Appendix 5.3 PROJECT COST (1)

SPOT NO.	DAMAGE TYPE	MAIN REPAIR WORK	PROJECT COST (1000 BAHT) TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK	TOTAL COST	SCHEDULE TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK
109/1	SD-2-10	D-4	330	527	857	1996	2001
109/2	SD-2-3	D-1	490	5,653	6,143	1996	2001
109/C1	SD-2-10	D-4	330	527	857	1996	2001
109/C2	SD-3-3	C-2.1		863	863		1999
109/3	SD-2-6	D-2.1		2,602	2,602		1995
109/C3	SD-2-6	B-7.1		3,123	3,123		1996
109/C4	SD-3-3	C-2.1		1,726	1,726		1998
109/C5	SD-2-10	D-4	495	791	1,286	1995	2000
109/C6	RF-1-3	D-1	490	5,653	6,143	1995	2000
109/C7	SD-2-10	D-1	429	686	1,115	1996	2001
109/C8	SD-3-3	D-4		2,589	2,589		1995
109/C9	SD-3-3	C-2.1		1,726	1,726		1995
109/C10	SD-2-3	D-1	49,000	565,300	614,300	1995 - 1999	2000 - 2004
TOTAL			51,564	591,766	643,330		
1095/C1	SD-3-6	F-2		1,726	1,726		1999
1095/C2	SD-2-6	D-1		1,270	1,270		1997
1095/C3	SD-2-3	A-8	294	3,392	3,686	1997	2002
1095/C4	SD-2-10	C-1.2	330	527	857	1998	2003
1095/C5	SD-2-6	C-1.2		3,186	3,186		1996
1095/C6	SD-2-8	D-2.2		186	186		1995
1095/C7	SD-2-3	D-1	490	5,653	6,143	1997	2002
1095/C8	SD-2-7	D-2.2		227	227		1996
1095/C9	SD-2-2	D-1	490	5,653	6,143	1996	2001
1095/C10	SD-2-3	D-1	392	4,523	4,915	1997	2002
1095/C11	SD-2-6	D-2.1		2,539	2,539		1996
1095/C12	SD-2-7	D-1		186	186		1995
1095/C13	SD-2-8	D-2.2		186	186		1996
1095/C14	SD-2-7	D-1		186	186		1996
1095/C15	SD-2-6	D-2.2		3,186	3,186		1996
1095/C16	SD-2-7	D-2.2		454	454		1997
1095/1	SD-2-7	D-2.2		3,269	3,269		1995
1095/C17	SD-3-3	D-4		1,726	1,726		1995
1095/2	SD-2-9	D-2.2		346	346		1995
1095/C18	SD-2-6	D-2.2		3,186	3,186		1996
1095/C19	SD-2-7	D-2.2		227	227		1997
1095/C20	SD-2-7	D-2.2		205	205		1996
1095/C21	SD-2-6	D-2.2		3,186	3,186		1998
1095/C22	SD-2-6	D-2.2		1,593	1,593		1999
1095/C23	SD-2-2	D-2.2		1,593	1,593		1999
1095/C24	SD-2-6	D-2.2		1,275	1,275		1999
1095/C25	SD-2-6	D-2.2		1,275	1,275		1999
1095/C26	SD-2-6	D-2.2		1,912	1,912		1999

PROJECT COST (2)

SPOT NO.	DAMAGE TYPE	MAIN REPAIR WORK	PROJECT COST (1000 BAHT)			SCHEDULE	
			TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK	TOTAL COST	TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK
1095/C27	SD-2-6	D-2.2		1,912	1,912		1999
1095/C28	SD-2-7	D-2.2		182	182		1995
1095/C29	SD-2-6	D-2.2		2,231	2,231		1997
1095/3	SD-2-6	B-7.1		3,186	3,186		1996
1095/4	SD-2-8	D-2.2		186	186		1996
1095/C30	SD-2-6	D-2.2		1,593	1,593		1999
1095/C31	SD-1-10	D-2.2		844	844		1999
1095/C32	SD-1-10	D-2.2		844	844		1999
1095/C33	SD-1-10	D-2.2		844	844		1999
1095/C34	SD-2-7	D-2.2		227	227		1996
1095/C35	SD-2-3	D-2.2		227	227		1997
1095/C36	SD-2-6	D-2.2		1,593	1,593		1999
1095/C37	SD-2-6	D-2.2		2,231	2,231		1997
1095/C38	SD-2-7	D-2.2		137	137		1997
1095/C39	SD-2-6	D-2.2		3,186	3,186		1995
1095/C40	SD-2-6	D-2.2		3,186	3,186		1998
1095/C41	SD-2-6	D-2.2		1,593	1,593		1999
TOTAL			1,996	77,075	79,071		
1149/C1	SD-2-3	D-4		102	102		2000
1149/C2	SD-2-3	D-4		102	102		2000
1149/C3	SD-2-3	D-4	36	107	143	1997	2002
1149/1	SD-2-6	B-7.1		3,133	3,133		1995
1149/C4	SD-2-3	D-4	36	107	143	1996	2001
1149/C5	SD-2-3	D-4	36	107	143	1996	2001
1149/C6	SD-2-3	D-4	51	152	203	1997	2002
1149/C7	SD-2-3	D-4	26	76	102	1997	2002
1149/C8	SD-2-3	D-4	36	107	143	1996	2001
1149/C9	SD-2-3	D-4		102	102		1996
1149/2	SD-2-3	D-4	51	152	203	1995	2000
1149/C10	SD-2-6	B-7.1		3,903	3,903		1995
TOTAL			272	8,150	8,422		
1256/1	RF-1-2	H-1		2,849	2,849		1996
1256/2/3	BC-1-5/9	J-1.1	74	229	303	1995	2000
1256/C1	SD-2-6	D-2.2		762	762		2004
1256/C2	SD-2-9	D-2.2		186	186		1999
1256/C3	SD-2-6/3	D-2.2		762	762		2004
1256/C4	SD-2-7	D-2.2		114	114		1999
1256/4	SD-2-3	D-4	56	190	246	1997	2002
1256/C5	SD-2-3	D-4	56	90	146	1999	2004
1256/5	SD-3-6	F-2	732	994	1,726	1995	2000
1256/C6	SD-2-3	D-4	112	380	492	1997	2002
1256/6	SD-2-6	B-7.1	764	1,775	2,539	1996	2001

PROJECT COST (3)

SPOT NO.	DAMAGE TYPE	MAIN REPAIR WORK	PROJECT COST (1000 BAHT)			SCHEDULE	
			TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK	TOTAL COST	TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK
1256/7	SD-2-7	D-2.2		227	227		2000
1256/C7	SD-2-8	D-2.2	764	1,775	2,539	1997	2002
1256/C8	SD-2-6	D-2.2	764	1,775	2,539	1996	2001
1256/C9	SD-2-6	D-2.2		1,270	1,270		1995
1256/C10	SD-2-6	D-2.2		227	227		1999
1256/C11	SD-2-7	D-2.2		227	227		1997
1256/C12	SD-2-8	D-2.2		227	227		1996
1256/C13	SD-2-10	D-2.2	1,150	959	2,109	1996	2001
1256/C14	SD-3-3	F-2	732	994	1,726	1996	2001
1256/C15	SD-2-10	D-2.2	1,150	959	2,109	1999	2004
1256/C16	SD-2-6	B-7.2		227	227		1999
1256/C17	SD-2-6	D-2.2		114	114		1998
1256/C18	SD-2-6	D-2.2	764	1,775	2,539	1996	2001
1256/C19	SD-2-6	D-2.2	764	1,775	2,539	1996	2001
1256/C20	SD-2-7	D-2.2		227	227		1999
1256/C21	SD-2-7	D-2.2		227	227		1996
1256/C22	SD-2-1	A-4.1		5,526	5,526		1998
1256/C23	SD-2-8	D-2.2		227	227		1999
1256/C24	SD-2-8	D-2.2		227	227		1996
1256/8	SD-3-7	F-2		1,092	1,092		1996
1256/C25	SD-2-8	D-2.2		341	341		1995
1256/C26	SD-2-6	D-2.2	764	1,775	2,539	1999	2004
1256/C27	SD-2-6	D-2.2	764	1,775	2,539	1999	2004
1256/C28	SD-2-6	D-2.2	764	1,775	2,539	1997	2002
1256/C29	SD-2-6	D-2.2		1,270	1,270		1999
1256/9	SD-2-1	A-6		4,605	4,605		2000
1256/C30	SD-2-1	A-4.1		4,605	4,605		1999
1256/C31	SD-2-1	A-4.1		4,605	4,605		1997
1256/C32	SD-2-1	A-4.1		4,605	4,605		2000
1256/C33	SD-2-6	D-2.2		1,778	1,778		2001
1256/C34	SD-2-8	D-2.2		227	227		1996
1256/10	SD-2-10	D-1	1,150	959	2,109	1996	2001
1256/C35	SD-2-7	D-2.2		227	227		1996
1256/11/12	SD-2-8/3-7	F-2	634	668	1,302	1995	2000
TOTAL			11,958	57,603	69,561		

PROJECT COST (4)

SPOT NO.	DAMAGE TYPE	MAIN REPAIR WORK	PROJECT COST (1000 BAHT)			SCHEDULE	
			TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK	TOTAL COST	TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK
4/C1	SD-2-3	C-1.2		424	424		1995
4/C2	SD-3-6	D-4		3,452	3,452		1995
4/C3	SD-2-3	C-1.2		318	318		1996
4/C4	SD-2-6	C-2.1		3,177	3,177		1995
4/1	SD-2-6	B-7.1		3,177	3,177		1995
4/C5	SD-2-6	C-2.1		3,177	3,177		1995
4/2/3	BC-1-5/9	J-1.1		4,119	4,119		1995
TOTAL			0	17,844	17,844		
410/C1	SD-2-6	D-2.2		530	530		1997
410/C2	SD-2-6	A-1.1		159	159		1999
410/C3	SD-2-7	C-1.2		515	515		2000
410/1	RF-3-3	M-1		723	723		1995
410/2	SD-2-7	B-7.1	658	1,058	1,716	1995	2000
410/C4	SD-2-6/3	D-2.2		795	795		1997
410/C5	SD-2-6	C-1.2		318	318		1999
410/C6	SD-2-6	C-1.2		424	424		1998
410/C7	SD-2-7	C-1.2		858	858		1996
410/C8	SD-2-7	C-1.2		1,202	1,202		2002
410/C9	SD-2-6	C-1.2		318	318		1999
410/C10	SD-2-6	C-1.2		1,060	1,060		1999
410/C11	SD-2-8	D-4		186	186		1997
410/C12	SD-2-6	C-1.2		530	530		1995
410/3	SD-2-6	D-2.2		530	530		1995
410/C13	SD-2-6	C-1.2		530	530		1999
410/C 14	SD-2-6	D-2.2		530	530		1999
410/C15	SD-2-6	B-7.1	658	1,058	1,716	1995	2000
410/C16	SD-2-6/7	B-7.1	658	1,058	1,716	1996	2001
410/C17	SD-2-7	B-7.1	658	1,058	1,716	1996	2001
410/C18	SD-2-7	B-7.1	658	1,058	1,716	1995	2000
410/C19	SD-2-7	B-7.1	658	1,058	1,716	1995	2000
410/C20	SD-2-6/7	B-7.1	987	1,587	2,574	1995	2000
410/C21	SD-2-7	B-7.1	658	1,058	1,716	1995	2000
410/4	SD-2-9	E-3.1	53	981	1,034	1996	2001
410/C22	SD-2-6	D-2.2		530	530		1999
410/C23	SD-2-8	D-2.2		186	186		1999
410/C24	SD-2-6	D-2.2		530	530		1997
410/C25	SD-2-7	C-1.2		858	858		1997
410/C26	SD-2-7	D-2.2		858	858		1999
410/C27	SD-2-7	D-1	461	741	1,202	1995	2000
410/C28	SD-2-8	D-2.2	159	2,943	3,102	1997	2002
410/5	SD-2-3	B-1.2		135	135		2000
410/C29	SD-2-9	D-2.2	106	1,962	2,068	1995	2000

PROJECT COST (5)

SPOT NO.	DAMAGE TYPE	MAIN REPAIR WORK	PROJECT COST (1000 BAHT) TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK	TOTAL COST	SCHEDULE TEMPORARY REPAIR WORK	PERMANENT REPAIR WORK
410/6	SD-2-8	D-1		3,033	3,033		1995
410/C30	SD-2-7	D-2.2		1,373	1,373		1997
410/C31	SD-2-7	D-1	490	5,653	6,143	1996	2001
410/C32	SD-2-6	C-1.2		530	530		1997
410/C33	SD-2-6	D-2.2		1,060	1,060		1995
410/C34	SD-2-6	D-2.2		424	424		1995
410/C35	SD-2-6	C-2.1	732	994	1,726	1995	2000
410/C36	SD-2-6	C-1.2		424	424		1996
410/C37	SD-2-6	C-1.2		424	424		1996
410/C38	SD-2-6	C-2.1	732	994	1,726	1996	2001
410/C39	SD-2-6	C-1.2		424	424		1997
410/C40	SD-2-8	D-2.2		2,124	2,124		1995
410/C41	SD-2-6	C-1.2		424	424		1996
410/C42	SD-3-5	C-1.2	732	994	1,726	1995	2000
410/C43	SD-2-6	C-1.2		371	371		1997
410/C44	SD-2-6	C-1.2		530	530		1996
410/C45	SD-2-6	D-2.2		530	530		1997
410/C46	SD-2-6	D-2.2		795	795		1996
410/C47	SD-2-6	D-1		530	530		1995
410/C48	SD-2-6	C-1.2		371	371		1999
410/C49	SD-2-6	D-1		530	530		1996
410/C50	SD-2-6	D-2.2		530	530		1995
410/C51	SD-3-6	F-2		1,726	1,726		1995
TOTAL			9,058	52,713	61,771		
4015/1	BC-1-5	J-5		861	861		1995
4015/2	RC-3-2	M-1		594	594		1996
4015/C1	BC-1-5	J-2.2		431	431		1996
4015/3	RC-3-1	M-1		568	568		1997
4015/4	BC-1-6	J-1.1		998	998		1995
4015/5	BC-1-7	K-1.1		1,561	1,561		1995
4015/C2	BC-1-5	J-1.1		431	431		1997
TOTAL				5,444	5,444		
4107/1/2	BC-1-5/6	J-4		530	530		1996
4058/1	BC-1-8	H-1		10,889	10,889		1999
TOTAL			0	11,419	11,419		

Appendix 6

Appendix 6.1 Economic Vehicle Operating Cost (1/3)
[Running + Fixed Costs in Baht/km]

Speed	Road Condition C-1	C-2	C-3	C-4	C-5	C-6	C-7
Motorcycle:							
5							1.6521
20	1.0301	1.0807	1.1312	1.1818	1.2577	1.2664	1.4356
25	0.9990	1.0484	1.0978	1.1473	1.2214	1.2288	1.3918
30	0.9679	1.0162	1.0644	1.1127	1.1852	1.1912	1.3481
35	0.9424	0.9899	1.0374	1.0849	1.1562	1.1605	1.3116
40	0.9170	0.9637	1.0104	1.0571	1.1272	1.1298	1.2752
45	0.8990	0.9450	0.9911	1.0371	1.1062	1.1095	1.2544
50	0.8810	0.9264	0.9717	1.0171	1.0851	1.0893	1.2336
55	0.8713	0.9175	0.9638	1.0101			
60	0.8615	0.9087	0.9559	1.0032			
65	0.8580	0.9071	0.9562	1.0053			
70	0.8545	0.9055	0.9564	1.0074			
75	0.8572	0.9088	0.9566	1.0196			
80	0.8600						
85	0.8695						
90	0.8789						
95	0.9108						
100	0.9426						
105							
110							
115							
120							
Passenger Car:							
5							9.7638
20	4.9852	5.3187	5.6522	5.9858	6.4861	6.6140	7.8706
25	4.6954	5.0122	5.3291	5.6460	6.1212	6.2598	7.4876
30	4.4056	4.7058	5.0060	5.3061	5.7564	5.9057	7.1047
35	4.2281	4.5188	4.8096	5.1003	5.5363	5.6845	6.8531
40	4.0506	4.3319	4.6131	4.8944	5.3163	5.4634	6.6015
45	3.9247	4.1986	4.4724	4.7463	5.1570	5.3077	6.4306
50	3.7988	4.0653	4.3317	4.5982	4.9978	5.1520	6.2597
55	3.6975	3.9648	4.2320	4.4992			
60	3.5962	3.8642	4.1322	4.4003			
65	3.5194	3.7867	4.0540	4.3213			
70	3.4425	3.7092	3.9758	4.2424			
75	3.3951	3.6601	3.9250	4.1899			
80	3.3478	3.6110	3.8742	4.1375			
85	3.3210						
90	3.2941						
95	3.3536						
100	3.4131						
105	3.5128						
110	3.6125						
115	3.9022						
120	4.1919						

Appendix 6.1 Economic Vehicle Operating Cost (2/3)
[Running + Fixed Costs in Baht/km]

Speed	Road Condition C-1	C-2	C-3	C-4	C-5	C-6	C-7
Light Bus / Pick-up (Passengers):							
5							9.1389
20	5.3038	5.4959	5.6881	5.8802	6.1684	6.3668	7.3401
25	5.0158	5.2005	5.3852	5.5699	5.8469	6.0387	6.9763
30	4.7278	4.9051	5.0823	5.2595	5.5254	5.7105	6.6125
35	4.5451	4.7178	4.8906	5.0634	5.3226	5.5023	6.3801
40	4.3623	4.5306	4.6990	4.8673	5.1198	5.2941	6.1478
45	4.2300	4.3944	4.5588	4.7233	4.9699	5.1436	5.9842
50	4.0977	4.2582	4.4187	4.5793	4.8201	4.9931	5.8206
55	3.9894	4.1471	4.3048	4.4626			
60	3.8811	4.0360	4.1909	4.3458			
65	3.8035	3.9599	4.1163	4.2727			
70	3.7259	3.8838	4.0417	4.1996			
75	3.6707	3.8282	3.9857	4.1432			
80	3.6156	3.7727	3.9298	4.0869			
85	3.5741						
90	3.5325						
95	3.6186						
100	3.7048						
105	3.7972						
110	3.8896						
115	4.1720						
120	4.4544						
Heavy Bus:							
5							16.8704
20	10.0225	10.5384	11.0543	11.5702	12.3441	12.6163	14.7083
25	9.6793	10.1820	10.6847	11.1874	11.9415	12.2153	14.2710
30	9.3360	9.8256	10.3151	10.8047	11.5390	11.8143	13.8337
35	9.0516	9.5309	10.0102	10.4895	11.2084	11.4880	13.4851
40	8.7673	9.2363	9.7053	10.1743	10.8778	11.1617	13.1365
45	8.6548	9.1265	9.5982	10.0698	10.7774	11.0599	13.0402
50	8.5423	9.0167	9.4910	9.9654	10.6769	10.9582	12.9438
55	8.5336	9.0206	9.5076	9.9947			
60	8.5249	9.0246	9.5242	10.0239			
65	8.5817	9.0969	9.6120	10.1272			
70	8.6385	9.1691	9.6998	10.2305			
75	8.7188	9.2659	9.8130	10.3602			
80	8.7991	9.3627	9.9262	10.4898			
85	8.9097	9.6813	9.9631	10.5245			
90	9.0202						
95	9.1412						
100	9.2622						
105	9.6168						
110	9.9714						
115	10.5338						
120	11.0962						

Appendix 6.1 Economic Vehicle Operating Cost (3/3)
[Running + Fixed Costs in Baht/km]

Speed	Road Condition C-1	C-2	C-3	C-4	C-5	C-6	C-7
Light Truck / Pick-up (Commodity):							
5							7.2970
20	3.5893	3.7934	3.9975	4.2016	4.5078	4.7206	5.7586
25	3.3631	3.5592	3.7553	3.9514	4.2456	4.4501	5.4475
30	3.1368	3.3250	3.5131	3.7012	3.9834	4.1796	5.1364
35	3.0108	3.1937	3.3767	3.5596	3.8340	4.0253	4.9567
40	2.8847	3.0625	3.2402	3.4180	3.6847	3.8710	4.7771
45	2.8023	2.9761	3.1498	3.3235	3.5841	3.7689	4.6597
50	2.7200	2.8897	3.0594	3.2290	3.4836	3.6668	4.5424
55	2.6562	2.8229	2.9895	3.1562	1.7418	1.8334	2.2712
60	2.5924	2.7560	2.9197	3.0834			
65	2.5550	2.7201	2.8852	3.0503			
70	2.5177	2.6842	2.8507	3.0172			
75	2.4989	2.6649	2.8309	2.9969			
80	2.4800	2.6455	2.8110	2.9765			
85	2.4717						
90	2.4634						
95	2.5861						
100	2.7088						
105	2.8358						
110	2.9627						
115	3.2880						
120	3.6132						
Medium / Heavy Truck:							
5							17.0099
20	9.9846	10.4964	11.0083	11.5202	12.2879	12.4852	14.4152
25	9.5918	10.0855	10.5792	11.0729	11.8135	12.0121	13.8904
30	9.1990	9.6746	10.1501	10.6257	11.3390	11.5390	13.3656
35	8.9104	9.3733	9.8362	10.2990	10.9934	11.2011	13.0053
40	8.6218	9.0720	9.5222	9.9724	10.6477	10.8633	12.6451
45	8.4944	8.9488	9.4031	9.8574	10.5389	10.7490	12.5322
50	8.3670	8.8255	9.2839	9.7424	10.4301	10.6347	12.4194
55	8.3163	8.7874	9.2585	9.7297			
60	8.2655	8.7493	9.2331	9.7169			
65	8.2746	8.7749	9.2753	9.7757			
70	8.2836	8.8006	9.3175	9.8344			
75	8.3516	8.8879	9.4242	9.9605			
80	8.4196	8.9752	9.5309	10.0866			
85	8.4984						
90	8.5772						
95	8.6759						
100	8.7746						
105	9.0554						
110	9.3362						
115	9.8788						
120	10.4215						

Appendix 6.2 Road Condition and Speed

	Rt.	Length km	Class	Terrain	Speed of vehicles in km/hr MC	PC	LB	HB	LT	HT
Rt. 0109:										
Original Trip	109	10	C-3	F	45	60	50	50	50	50
		24	C-3	M	30	40	30	25	30	25
		10	C-5	F	35	50	40	40	40	40
		29	C-5	M	20	30	20	20	20	20
Total		73								
Detour Trip	118	30	C-3	R	35	50	40	35	40	35
	1	53	C-2	F	50	65	55	55	55	55
	1089	40	C-4	F	40	55	45	45	45	45
		50	C-4	R	30	45	35	30	35	30
Total		173								
Rt. 1095:										
Original Trip	107	37	C-2	F	50	65	55	55	55	55
	1095	55	C-4	F	40	55	45	45	45	45
		150	C-4	M	25	35	25	20	25	20
Total		242								
Detour Trip	108	100	C-3	F	45	60	50	50	50	50
		100	C-4	F	40	55	45	45	45	45
		155	C-4	M	25	35	25	20	25	20
Total		355								
Rt. 1256:										
Original Trip	1256	17	C-4	F	40	55	45	45	45	45
		30	C-4	M	25	35	25	20	25	20
Total		47								
Detour Trip	1081	25	C-4	F	40	55	45	45	45	45
		25	C-4	R	30	45	35	30	35	30
	1169	25	C-4	R	30	45	35	30	35	30
Total		75								
Rt. 0004:										
Original Trip 1	4	33	C-3	F	45	60	50	50	50	50
		20	C-3	M	30	40	30	25	30	25
Total		53								
Original Trip 2	4	98	C-3	F	45	60	50	50	50	50
		20	C-3	M	30	40	30	25	30	25
Total		118								
Detour Trip 1	4	34	C-3	F	45	60	50	50	50	50
	403	26	C-3	F	45	60	50	50	50	50
	4151	15	C-4	F	40	55	45	45	45	45
		20	C-4	M	25	35	25	20	25	20
	41	50	C-2	F	50	65	55	55	55	55
Total		145								
Detour Trip 2	404	50	C-3	F	45	60	50	50	50	50
	416	80	C-3	F	45	60	50	50	50	50
	406	20	C-3	F	45	60	50	50	50	50
		25	C-3	M	30	40	30	25	30	25
Total		175								
Rt. 4015:										
Original Trip	4015	12	C-4	R	30	45	35	30	35	30
		12	C-4	F	40	55	45	45	45	45
Total		24								
Detour Trip	4238	20	C-5	R	25	40	30	25	30	25
	403	20	C-3	R	35	50	40	35	40	35
	41	55	C-2	F	50	65	55	55	55	55
Total		95								
Rt. 4107/4058:										
Original Trip	4058	11	C-5	F	35	50	40	40	40	40
	4107	21	C-4	R	30	45	35	30	35	30
Total		32								
Detour Trip	42	30	C-3	F	45	60	50	50	50	50
	4060	45	C-4	R	30	45	35	30	35	30
Total		75								

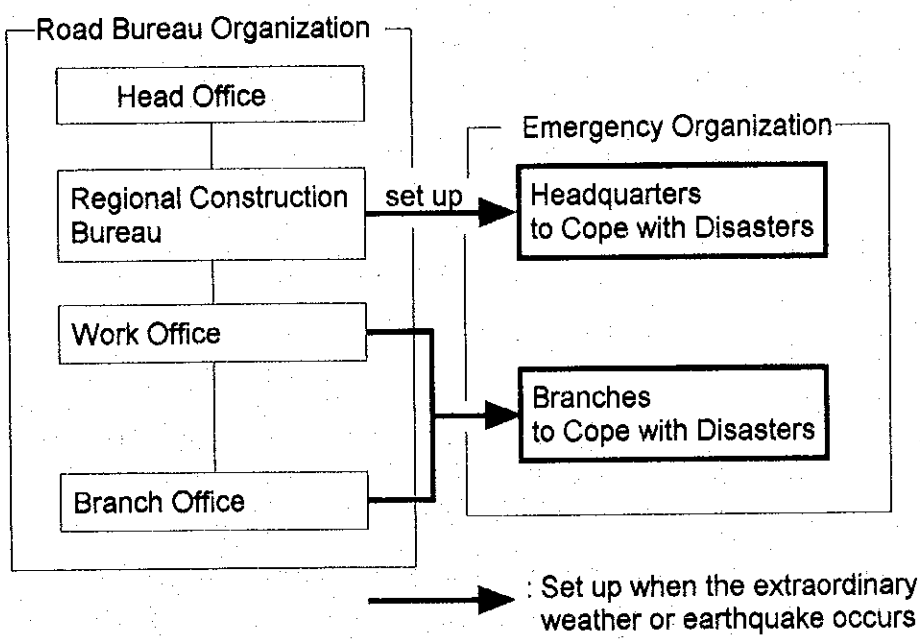
F: Flat R: Rolling M: Mountainous

Appendix 7

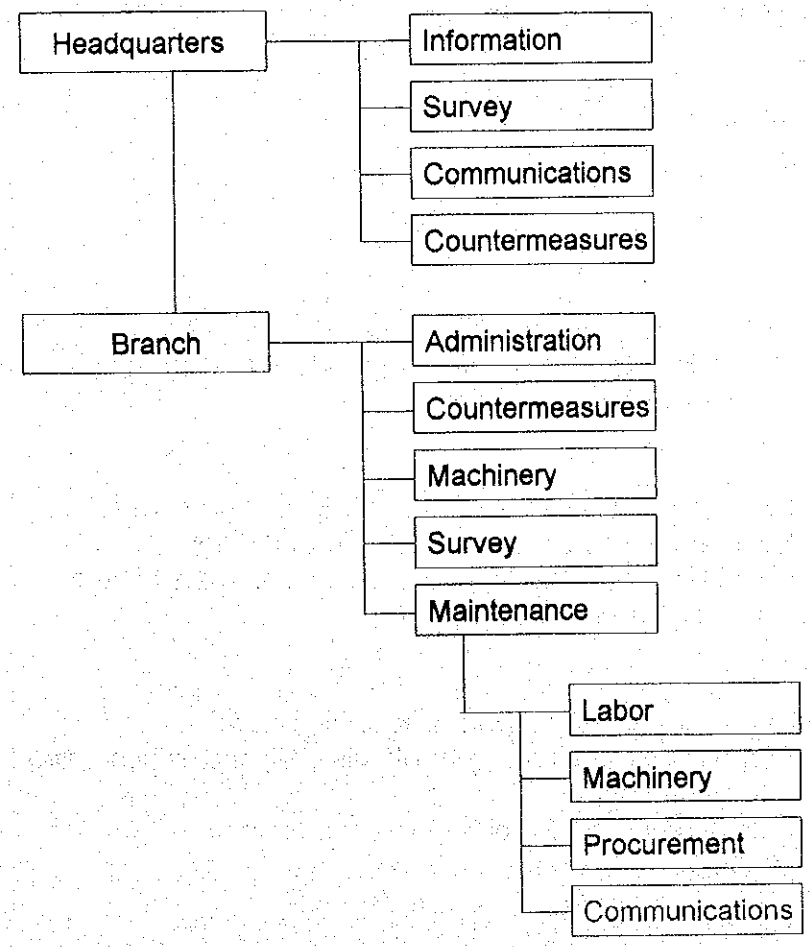
Appendix 7.1 Organizations and Systems of Road Bureau in Japan for Coping with Disasters

1. Organization

1.1 Emergency Organization



1.2 Responsibilities of Headquarters and Branches of Emergency Organization



1.3 Objectives of Emergency Organization

- To collect the latest information on weather, road and traffic conditions.
- To arrange and present the latest information on road and traffic conditions.
- To summon staff for emergency work.
- To procure materials and equipment.
- To prepare and execute countermeasures for traffic control work.

2. Emergency Organization Disaster Preparation System

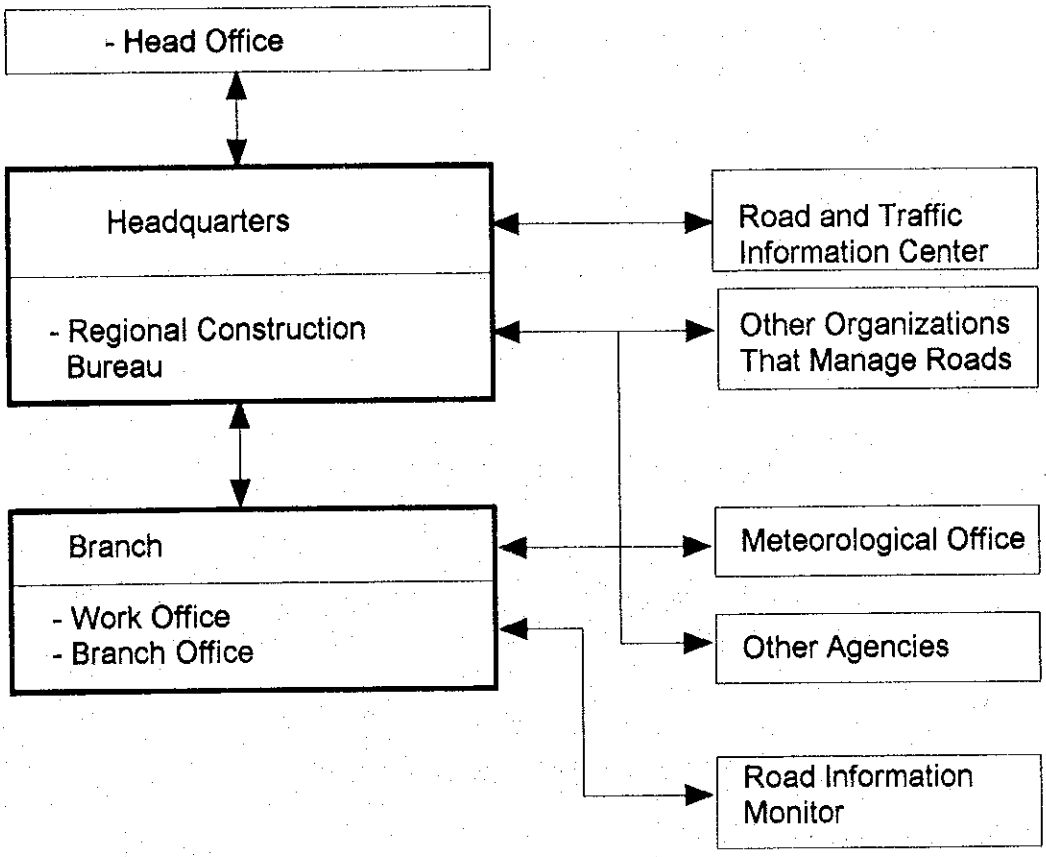
2.1 Classification of Disaster Preparation

Disaster Preparation	Incidence
CAUTION	When a road disaster due to extraordinary weather or a earthquake is anticipated.
WARNING	When the risk of a disaster is high. When a road disaster occurs in a limited region.
EMERGENCY	When serious road damage extends over a wide area.

2.2 Duty in Each System

Disaster Preparation	Duty
CAUTION	Post communicating staff in headquarters or branches. Contact with relational office and agencies according to the state of meteorology.
WARNING	Post necessary staff in headquarters and branches Post persons to command staff day and night. Distribute staff, materials and equipment to the base of site according to demand.
EMERGENCY	Excute urgent repair work and traffic control. Request support from other offices or agencies according to the demand. Post persons to control headquarters and branches day and night.

3. Communications Network



4. Road Closure before a Damage

4.1 Reasons for Closing Road

(1) Closed Road Section

a. A section where a damage, such as a rockfall or landslide, is anticipated based on past experience.

b. Section patrolling staff judges to be hazardous.

(2) Standards for prohibiting passage

Standards for passage prohibition are decided by past meteorological and disaster records.

a. Rain

- Consecutive rainfall
- Standard in Kanto Regional Construction Bureau is 130 - 200 mm

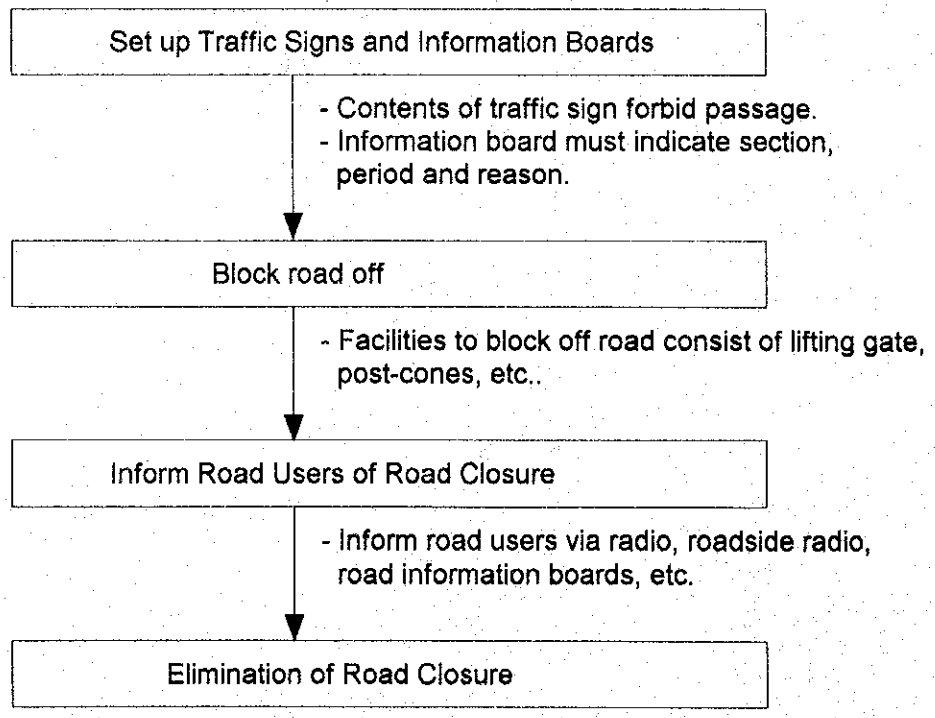
b. Snow

- Snow depth, temperature, wind velocity and snowslide warning announcement.

c. Wind

- High wind velocity and storm warning announcement.

4.2 Implementation of Road Closure



[Items to Consider]
- Confirmation there has not been continuous rain.
- Confirmation road and slope safety by patrols.
- Inform related offices and agencies.

Appendix 7.2 Road information Monitoring System in Japan

1. Objective of System

- To collect and present the latest information on road conditions and disasters without patrolling.
- To set up and off the traffic sign to inform road user of passage prohibition, traffic restriction, etc.

2. Entrusting Road Information Monitor

2.1 District to Entrust

- Where the road disaster has occured, and where the potential for a disaster is high.
- 1 monitor per 5 - 10 km. for hazardous sections.

2.2 Person to Entrust

- Manager of a roadside store/concession, such as a gas station or restaurant.

Appendix 8

Appendix 8 Introduction of Examples of Countermeasure

1. COASTAL EROSION

1.1 Cause of the Coastal Erosion

The coastal erosion is generally caused by the decrease of the supply of sand by river flow (see Fig.1.1). It is commonly induced by the construction of river dams. The construction of a jetty or an offshore breakwater can also be one of the causes of the coastal erosion (see Fig.1.2). Besides, the excavation of sand and gravel at seashore is another potential cause of erosion.

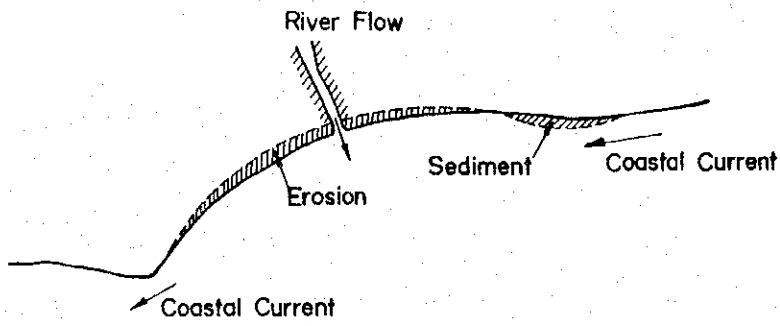


Fig.1.1 Coastal Erosion by Shortage of Sand Supply

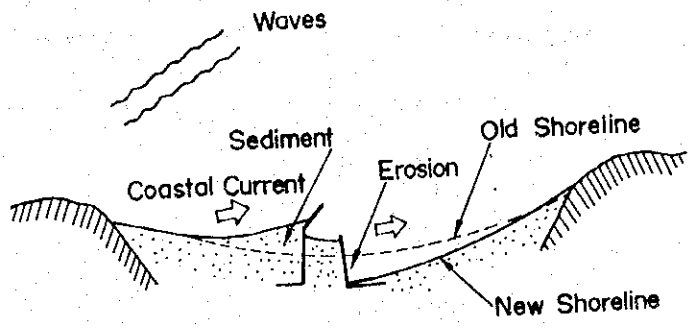


Fig.1.2 Coastal Erosion by Jetty

In the case of Hua Sai, the cause of the coastal erosion can not fit in with the above-mentioned causes. Various types of surveys, laboratory test and/or simulation study will be needed to reach a real answer.

However, the cause of the erosion can be imagined at present with the assistance of the information from site reconnaissance. According to the knowledge from site reconnaissance, the original seashore was flourished by mangrove trees and protected from tidal current and wave force by them.

Before a decade or some more years, the mangrove forest

turned into the shrimp farm and result in a loss of seashore protection. Since then, the coastal erosion has started and still is in the making.

1.2 Countermeasures

In the case of Hua Sai, the erosion might be protected by usage of a breakwater. Some types of breakwater are shown in Fig.1.3 and Fig.1.4.

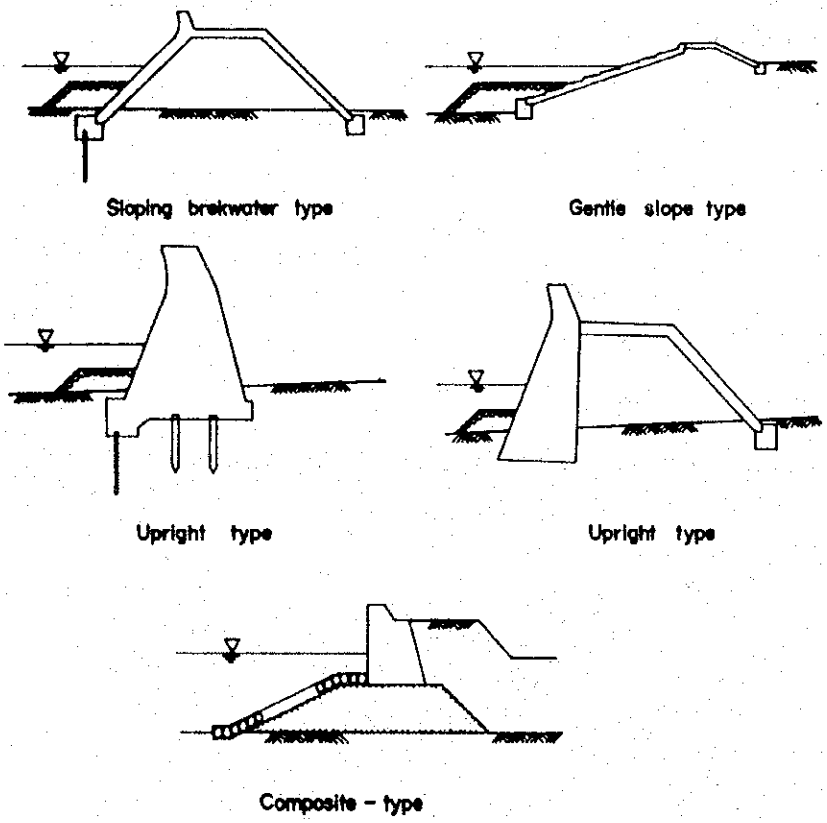


Fig.1.3 Structural Types of Breakwater

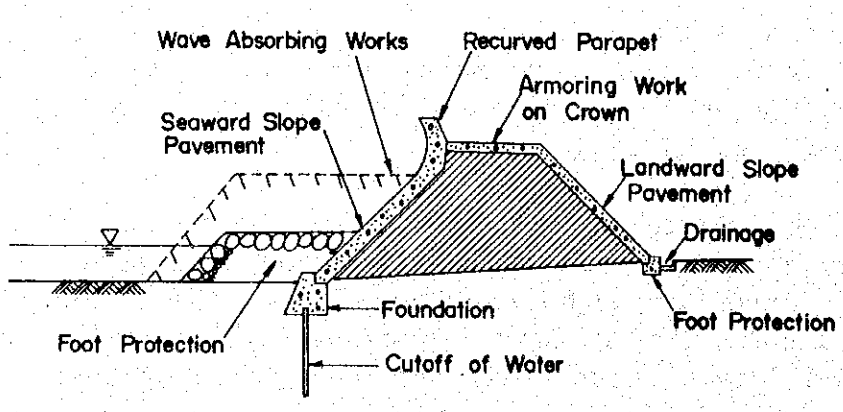


Fig.1.4 Details of Typical Type of Breakwater

1.3 Typical examples of seashore protection in Japan

Typical examples of seashore protection are shown in Fig.1.5 and Photo.1.1.

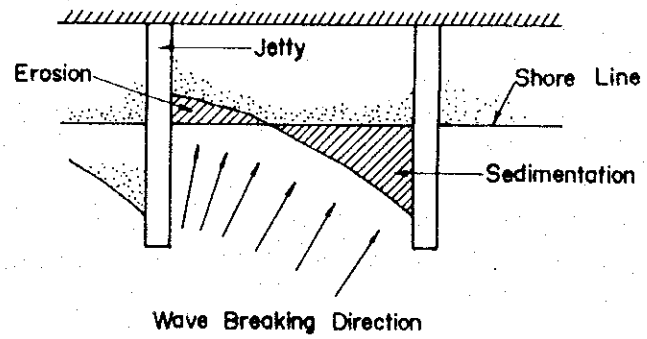


Fig.1.5 Shoreline between Jetty

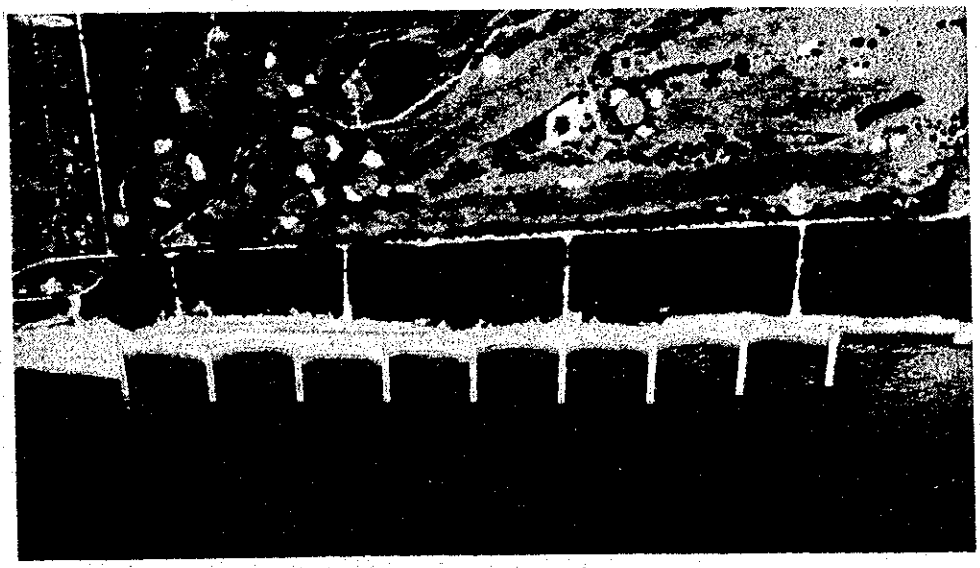


Photo.1.1 Groins

2. RIVER CHOKING

2.1 Cause of the river choking in changwat Phangnga

It can be imagined that the river choking in Phangnga occurs in the following manner.

(1) River conveys large amount of sand and gravel from upstream to downstream mainly at the time of flooding.

(2) Lange amount of sand and gravel are supplied from large number of abandoned tin mines that are located in the mountainous area.

(3) Deforestation and vegetational change (from primitive forest to rubber plantation) have increased the run-off coefficient and resulted in the increase of river sediment.

2.2 Countermeasures

Construction of the SABO dam (soil saving dam) is effective to reducing the river sediment and applied frequently in Japan. Concepts on the sabo dam and the outline of the dam structure are explained below.

(1) Two or three dams are installed from the source of sediment to the object to be protected from the sediment. Spacing of each dam depends on the gradient of river bed (see Fig.2.1).

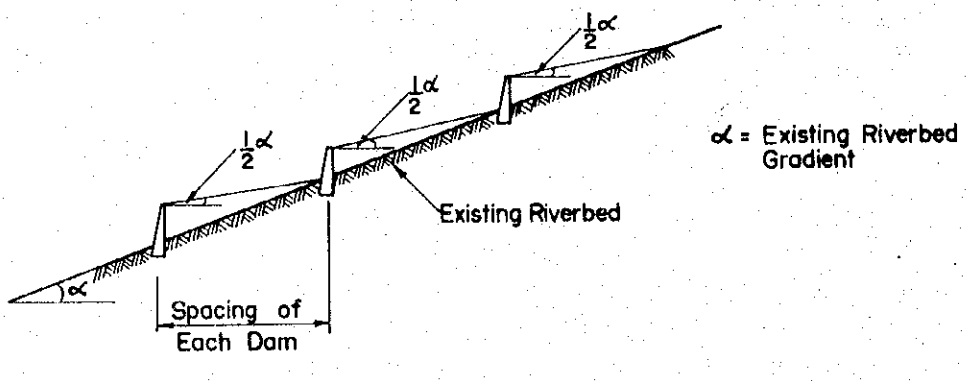


Fig.2.1 Spacing of the SABO dam

(2) Design capacity for sediment at each dam is prescribed in Japan as more than 30 % of toal river sediment per one flooding. Dam sediment shall be excavated after every flooding.

(3) A set of dam structure usually consists of main dam and sub dam as illustrated in Fig.2.2.

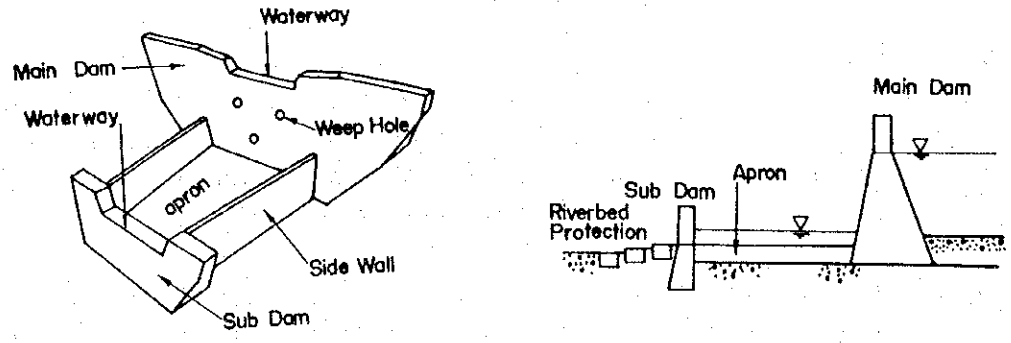


Fig.2.2 Details of Dam Structure

(4) Structural types of SABO dam commonly applied in Japan are shown in Fig.2.3.

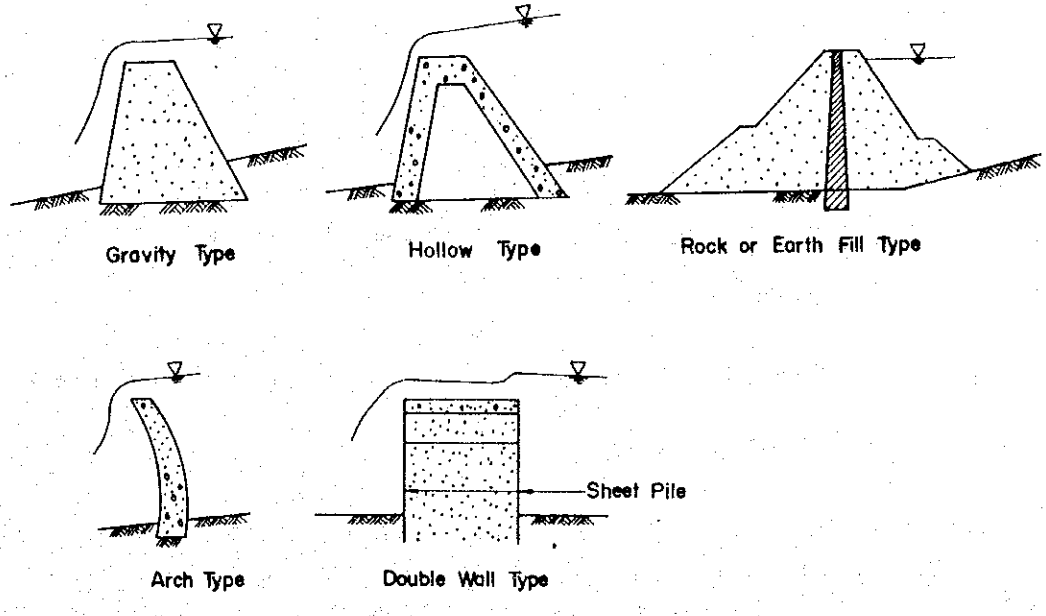


Fig.2.3 Types of SABO dam

3. AESTHETIC IMPROVEMENT OF CUT AND FILL SLOPE AT SEASHORE

3.1 Existing Situation

At present, a section of Rt.4233 is under construction at the north of Patong beach. The road stretches at hill side of seashore with cut and fill formation (see Fig.3.1) and producing a unsightliness. Cut slope consists of rock deposits and fill slope embankment is constructed with tipped till.

Considering the site is located nearby tourist area, the unsightliness shall be moderated as much as possible by some means or other.

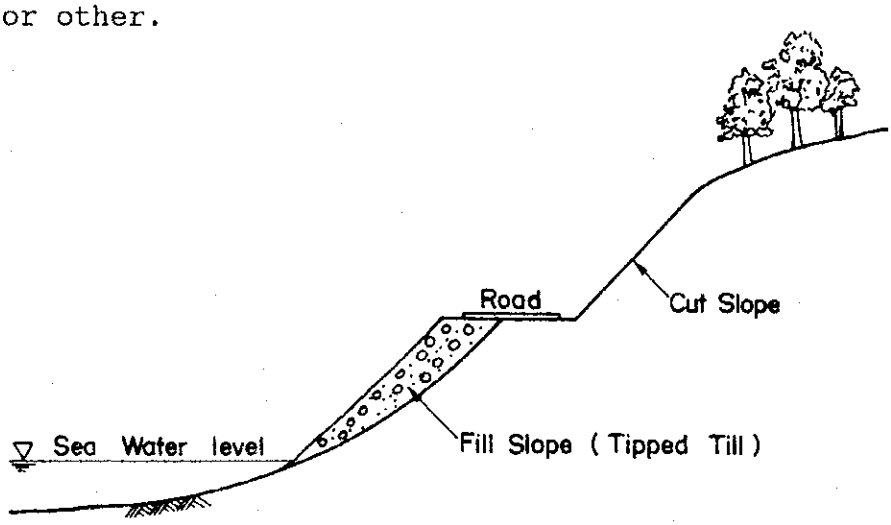


Fig.3.1 Schematic Cross Section of Existing Situation

3.2 Applicable Countermeasures

From the standpoint of aesthetic improvement of cut slope, slope covering with vegetation looks like the most desirable measure. The followings are recommended as applicable types of vegetational method.

- Seed spraying
- Cribwork with vegetation (see Photo.3.1)
- Seed packet with chemical fiber (see Photo.3.2)

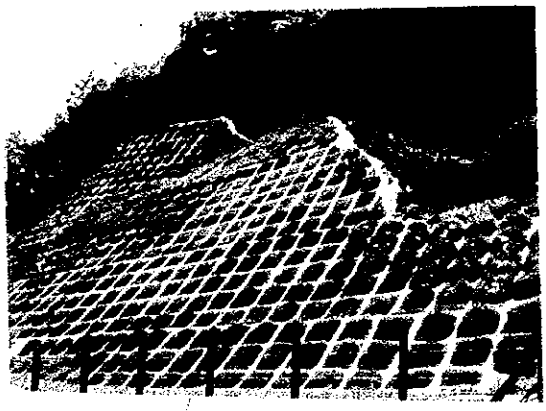


Photo.3.1 Cribwork with Vegetation

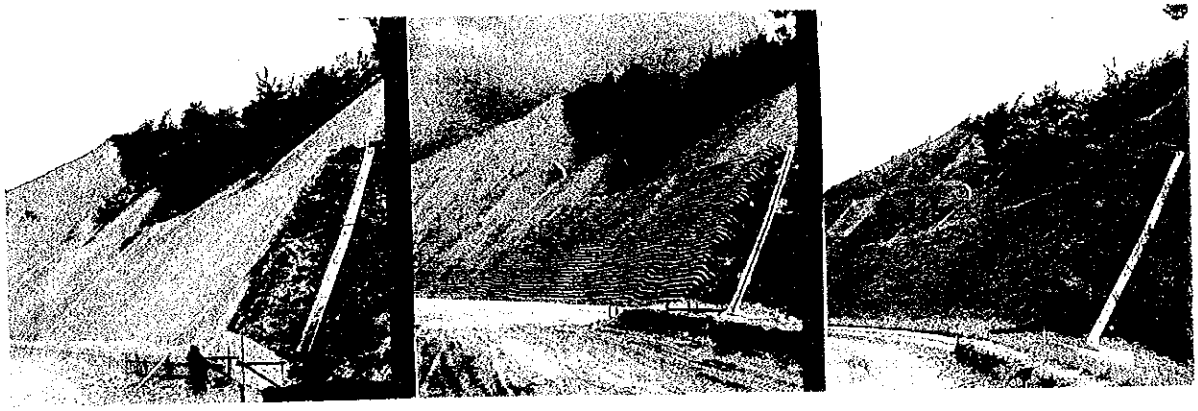


Photo.3.2 Seed Packet with Chemical Fiber

Regarding fill slope, the toe of the slope shall be protected from scouring due to wave and tidal current. Slope surface shall be covered with vegetation or invisualized by trees planted at the foot of slope. A schematic idea is illustrated in Fig.3.2.

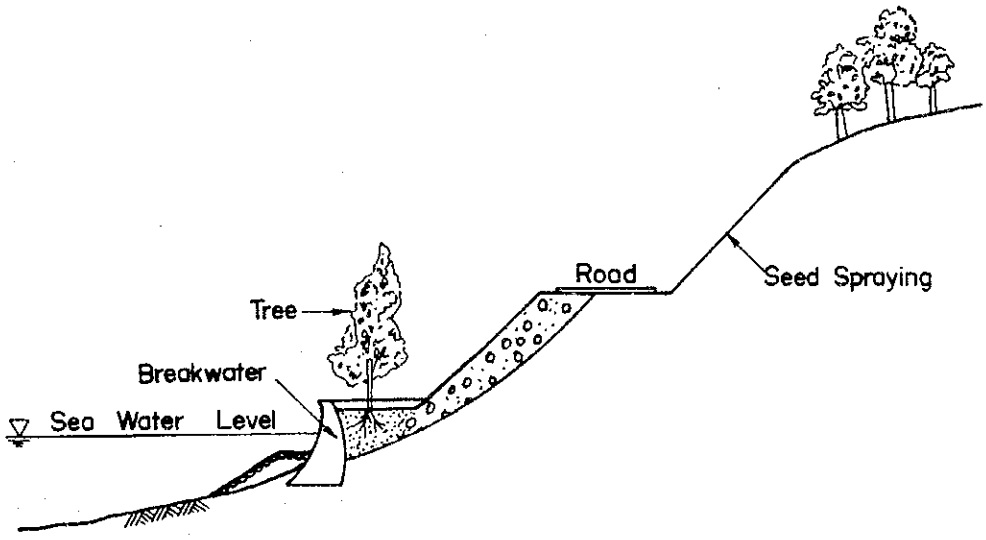


Fig.3.2 Invisualization of Fill Slope with Trees

Appendix 9

Appendix 9 Introduction of New Tecnologies

1. GEOTEXTILE

1.1 Types of Geotextile

The following eight types of geotextile are well applied and available in Japanese market.

- Nonwoven geotextile
- Woven geotextile
- Knitted geotextile
- Geogrid
- Geonet
- Geocomposite
- Geofiber
- Geomembrane

1.2 The function of Geotextile

Main function of geotextile are as follows:

(1) Drainage: to collect and drain the underground water.

(2) Filtering: to prevent the soil particle from draining.

(3) Separation: to prevent two types of soil from mixing.

(4) Reinforcing: to stabilize the soil mechanically with the assistance of tensile strength and friction force of geotextile.

(5) Protection: to protect friable membrane with geotextile covering.

(6) Imperviousness: to protect water permeation.

1.3 Application

(1) Reinforced Embankment

In this case, the objectives of the usage of geotextile are as follows:

(a) Tensile strength of geotextile are utilized to strengthen the entire embankment.

(b) If banking materials contains high moisture, geotextile can be used as a drainage layer. As a result, it accelerates the consolidation of the banking materials.

(c) After completion of a bank, geotextile drains the water permeated into the bank.

(d) Erosion of bank slope is mitigated by geotextile.

Typical applications to banking are illustrated in Fig.1.1-1.2.

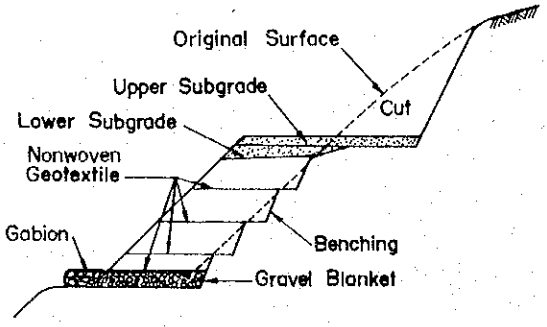


Fig.1.1 Cut and Fill Section with Nonwoven Geotextile

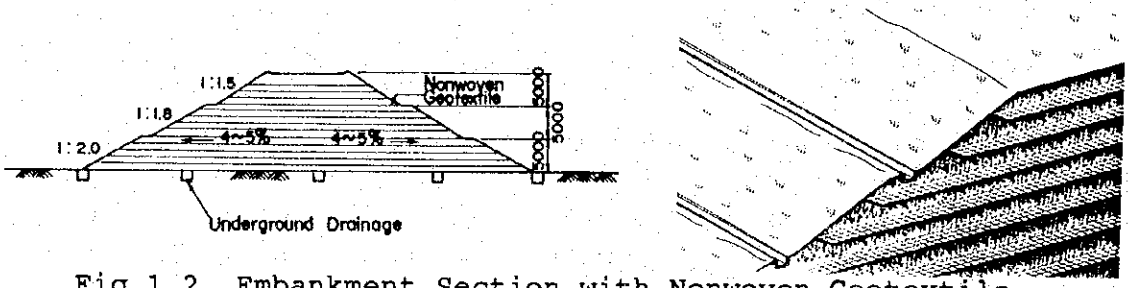


Fig.1.2 Embankment Section with Nonwoven Geotextile

(2) Reinforced Earth Wall

For this application, the range of the slope gradient is in between 45 degrees and 90 degrees. Geotextile is used to strengthen the embankment with the tensile strength of geotextile itself. Conceptional sketch of a reinforced earth wall is shown in Fig.1.3.

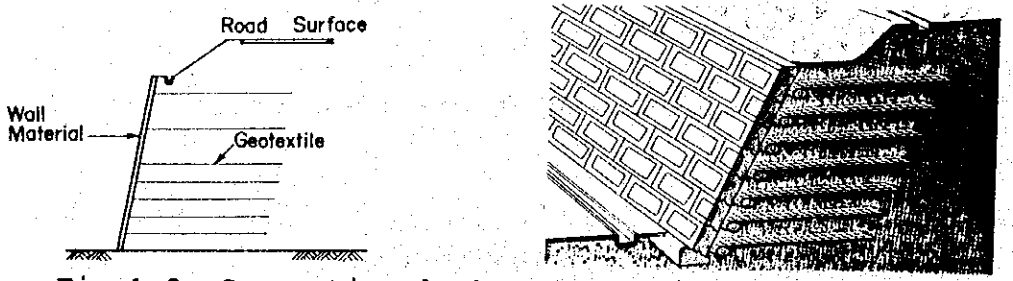


Fig.1.3 Conceptional Sketch of Reinforced Earth Wall

Appendix 9 Introduction of New Tecnologies

Various types of wall structures have been developed in Japan. Some of them are illustrated in Fig.1.4.

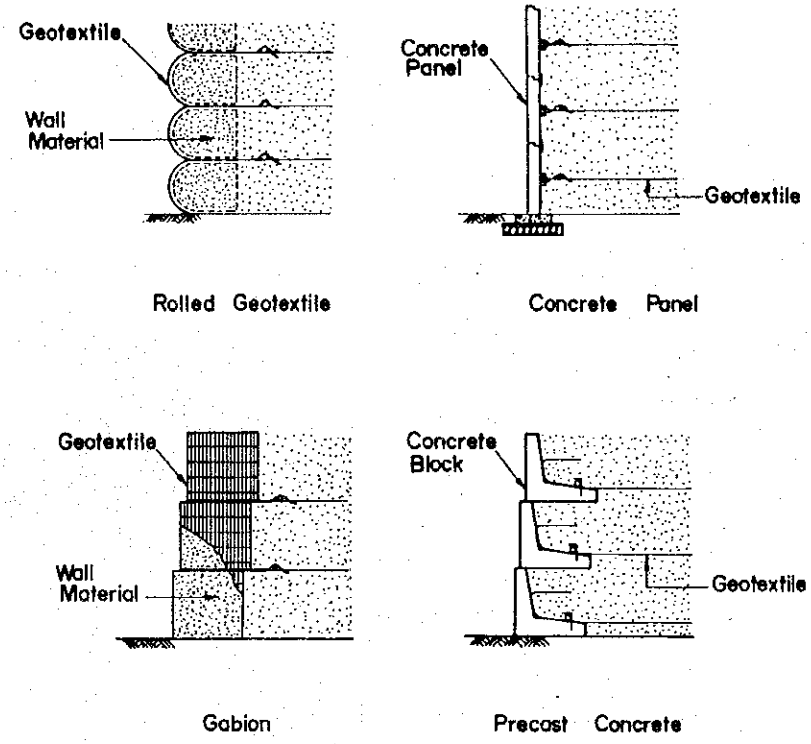


Fig.1.4 Wall Structures

(3) Improvement of Soft Ground

If geotextile is applied to improve the defect of soft ground, the following effects are expected.

- Hammock effect
- Heaving restraint
- Anchoring
- Frictional resistance
- Skid friction
- Load distribution

These effects are explained in Fig.1.5.

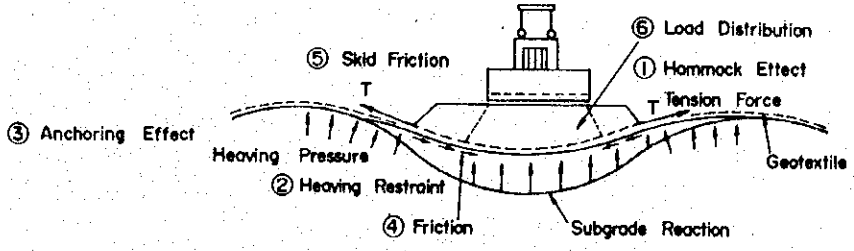


Fig.1.5 Increase of Bearing Capacity with Geotextile

Typical application examples to the improvement of soft ground are shown in Fig.1.6 and 1.7.

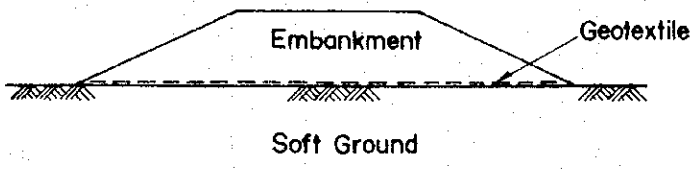


Fig.1.6 Application to the Stabilization of Embankment

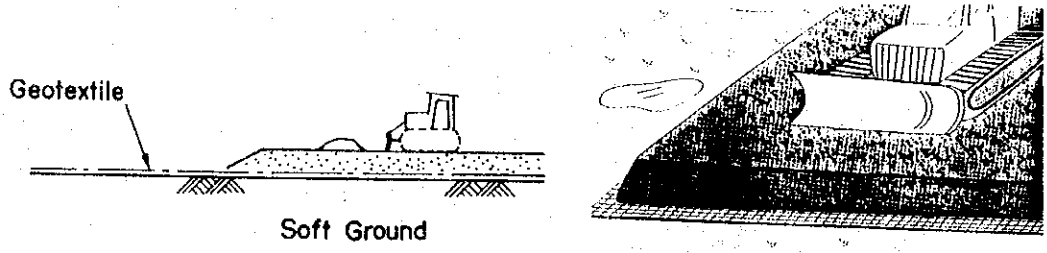


Fig.1.7 Application to the Spreading of Banking Materials

2. CEMENT COLUMN BY JET GROUTING

2.1 Construction Method

The basic principle of jet grouting is to make a void underground by jetting of liquid with high pressure and replace the void with coagulative materials. There are two types of prevailing construction method in Japan.

(1) JSG Method (Jumbo-Jet-Special Grout Method)

(2) CJG Method (Column Jet Grouting)

The outline of CGS construction is illustrated in Fig.2.1.

Conception of column construction is also illustrated in Fig.2.2.

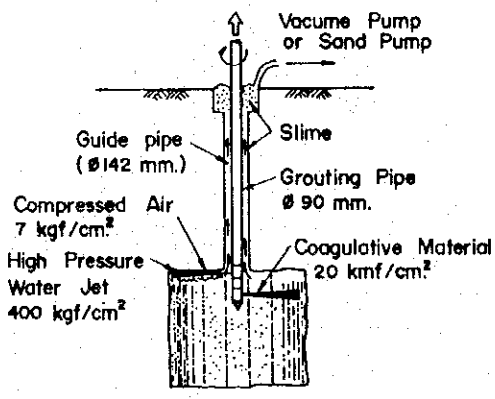


Fig.2.2 Conceptional Figure of Column Construction

2.2 Application

Comparison with main soil improvement method are tabulated in the following table.

Soil Improvement Method	Application (kgf/cm²)
Chemical Grouting	0 - 1
Deep Soil Stabilization	1 - 10
Jet Grouting	10 - 100
Piling	>100

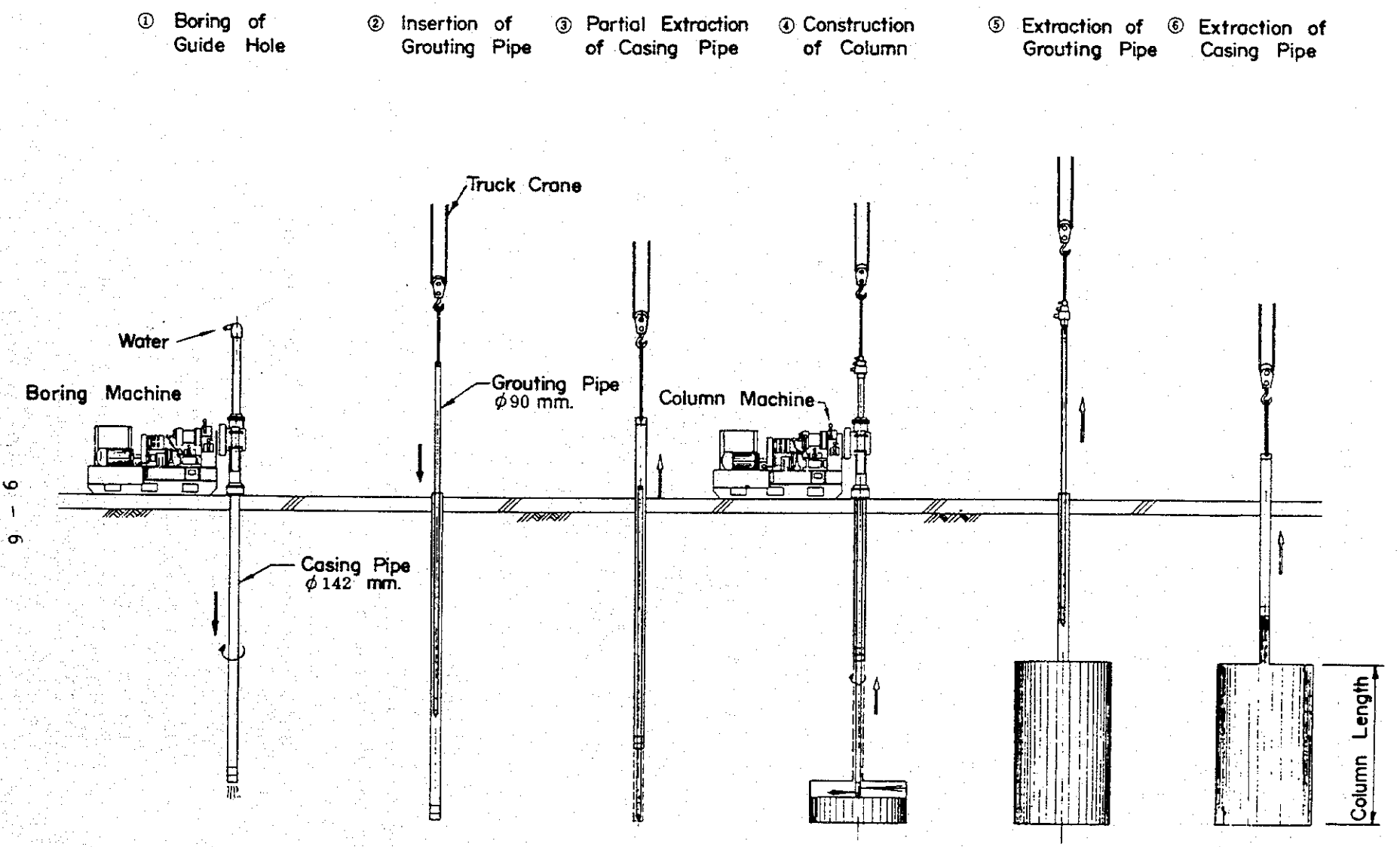


Fig. 2.1 Outline of CGS Construction

Typical examples of applications in Japan are mainly underpinning as shown below (refer to Fig.2.3 - Fig.2.6).

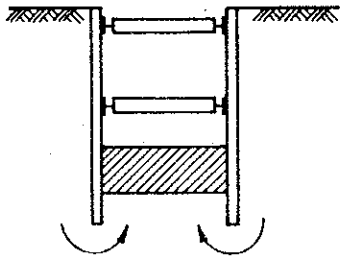


Fig.2.3 Improvement of Excavation Basement

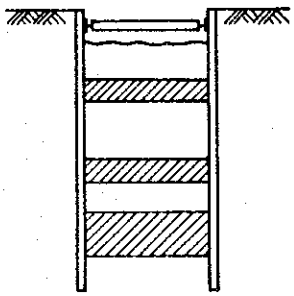


Fig.2.4 Pre-Construction of Strut

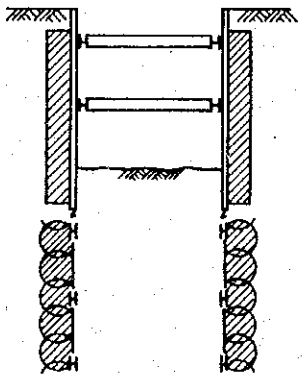


Fig.2.5 Reinforcement of Sheet Pile

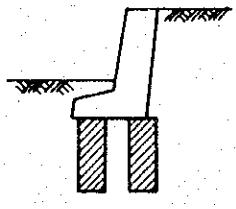


Fig.2.6 Improvement of Bearing Capacity