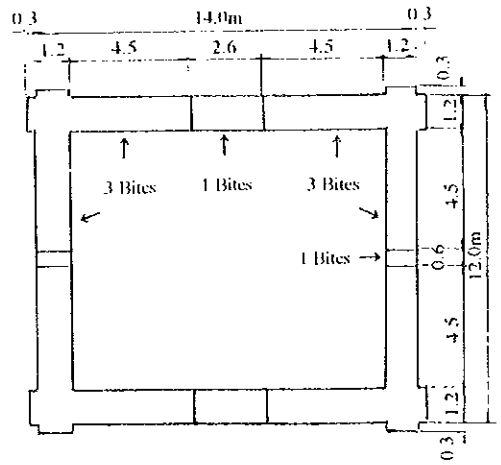
36 lifts x 12 x 1/30 = 14.5 Mon. ②

①+② Total 16 Mon.

Breakdown of Pylon Foundation

(1) Concrete Diaphragm Wall 2x3.5 = 7 Mon.





Total 28 Bites

Exca. 3 days/ Bites x 28 = 56 days

Re-bar Concrete 8 panels x 1 day = 8 days

including loss time

3.5 Mon./ Ea.

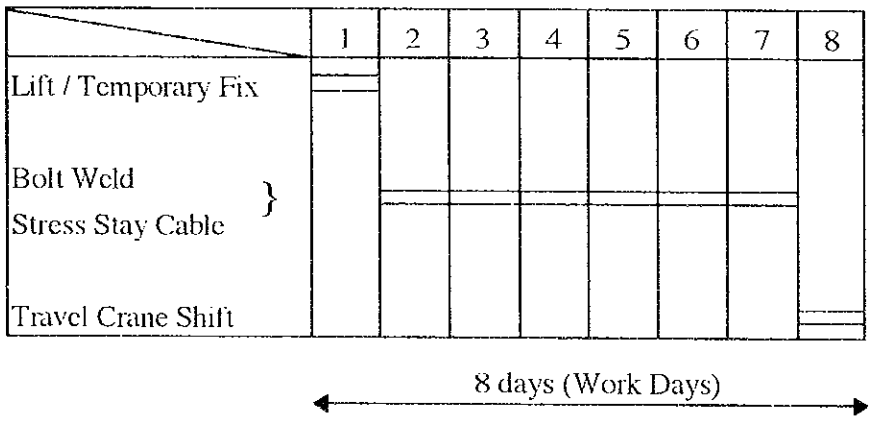
3. Steel Box Girder for Main Bridge 8 Mon.

1) Procurement (5 Mon.)
2) Fabrication 7,400 t 500 t / Mon.(15 Mon.)
3) Assembly on Site 7,400 t 615 t / Mon. (12 Mon.)

4) Cantilever Erection 8 Mon.

- Erection onto Bent with 450 t Crawler Crane 1 Mon.
- Assemble Traveler Crane 0.5 Mon.
- Cantilever Erection 5.5 Mon.

Center 12 m (120 t) 16 Block
Side 10 m (100 t) 16 Block



16 Block x 8 days x 1/25 = 5.5 Mon.

- Stay Cable Stress Adjustment 1 Mon.

Contract of Main Contractor

Radar ▽

	1 2	3 4	5 6	7 8	9 10	11 12
Site Facility		—				
Civil Foundation		—				
Tower		Fabricate	Install			
Commu. Cable			—	—	—	
Radar Fabricate		—	—			
Transport			—	—		
Install					—	—
Trial / Test						—

Approach Bridge (Japan Grant Aid Portion)

1. Cast in Situ Pile 14 Mon

ϕ1.5 m x 15 m Total 256 Nos. 1 Set

256 x 1.3 day x 1/25 = 14 Mon.

2. Pile Cap 14 Mon

14 Nos.

Concrete Volume Average, Approx. 630 m^3

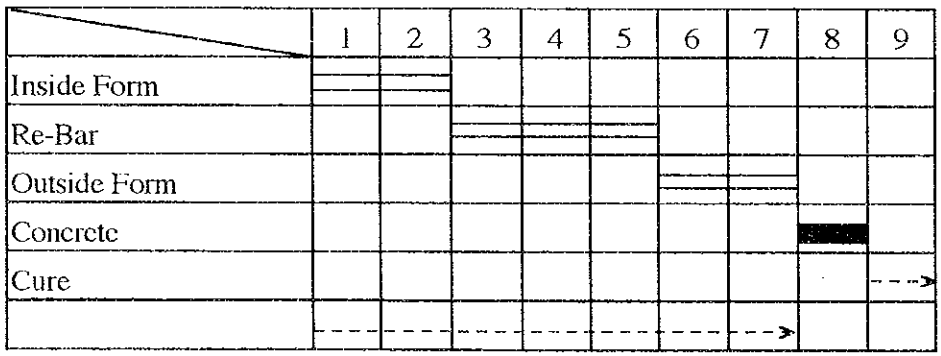
1 Mon. per No.

14 Mon.

3. Pier 18 Mon

3.5 m x 4.5 m x Ave. 53 m high

Cycle Time for 1 Lift of 4 m



For high piers, with work efficiency

9 days / cycle

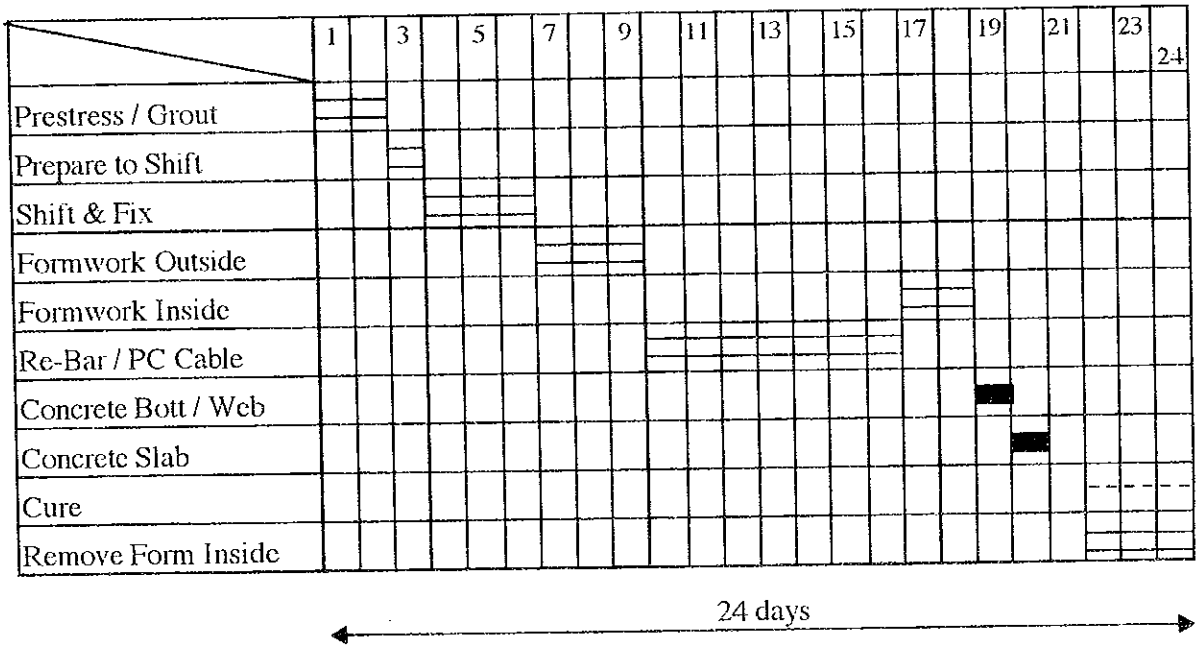
Per Lift (4 m)

Concrete	37 m^3
Re-Bar	9 ton
Formwork	90 m^2

28 Nos. x 14 Lift x 9 days x 1/25 x 1/8 sets = 18 Mon.

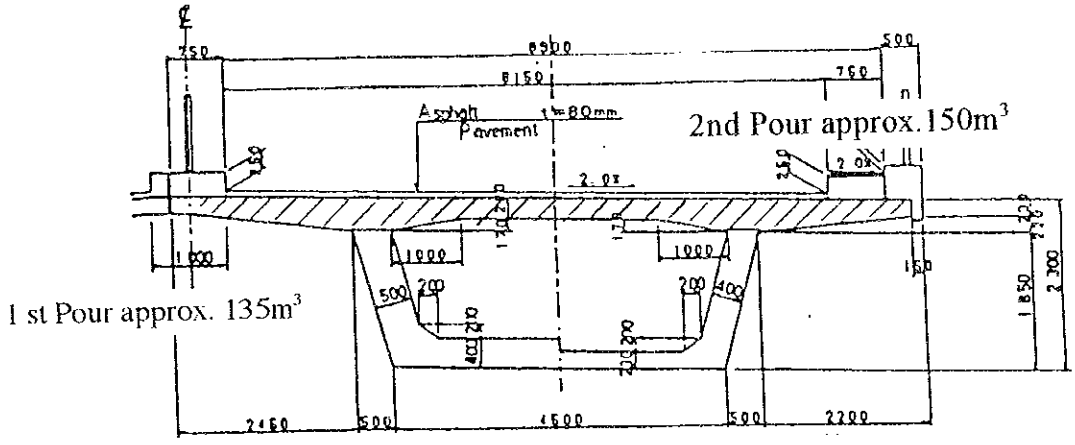
4. Girder constructed with Movable Falsework 27 Mon

1) 1st span to be cast on Staging 2 Mon.
2) Assemble Movable Falsework 2 Mon.
3) Shift Movable Falsework North Br. to South Br. 1 Mon.
4) Dismantle Movable Falsework 1 Mon.
5) Cycle Time for 1 Span



Per Span Concrete 285 m^3, Re-Bar 49 t
PC 9 t, Formwork 835 m^3

13 span x24 days x1/30 =11 Mon./ Each Bridge

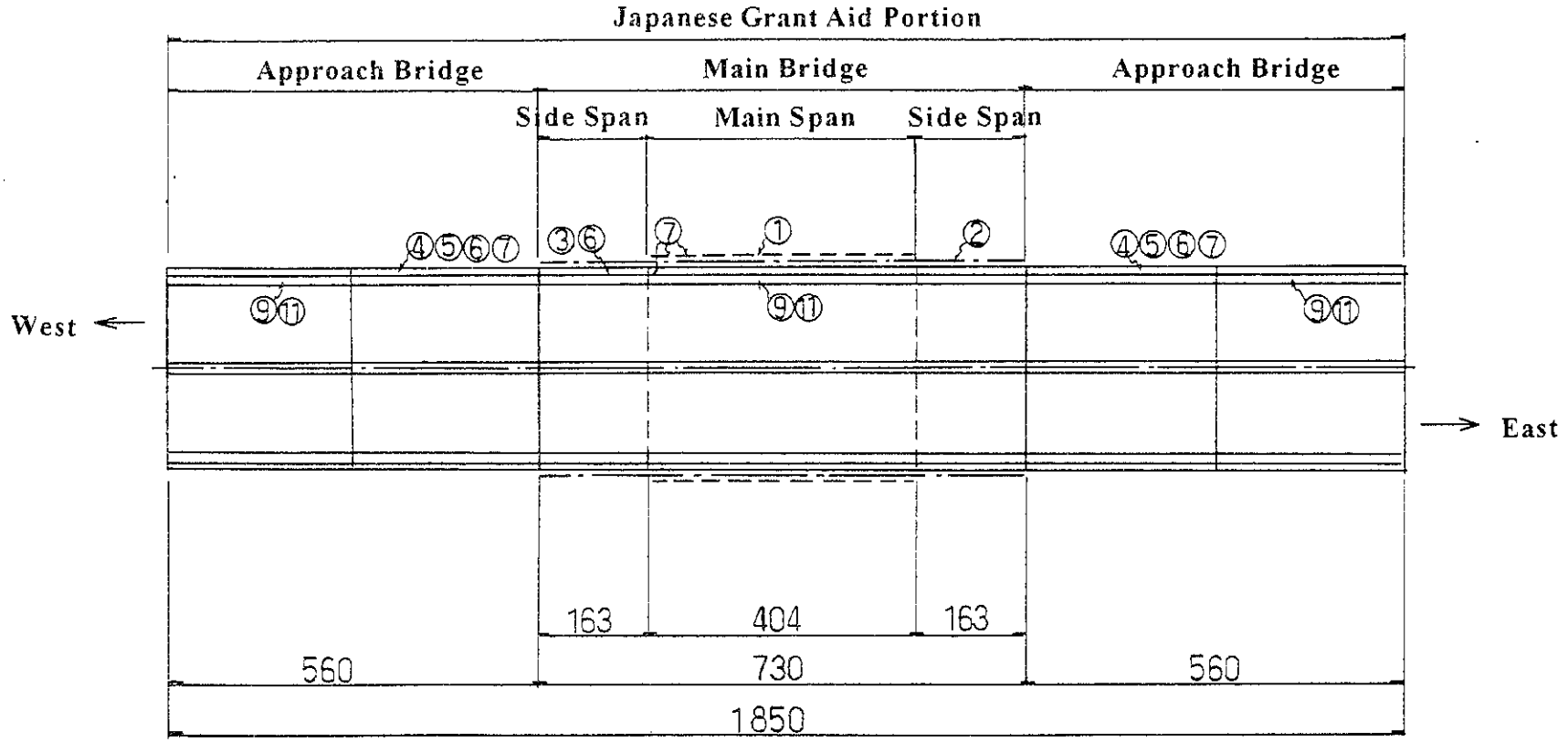


Concreting Sequence

CONSTRUCTION SCHEDULE OF MISCELLANEOUS WORKS

Unit : Month

Items	1	2	3	4	Remarks
1) Installation of Fairing	2.0 (2.0)				2×404 m = 808 m, 6 m/block, 136 blocks, 4 parties 136 blocks / 4 parties×1.5 days/block / 25 days/M ≒2.0 M
2) Installation of Protection Net		1.5 (0.4)			2×730 m = 1,460 m, 20 m/day, 2 parties 1,460 m / 20 m/day / 2 panties / 25 days/M ≒1.5 M 404 m / 20 m/day / 2 panties / 25 days/M ≒0.4 M
3) Installation of Guard Rail			1.0 (0.3)		2×730 m = 1,430 m, 30 m/day, 2 parties 1,460 m / 30 m/day / 2 parties / 25 days/M ≒1.0 M 404 m / 30 m/day / 2 parties / 25 days/M ≒0.3 M
4) Concrete Barrier		2.2			4×560 m = 2,240 m,10 m/day, 4 parties 2,240 m /10 m/day / 4 parties / 25 days/M ≒2.2 M
5) Installation of Handrail			0.6		4×560 m = 2,240 m, 40 m/day, 4 parties 2,240 m / 40 m/day / 4 parties / 25 days/M ≒0.6 M
6) Installation of Road Lighting Poles			1.0		76 sets + 112 sets = 188 sets, 8 poles/day 188 poles/ 8 poles/day / 25 days/M ≒1.0 M
7) Painting			1.0 (0.3)		Net /Guard Rail / Handrail / Light Pole
8) Drainage		1.0			38 sets + 28 sets = 66 sets, 3 sets/day 66 sets / 3 sets/day / 25 days/M ≒1.0 M
9) Concrete Sidewalk			1.2		2×730 m + 4×560 m = 3,700 m, 30 m/day, 4 parties 3,700 m / 30 m/day / 4 parties / 25 days/M ≒1.2 M
10) Traffic Management Facilities				0.5	Signs / Telephone / Information Board / etc.
11) Cable for Lighting / Communication				1.0 (1.0)	Ducts under sidewalk
12) Others		4.0			Road Lighting / Median / Inspection Gondola / Navigation Lights / Aviation Lights / Lightning Rods / Watch Platform / Expansion Joints


Japanese Grant Aid Portion
Approach Bridge
Main Bridge
Approach Bridge
Side Span
Main Span
Side Span
West
East
163
404
163
560
730
560
1850

CONSTRUCTION SCHEDULE OF PAVEMENT

JAPANESE PORTION

Unit : Day

Items		1 st Month	2 nd Month	Remarks
1) Surface Cleaning	Main Bridge	10 10		
	Approach Bridge	6 6 6 6		
2) Prime Coat	Main Bridge	3 4 2 5		
	Approach Bridge	3 3 3 3		
3) Base Course	Main Bridge	3	3	
	Approach Bridge	2 2 2 2		
4) Tack Coat	Main Bridge		2	
	Approach Bridge		4	
5) Surface Course	Main Bridge		4 4	
	Approach Bridge			
6) Road Marking	Main Bridge		8 (7)	
	Approach Bridge		6 6	
TOTAL		60		

Pavement Schedule

→	Approach Bridge	Main Bridge	Approach Bridge
←	560m	730m	560m

		Main Bridge	Approach Bridge x 2	Total
	Length	730m	560m x 2	1850 m
	Area	6000m2/side	4600m2/side x2	15,000m2/side
1	Surface Cleaning	6000m2x0.2=1200m2	4600m2x0.2=920m2	
		1200/150m2	920m2/200m2	22 days/side
		=8+2day	=5+1day	44 days
2	Prime coat	1000m2/day	4600m2/dayx2	13 day/side
		=6+1day	=2day+1/side	26 day
3	Base course			
	thickness	5cm	4cm	
	As. Mixture	730ton/side	450ton/side	
	500t/days=>	2day+1 /side	1+1day/side	7 days/side
		=3days/side	=2days /side	14 days
4	Tack coat	6000m2/day=1day	1day	3day/side=6day
5	Surface course			
	thickness	3cm	3cm	
	As. Mixture	440 ton/side	330ton /side	
	500t/days=>	1day+1 /side	1+1day /side	6 days/side
		=2days/side	=2days x2/side	=12 day
6	Road Marking	730mx3line/1000m/day	560mx3line/1000m/day	10 days/side
		=3+1day/side	=2+1day/side	

Total 60 days

Refer to the flow chart on the previous page.

SCHEDULE OF DEMOBILIZATION

Item	1	2	3	Remarks
ON THE BRIDGE (main and approach)				
- Removal of equipment and materials & cleaning				
- Final measurements of structural dimensions (including material sampling and testing)				
- Final inspection by client, consultant and contractor				
- Remedial work on bridge				
- Provisional hand over to the client				
ON LAND				
- Demolishing of steel girder assembly yard				
- Demolishing of temporary concrete structures of approx. 7,000 cu.m.				
- Demolishing of temporary facilities				
Concrete plant				
Workshops, etc.				
- Leveling work at site				
TOTAL				2 months

(Egyptian Portion)

Approach Bridge , East Bank

- Cast In Situ Pile 11 Mon.

438 piles for 21 pilecaps and 1 Abutment

352 x 1.3 days x 1/25 x 1/2= 12 Mon.

- PileCap 11 Mon.

22 Nos. 2 sets of crew

22 pile caps x 1 mon. x 1/2 = 11 Mon.

-Pier 44 Nos. 10 sets of climbing form and crew 15 Mon.

lowest 17.5m 5 lifts 5 lifts x 9 days x 1/25 = 2 Mon.

highest 47m 12 lifts 12 x 9 x 1/25 = 4.5Mon.

average 33 m 9 lifts

44 Nos. x 9 lifts x 9 days x 1/25 x 1/10 = 15 Mon.

- Girder constructed with Movable Scaffolding 18Mon.

Cycle time of 24 days will be used, same as Japanese Grant aid Portion.

22 spans x 24 days x 1/30 = 18 Mon.

(Egyptian Portion)

Approach Bridge, West Bank

-Cast In Situ Pile 11 Mon.

573 piles for 30 pilecaps and 1 Abutment

573 x 1.4 days x 1/25x 1/3 = 11 Mon.

- Pile Cap 11 Mon.

31 Nos. 3 sets of crew

31 Nos. x 1 mon. x 1/3 = 11 Mon.

- Pier 10 sets of climbing form and crew 16 Mon.

lowest 7.5 m 2 lifts 2 lifts x 9 days x 1/25 = 1 Mon.

highest 47 m 12 lifts 12 x 9 x 1/25 = 4.5 Mon.

average 27 m 7 lifts

62 Nos x 7 lifts x 9 days x 1/25 x 1/10 = 16 Mon.

-Girder constructed with Movable Falsework 25 Mon.

31 spans x 24 days x 1/30 = 25 Mon.

Approach Road, West Bank

-Embankment 5 Mon.

Embankment Volume Approx. 76,000 m^3

15,000 m^3 each month. 5 months required.

-Settlement Period 12 Mon.

-Access Road 4 Mon

1,575 m x 3.5 m x 25 m = 137,813 m^3, 35,000 m^3 each month

-Subbase/Miscellaneous Works 6 Mon.

Approach Road, East Bank

-Embankment 7 Mon.

Embankment Volume Approx. 296,000 m^3

43,000 m^3 each month, 7 Mon. required

-Settlement Period 12 Mon.

-Access Road 8 Mon.

3,285 x 3.0 m x 25 m x 24.1 m = 246,375 m^3 30,000 m^3 each month

-Subbase/Miscellaneous Work 8 Mon.

CONSTRUCTION SCHEDULE OF MISCELLANEOUS WORKS

EGYPTIAN PORTION (EAST BANK)

Unit : Month

Items	1	2	3	4	5	6	7	8	9	10	Remarks
1) Concrete Barrier		3.5									2×880 m = 1,760 m, 10 m/day, 2 parties 1,760 m /10 m/day / 2 parties / 25 days/M ≒3.5 M
2) Installation of Handrail				0.9							2×880 m = 1,760 m, 40 m/day, 2 parties 1,760 m / 40 m/day / 2 parties / 25 days/M ≒0.9 M
3) Installation of Road Lighting Poles					0.4						88 sets, 8 poles/day 88 poles/ 8 poles/day / 25 days/M ≒0.4 M
4) Painting					0.5						Handrail / Light Pole
5) Drainage					0.6						44 sets, 3 sets/day 44 sets / 3 sets/day / 25 days/M ≒0.6 M
6) Concrete Sidewalk						1.2					2×880 m = 1,760 m, 30 m/day, 2 parties 1,760 m / 30 m/day / 2 parties / 25 days/M ≒1.2 M
7) Traffic Management Facilities							0.5				Signs / Telephone / Information Board / etc.
8) Cable for Lighting / Communication								1.0			Ducts under sidewalk
9) Others					4.0						Road Lighting / Median / Expansion Joints

CONSTRUCTION SCHEDULE OF MISCELLANEOUS WORKS
EGYPTIAN PORTION (WEST BANK)

Unit : Month

Items	1	2	3	4	5	6	7	8	9	10	Remarks
1) Concrete Barrier			4.7								2×1179.5 m = 2,359 m,10 m/day, 2 parties 2,359 m /10 m/day / 2 parties / 25 days/M ≒ 4.7 M
2) Installation of Handrail						1.2					2×1,179.5 m = 2,359 m, 40 m/day, 2 parties 2,359 m / 40 m/day / 2 parties / 25 days/M ≒ 1.2 M
3) Installation of Road Lighting Poles							0.6				118 sets, 8 poles/day 118 poles/ 8 poles/day / 25 days/M ≒ 0.6 M
4) Painting							0.7 (0.4)				Handrail / Light Pole
5) Drainage						0.8					62 sets, 3 sets/day 62 sets / 3 sets/day / 25 days/M ≒ 0.8 M
6) Concrete Sidewalk								1.6			2×1,179.5 m = 2,359 m, 30 m/day, 2 parties 2,359 m / 30 m/day / 2 parties / 25 days/M ≒ 1.6 M
7) Traffic Management Facilities									0.5		Signs / Telephone / Information Board / etc.
8) Cable for Lighting / Communication										1.0	Ducts under sidewalk
9) Others						5.0					Road Lighting / Median / Expansion Joints