In case bailey bridge is used as long-lived urgent measures, its maintenance costs are taken into account as shown in Chapter 15.2.4.

6) Discount Rate: 15% per annum

15.2.2 Cost

The construction costs discussed in Chapter 4 are the financial costs and do not include the costs for design and construction supervision. In the cost-benefit analysis, the following economic cost is used:

Construction Cost	100%
- Tax	- 15%
+ Design and Construction Supervision Cost	+5%
Economic Cost	90%

15.2.3 Traffic Benefit

1) Traffic Benefit

Traffic benefit was calculated as follows depending on the disaster occurrence pattern:

Disaster occurrence pattern-1: TC_d-TC_o or TC_t - TC_o depending on before or after completion of urgent measures

Disaster occurrence pattern-2: TC_t - TC_o

Disaster occurrence pattern-3: TC_t - TC_o

Disaster occurrence pattern-4: TC_d -TC_o or TC_d -TC_t depending on permanent measures or urgent measures to be evaluated

Disaster occurrence pattern-5: TC_d - TC_o

where, TC_d = traffic costs in damaged condition
TC_t = traffic costs in temporarily restored condition
TC_o = traffic costs in original/completely restored condition

2) Traffic Costs in Original Condition

Basic Traffic Costs

The basic traffic costs were provided by PMO-FS, as shown in Table 15.2-1.

TABLE 15.2-1 BASIC TRAFFIC COSTS EXCLUDING TAX

(As of December 1990)

	Running Cost (₱/Km)	Fixed Cost (₱/hour)	Time Cost (₱/hour)
Car	2.59	7.14	30.06
Jeepney	1.55	35.46	44.10
Bus	3.50	48.60	158.70
Truck	4.48	52.20	0
Tricycle	0.73	14.64	8.28
Motorcycle	0.61	1.02	14.46

Actual Traffic Costs

The actual traffic costs are estimated according to the dl- system concerning running costs and the dt-system with regard to fixed and time costs. The dl-values and operating speed for different surface conditions are shown in Tables 15.2-2 and 15.2-3, respectively.

TABLE 15.2-2 dl-VALUES IN KM PER ACTUAL KM

	Surface Type			
Surface Condition	PCC	Bitu-minous	Gravel	Earth
Good	0	0.14	0.29	-
Fair	0.17	0.38	0.60	-
Bad	0.43	0.65	0.87	1.20
Very Bad	0.89	1.04	1.20	1.56

TABLE 15.2-3 OPERATING SPEED IN KM/HOUR

Surface Condition	Surface Type											
	PCC			Bituminous			Gravel			Earth		
	OV	TC	MC	OV	TC	MC	OV	TC	MC	OV	TC	MC
Good	65	40	60	63	38	55	60	35	50	-	-	-
Fair	55	35	50	53	33	45	50	30	40	-	-	-
Bad	30	20	20	30	20	20	30	20	20	20	10	10
Very Bad	20	10	10	20	10	10	20	10	10	10	5	5

Note: OV: Car/Jeepney/Bus/Truck
TC: Tricycle
MC: Motorcycle

Actual traffic costs are calculated as follows:

$$TC_o = \sum_i v_i \; TC_{oi} \; L$$

$$TC_{oi} = BRC_i (1 + dl) + (BFC_i + BTC_i)/S_i$$

where,
- TC_o = traffic costs in original condition, in P
- V_i = volume of vehicle type i
- L = length of road section, in km
- TC_{oi} = unit traffic cost for vehicle type i, in P/km
- BRC_i = basic running cost for vehicle type i, in P/km
- BFC_i = basic fixed cost for vehicle type i, in P/hour
- BTC_i = basic time cost for vehicle type i, in P/hour
- dl = dl-value corresponding to surface type and condition, in km/km
- S_i = operating speed for vehicle type i corresponding to surface type and condition, in km/hour

3) Traffic Costs in Damaged Condition

During the period from disaster occurrence till completion of urgent measures, the road is left in damaged condition. Traffic costs in damaged condition depend on magnitude of traffic interruption and availability of detour road in case that the traffic is fully interrupted. This situation is divided into the following four cases:

- Case-1: Traffic interruption in full width, detour road available
- Case-2: Traffic interruption in full width, no detour road
- Case-3: Traffic interruption in one lane
- Case-4: Traffic interruption in shoulder

Case-1: Traffic interruption in full width, detour road available

Traffic costs were estimated assuming that all traffic make detour, thus:

$$TC_d = \sum_i V_i \, TC_{di} \, L_d$$

where,
- TC_d = traffic costs in damaged condition, in P
- V_i = volume of vehicle type i
- TC_{di} = *unit traffic cost along detour road depending on its surface type and condition for vehicle type i*, in P/km
- L_d = length of detour road, in km

Case-2: Traffic interruption in full width, no detour road

Due to interruption for motorized vehicles, either substutive transport means such as animal, walking and boat will be taken, or trips will be given up. Extra traffic costs in the former case and a loss due to impediment for normal socio-economic activities in the latter case are considered as the costs savable in with case, or benefit. For simple quantification, the loss due to trip suspension was, in this Study, substituted by the traffic costs which would be expended if the latent traffic demand would be met by taking substitutive transport means.

Thus, the following assumptions were made in calculating the traffic costs in damaged condition:

- Traffic demand is the same as before the disaster occurred in terms of number of passengers and commodity tonnage.
- For meeting the traffic demand, animal and walking/head loading on land and banca boat on water are used as substitutive transport means.

The Procedure for calculating the traffic costs is as follows:

(a) The route for substitutive transport means is assumed and travel distances on land and on water are determined.

(b) Number of passengers and commodity tonnage are calculated based on traffic volume by vehicle type, assuming the average occupancy and load and passenger/commodity share shown in Table 15.2-4.

(c) For transportation on land, numbers of animals and persons for carrying the passengers and commodity calculated in (b) above are estimated assuming the average occupancy and load shown in Table 15.2-4 and half-and-half animal/person share (half passengers are carried by animals and half passengers walk; half commodity is carried by animals and remaining by person).

(d) For transportation on water, only banca boats are used. Likewise as above, number of banca boats is estimated.

(e) Based on the numbers of animals/persons/banca boats and their respective travel distances, traffic costs are calculated assuming the unit traffic costs shown in Table 15.2-5.

TABLE 15.2-4 AVERAGE OCCUPANCY AND LOAD AND PASSENGER/ COMMODITY SHARE

	Average Occupancy (passenger/ vehicle)	Average Load (ton/ vehicle)	% Share	
			Passenger	Commodity
Car	3.4	1.0	65	35
Jeepney	13.0	1.0	76	24
Bus	28.0	2.0	100	0
Truck	8.0	5.0	10	90
Tricycle	2.9	0.3	69	31
Motorcycle	1.7	0.15	80	20
Animal	2.5	0.2	-	-
Walking	1.0	0.03	-	-
Boat	4.0	0.3	-	-

TABLE 15.2-5 TRAFFIC COSTS FOR SUBSTITUTIVE TRANSPORT MEANS

Mode	Traffic Cost (₱/km)
Animal	11.0
Walking	3.0
Banca Boat	10.0

Case-3: Traffic Interruption in One Lane

This case is possible only for 2-lane road because 1-lane road in which one lane is damaged is categorized as case-1 or case-2.

In the damaged section where only one lane is passable, vehicle operating speed is remarkably suppressed resulting in extra traffic costs. Taking such situation into consideration, traffic costs in damaged condition were calculated on the following assumptions:

dl-value : same as before disaster
operating speed : 5 km/hr
additional costs for deceleration/acceleration: equivalent to 0.2 km's basic running cost

Case-4: Traffic Interruption in Shoulder

In the portion where shoulder is damaged (falling in or covered by obstacles), motorists are forced to reduce the speed. Taking this effect into consideration, traffic costs were calculated on the following assumptions:

dl-value : same as before
operating speed : 10 km/hr or 5 km/hr in case of 2-lane road or 1-lane road, respectively
additional costs for deceleration/acceleration:
equivalent to 0.1 km or 0.2 km's basic running cost in case of 2-lane road or 1-lane road, respectively

4) Traffic Costs in Temporarily Restored Condition

After completion of urgent measures, at least one lane is secured for traffic but the road is not restored yet in full width. Incompleteness of the road section results in reduction in the vehicle operating speed and extra traffic costs accordingly.

Taking the effect of speed reduction into account, traffic costs in temporarily restored condition were calculated on the following assumptions:

	dl-Value	Operating Speed	Additional Costs for Deceleration/ Acceleration
Bailey Bridge	1.0 km per actual km	5 km/hr	0.2 km's basis running cost
2-lane road, shoulder damaged	same as before disaster	10 km/hr	0.1 km's basic running cost
other cases than above	same as before disaster	5 km/hr	0.2 km's basic running cost

15.2.4 Maintenance Benefit

The restoration costs needed in without case and savable in with case are considered as a part of benefits. This benefit is, in this study, called maintenance benefit.

The contents of the maintenance benefit depend on the disaster occurrence pattern described in 15.2.1 2).

1) Disaster Occurrence Pattern-1

In without case, urgent measures will be taken every time when disaster occurs, while in with case, disaster will not recur resulting in the savings of costs for urgent measures. Such savings were counted as maintenance benefit. Costs for the urgent measures for the first occurrence of disaster was not included in the benefit because the first urgent measures will be taken also in with case.

2) Disaster Occurrence Pattern-2

Since urgent measures are assumed to be taken only one time in both without and with cases, no maintenance benefit accrues, except the following cases:

i. Another disaster anticipated

In case that another disaster is anticipated at neigboring area and the permanent measures are preventive thereof, costs for the urgent measures to be taken after the second disaster were counted as maintenance benefit.

ii. Use of bailey bridge as urgent measures

In with case, cost of bailey bridge was estimated at the depreciation basis because it will be used only for a short period and thereafter it may be re-used for other portions, while in without case, the bailey bridge is assumed to be used throughout the whole analysis period and its full cost is counted accordingly. As well as the difference in the costs of bailey bridge between without and with cases, annual maintenance costs of the bailey bridge which are assumed to be 5% of its full cost were taken as maintenance benefit.

3) Disaster Occurrence Pattern-3

In without case, urgent measures will be taken after a disaster occurred and thereafter the urgent measures will be reconstructed repeatedly for preventing recurrence of disaster. The reconstruction costs of the urgent measures, which are savable in with case, were counted as maintenance benefit.

4) Disaster Occurrence Pattern-4

Since no measures are taken in without case, no maintenance benefit accrues.

In case bailey bridge is subjected to the evaluation, its annual maintenance cost which are assumed to be 5% of its initial construction cost were counted as negative benefit.

5) Disaster Occurrence Pattern-5

In without case, road facilities will collapse in future and restored thereafter. The restoration costs, which are savable in with case, were counted as maintenance benefit.

If some urgent measures are taken prior to permanent measures in with case, the costs for such urgent measures are considered as a part of cost.

On the same basis as in cost calculation, 90% of the restoration costs were used in the benefit calculation.

15.2.5 Economic Evaluation

1) Evaluation Cases

The economic evaluation was made on the following cases:

Other Disasters than Temporary Bridge Washout

Permanent measures were evaluated against the condition where only urgent measures are taken or do-nothing condition as the case may be.

Temporary Bridge Washout

The following two cases were examined:

- Evaluation of bailey bridge construction against do-nothing condition under disaster occurrence pattern-4
- Evaluation of concrete bridge construction against the condition of being restored by bailey bridge under disaster occurrence pattern-2

The former case is considered as restoration to the original condition, while the latter case as its upgrading.

2) Evaluation Results

The results of economic analysis for individual spots are presented in Appendix 15-1, including assumptions, benefit stream and economic indicators such as net present value, benefit/cost ratio and internal rate of return.

Tables 15.2-6, 15.2-7 and 15.2-8 summarize the analysis results for the disaster spots in Benguet, Batangas and Leyte, respectively.

These results show that implementation of the restoration measures proposed in Chapter 14 (all inclusive of permanent measures except for Spots L-4 and L-6 where only urgent measures were proposed) are all economically feasible, while upgrading schemes in Spots L-4 and L-6 are unfeasible.

TABLE 15.2-6 SUMMARY OF ECONOMIC EVALUATION (BENGUET)

	Spot No.	Road Name	1992 AADT 1)	Disaster Type	Disaster Pattern	Traffic Interruption	Urgent Restoration Measures				Permanent Restoration Measures					EIRR(%)
							Cost(Mp)	Type of Work			Cost(Mp)	Type of Work				2)
*	Bt-1	Baguio-Itogon Rd	1042	C-F	1	Full Width	0.044	U1-1	U1-2		0.531	P1-1 P6-9	P2-2	P4-8	P6-2	(inf)
*	Bt-2	- do -	1042	Rd-D	4	Full Width	-				11.257	P1-3	P6-9	P19-1		53.4
*	Bt-7	- do -	1042	CLV-D	1	One-lane	0.004	U1-1	U3-1		0.125	P6-2	P6-9	P16-3	P18-1	(inf)
*	Bt-11	- do -	1042	L-SL	3	Speed Down	0.008	U7-1			0.492	P1-4 P6-9	P2-1 P19-2	P2-5	P3-2	73.9
*	Bt-14	Baguio-Bokod Rd	180	C-F	1	One-lane	0.023	U1-1	U3-1		0.170	P1-1 P6-2	P2-2	P4-2	P5-3	(inf)
*	Bt-20	- do -	180	E-F	3	Shoulder	0.015	U1-4	U3-2	U4-3	0.049	P6-2	P16-3			(inf)
*	Bt-24	- do -	180	D-FL	1	Full Width	0.006	U1-1			0.164	P1-1	P2-2	P8-2		(inf)
*	Bt-25	- do -	180	E-F	3	One-lane	0.007	U3-1			0.331	P1-3	P2-2	P6-2	P16-1	93.8
*	Bt-33	Kapangan-Acop Rd	127	FALL	1	Full Width	0.003	U1-1	U1-2		0.133	P1-1	P2-2	P4-6	P6-2	(inf)
*	Bt-38	- do -	127	E-F	3	One-lane	0.009	U3-1			0.087	P1-3	P2-2	P4-2	P6-2	(inf)
*	Bt-39	- do -	127	D-FL	1	Full Width	0.005	U1-1			0.270	P6-2	P8-2	P16-3	P18-1	(inf)
*	Bt-43	Kibungan-Kapangan Rd	97	C-F	1	Shoulder	0.007	U1-1			0.154	P1-1	P2-2	P4-6	P6-2	160.6
*	Bt-54	- do -	97	E-F	3	Full Width	0.003	U1-4	U4-3		0.244	P1-3	P6-9			53.1
*	Bt-55	- do -	97	PBr-A	3	One-lane	0.013	U4-1			0.743	P1-3	P6-2	P15-1		22.8
*	Bt-57	Atok-Provincial Rd	145	C-F	1	Shoulder	0.007	U1-1	U1-2		0.097	P1-1	P2-2	P4-8	P6-2	(inf)
*	Bt-58	- do -	145	E-F	3	Shoulder	0.004	U3-1			0.149	P6-2	P16-2	P16-3		304.0
*	Bt-59	- do -	145	C-F	1	Full Width	0.007	U1-1			0.223	P2-2	P4-8	P6-2		(inf)
*	Bt-62	Baguio-Itogon Rd	1042	D-FL	1	Full Width	0.007	U1-1	U1-2		0.122	P6-2	P8-2	P16-3		(inf)
*	Bt-63	Abatan-Mankayan Rd	588	PBr-A	2	Full Width	0.122	U6-3			1.396	P6-2	P15-1			39.6
*	Bt-68	- do -	588	CLV-D	3	Shoulder	0.015	U1-4	U3-1	U3-2 U4-1	0.068	P2-4	P2-5	P6-2	P16-3	(inf)
*	Bt-70	Kapangan-Acop Rd	127	D-FL	1	Full Width	0.014	U1-1			5.018	P1-3	P15-1	P19-1		15.0

Note * Evaluation of permanent measures against urgent measures or do-nothing
1) AADT : excluding tricycle & motorcycle
2) EIRR : (inf) = infinite because first year benefit exceeds cost

TABLE 15.2-7 SUMMARY OF ECONOMIC EVALUATION (BATANGAS)

	Spot No.	Road Name	1992 AADT 1)	Disaster Type	Disaster Pattern	Traffic Interruption	Urgent Restoration Measures				Permanent Restoration Measures					EIRR(%)
							Cost(Mp)	Type of Work			Cost(Mp)	Type of Work				2)
*	Bs-3	Matingain-Tabla Rd	508	E-F	3	One-lane	0.005	U1-4	U3-2		0.057	P1-3	P6-2	P16-3		(inf)
*	Bs-6	Calaca-Sinisian Rd	4128	PBr-D	5	Full Width	0.006	U5-1			0.354	P14-2	P16-1			578.9
*	Bs-8	Mabini-Saguing Rd	988	SW-D	3	Shoulder	0.001	U4-1	U4-3		0.008	P6-4				(inf)
*	Bs-12	Mabini-Solo Rd	169	FALL	1	Full Width	0.006	U1-1	U1-2		0.123	P8-2	P19-1			(inf)
*	Bs-14	- do -	169	FM-Rd	1	Full Width	0.004	U2-2	U7-1		0.070	P2-2 P16-3	P2-5 P18-1	P6-6	P6-9	(inf)
*	Bs-28	Batangas-Lobo Rd	1333	E-F	3	One-lane	0.011	U1-4	U3-2	U4-3	0.261	P1-3 P16-3	P2-4	P6-2	P6-9	(inf)
*	Bs-30	- do -	1333	FALL	1	Full Width	0.008	U1-1	U1-2		0.267	P1-1	P4-8	P8-2		(inf)
*	Bs-33	- do -	1333	PBr-A	2	Full Width	3.375	U6-2	U6-3		15.348	P6-9	P15-1	P17-2		29.2
*	Bs-36	Talisay-Canlubang Rd	122	C-F	1	Shoulder	0.004	U1-1			0.378	P1-1	P2-2	P4-6	P6-2	16.2
*	Bs-42	Laurel-Talisay Rd	398	CLV-D	3	Shoulder	0.001	U4-1			0.026	P2-4	P6-2	P16-3		(inf)
*	Bs-43	- do -	398	CLV-D	3	Shoulder	0.005	U1-4	U3-2		0.023	P6-2	P16-3			(inf)
*	Bs-45	Tubig-Agoncillo Rd	413	Rd-D	3	Shoulder	0.003	U1-4	U3-2		0.025	P6-2	P16-3			(inf)
*	Bs-48	Bugaan-Tubig Rd	103	PBr-D	5	Full Width	-				0.812	P6-10	P16-1	P16-2		45.9
*	Bs-50	Sn.Luis-Bato Rd	428	TBr-D	5	Full Width	0.173	U1-4	U4-2		0.180	P1-3	P6-9			89.8
*	Bs-51	- do -	428	SW-D	3	Shoulder	0.020	U1-4	U3-2	U4-3	0.773	P6-5				57.1
*	Bs-53	Bayabayin Rd	48	FM-Rd	4	Full Width	-				0.301	P1-3	P2-2	P2-4	P19-1	24.4
**	Bs-62	Pinagbayanan Rd	109	TBr-W	4	Full Width	0.503	U6-2	U6-3		-					(inf)
*	Bs-62	- do -	109	TBr-W	2	Full Width	0.204	U6-2	U6-3		1.074	P1-3 P19-1	P6-2	P15-1	P16-2	31.1
*	Bs-66	Lipa-Balete Rd	101	SPW-D	2	Full Width	0.126	U1-5	U4-2		0.267	P2-4	P6-6	P19-3		35.1

Note * Evaluation of permanent measures against urgent measures or do-nothing
** Evaluation of urgent measures against do-nothing
1) AADT : excluding tricycle & motorcycle
2) EIRR : (inf) = infinite because first year benefit exceeds cost

TABLE 15.2-8 SUMMARY OF ECONOMIC EVALUATION (LEYTE)

	Spot No.	Road Name	1992 AADT 1)	Disaster Type	Disaster Pattern	Traffic Interruption	Urgent Restoration Measures					Permanent Restoration Measures					EIRR(%)
							Cost(Mp)	Type of Work				Cost(Mp)	Type of Work				2)
**	L-4	Barugo-Bagacay Rd	78	TBr-W	4	Full Width	5.824	U1-4	U6-2	U6-3	U7-1	-					27.7
*	L-4	- do -	79	TBr-W	2	Full Width	2.616	U1-4	U6-2	U6-3	U7-1	12.892	P15-1				< 0.0
**	L-6	Babatogon-StaCruz Rd	35	TBr-W	4	Full Width	2.127	U1-4	U6-2	U6-3	U7-1	-					41.7
*	L-6	- do -	35	TBr-W	2	Full Width	0.963	U1-4	U6-2	U6-3	U7-1	4.788	P15-1				< 0.0
*	L-13	Palompon-Matagob Rd	204	CLV-D	3	One-lane	0.021	U1-4	U3-1	U3-2	U4-3	0.101	P2-1 P16-3	P2-4	P2-5	P6-2	(inf)
*	L-16	Ormoc-LakeDanao Rd	55	C-F	1	One-lane	0.003	U1-1				0.274	P8-2				22.6
*	L-19	Kananga-Milagros Rd	102	SPW-D	2	Full Width	0.296	U1-5	U4-2			0.530	P6-6	P19-3			15.5
*	L-21	Calubian Rd	164	FALL	1	One-lane	0.001	U1-1	U1-2			0.157	P1-1	P2-1	P6-2		249.9
*	L-23	SanIsidro-Tabango Rd	141	FM-Rd	1	Full Width	0.016	U2-2	U7-1			0.234	P2-2	P2-3	P2-4	P2-5	(inf)
*	L-26	Cabugcayan Rd	229	FM-Rd	1	Full Width	0.007	U4-1				0.800	P1-3 P18-1	P2-2	P2-4	P6-2	(inf)
*	L-38	Culaba-Kawayan Rd	132	TBr-A	3	Full Width	0.003	U1-4	U3-2			0.028	P6-2	P16-2			(inf)
*	L-38	- do -	132	D-FL	1	Full Width	0.006	U1-1				1.829	P1-3	P15-1	P19-1		78.7
*	L-45	Baybay-Liberacio Rd	409	E-F	3	One-lane	0.017	U1-4	U2-2	U3-2	U4-3	0.131	P1-3	P2-2	P4-2	P16-2	(inf)
*	L-47	- do -	409	L-SL	1	One-lane	0.001	U1-1	U2-2			0.131	P1-1 P4-2	P1-3 P16-2	P2-2	P3-2	(inf)
*	L-50	- do -	409	L-SL	1	One-lane	0.004	U1-1				0.168	P2-2	P3-2	P16-2		(inf)
*	L-65	Albuera-Burauen Rd	31	FALL	1	Full Width	0.002	U1-1	U1-2			0.462	P1-1	P2-2	P6-2		25.5
*	L-68	- do -	31	C-F	1	Full Width	0.001	U1-1	U1-2			0.197	P1-1	P2-2	P4-6	P6-2	68.9
*	L-76	Burauen-Lapaz Rd	107	PBr-A	4	Full Width	0.407	U6-3				2.935	P6-2	P15-1			(inf)
*	L-78	Mahagnao Rd	68	C-F	1	One-lane	0.003	U1-1				0.861	P4-8	P8-2			15.9
*	L-80	Abuyog-Nebga Rd	99	C-F	1	Shoulder	0.001	U1-1				0.177	P4-6				23.8
*	L-81	- do -	99	CLV-D	3	Shoulder	0.010	U3-1	U4-1			0.043	P1-3 P16-3	P2-5	P4-2	P6-2	2071.8
*	L-82	- do -	99	E-F	3	Shoulder	0.006	U2-2	U4-3			0.053	P2-1	P2-2	P2-4	P2-5	162.9
*	L-84	- do -	99	C-F	1	Full Width	0.003	U1-1				0.057	P1-1	P2-2	P4-2	P6-2	(inf)
*	L-87	- do -	99	C-F	1	Full Width	0.003	U1-1				0.169	P1-1 P6-2	P1-3	P2-2	P4-2	(inf)
*	L-90	Sto.Domingo Rd	54	SPW-D	2	Full Width	0.051	U1-5	U4-2			0.222	P2-4	P6-6	P16-2	P19-3	19.0

Note * Evaluation of permanent measures against urgent measures or do-nothing
** Evaluation of urgent measures against do-nothing
1) AADT : excluding tricycle & motorcycle
2) EIRR : (inf) = infinite because first year benefit exceeds cost

PART V
PROJECT IMPLEMENTATION

CHAPTER 16

DISASTER MANAGEMENT SYSTEM

16.1 ORGANIZATION FOR DISASTER MANAGEMENT

16.1.1 Overall Organization

Under direction and control of the National Disaster Coordinating Council (NDCC), all emergency operations are exercised by the all concerned Departments, local government units, as well as non-government organizations and private sectors. Overall organization for disaster management is shown in Figure 16.1-1.

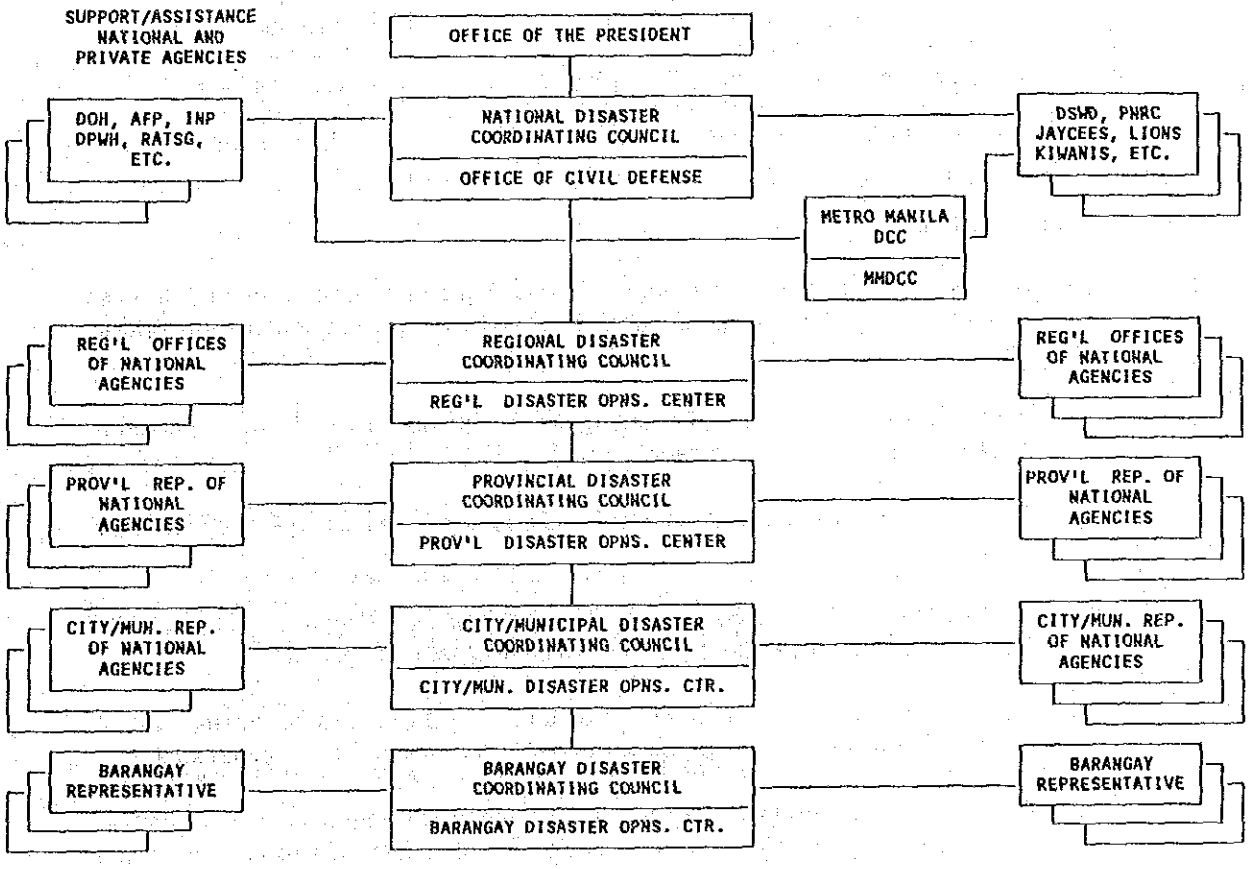


FIGURE 16.1-1 OVERALL ORGANIZATION FOR DISASTER MANAGEMENT

16.1.2 National Disaster Coordinating Council (NDCC)

Member of NDCC

Secretary,	Department of National Defense	- Chairman
Secretary,	Department of Public Works and Highways	- Member
Secretary,	Department of Transportation and Communications	- Member
Secretary,	Department of Social Welfare and Development	- Member
Secretary,	Department of Agriculture	- Member
Secretary,	Department of Education, Culture and Sports	- Member
Secretary,	Department of Finance	- Member
Secretary,	Department of Labor and Employment	- Member
Secretary,	Department of Trade and Industry	- Member
Secretary,	Department of Health	- Member
Secretary,	Department of Environment and Natural Resources	- Member
Secretary,	Department of Local Government	- Member
Secretary,	Department of Budget and Management	- Member
Secretary,	Department of Justice	- Member
Director,	Philippine Information Agency	- Member
Presidential Executive Secretary		- Member
Chief of Staff, Armed Forces of the Philippines		- Member
Secretary-General, Philippine National Red Cross		- Member
Administrator, Office of Civil Defense		- Member and Executive

Tasks of NDCC

- Advises the President on the status of disaster preparedness programs, disaster operations and rehabilitation efforts undertaken by the government and the private sector;
- Establishes policy guidelines on emergency preparedness and disaster operations involving rescue, relief and rehabilitation;
- Establishes priorities in the allocation of funds, services, disaster equipment and relief supplies;
- Advises the lower-level Disaster Coordinating Councils through the Office of Civil Defense in accordance with the guidelines on disaster management;
- Recommends to the President the declaration of a state of calamity in areas extensively damage; and submits proposals to restore normalcy in the affected areas;
- Creates an Action Group composed of permanent representatives from the member-departments and other government agencies with the Executive Officer as head; and
- Utilizes the facilities and services of the Office of Civil Defense in Camp Aguinaldo, Quezon City, in discharging its functions.

16.2 DPWH STANDARD OPERATION PROCEDURE

16.2.1 DPWH Disaster Coordinating Body

The Department of Public Works and Highways (DPWH) organizes the Disaster Coordinating Body at the Central Office as well as field offices from Regional down to District/City levels. Standard organization of the Disaster Coordination Body is shown in Figure 16.2-1.

Major tasks of DPWH in the overall context of disaster operation are as follows:

- Restores destroyed public works such as flood control, water works, roads, bridges, and other vertical and horizontal facilities/structures;
- Provides heavy and light equipment for rescue and recovery operations;
- Makes available existing communications facilities for disaster operations;
- Assists in providing transportation facilities to transport relief supplies, personnel and disaster victims;
- Provides warning to the public on impending releases of water from dams under its control; and
- Organizes reaction teams in the department proper as well as in all bureaus and offices under it.

Functions of the staff and teams in the Disaster Coordinating Body are as follows:

Administrative Staff

- Provide the administrative supports (personnel acquisition, clerical, reporting, recording, financials, etc.) and supplies including equipment.

Communication Staff

- Provide networks in telephone, telegram, radio system, courier and postal service for DPWH Disaster Preparedness and Control Units, and DPWH assistance to other Government Agencies and Disaster Coordinating Council.

Transportation Staff

- Provide transport assistance to DPWH Units and Councils/Agencies that need assistance.

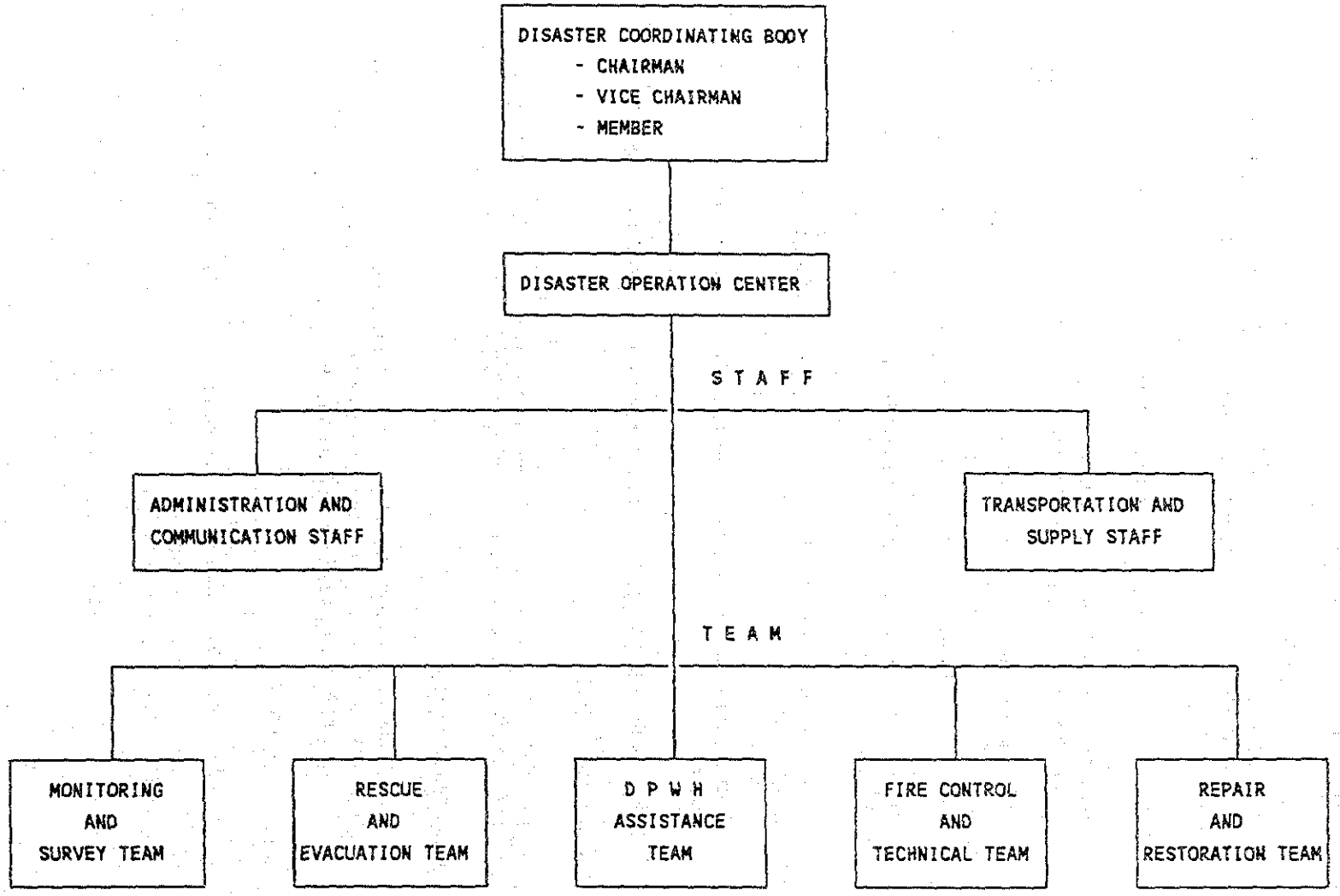


FIGURE 16.2-1 STANDARD DPWH DISASTER COORDINATING BODY

Monitoring and Survey Team

- Monitors impending disasters, and at the first sign of disaster, sound alarm to activate appropriate Teams.
- Surveys damages to infrastructure and transmit relevant reports to DPWH Manila within 24 hours.
- Monitors all emergency and post emergency activities of various Teams, particularly the Repair and Restoration Team, and prepare/submit corresponding reports.

Rescue and Evacuation Team

When requested during emergencies by appropriate agencies thru the DPWH Coordination Body, shall assist in the:

- Rescue operations in locating injured or trapped persons and moving them to places where they can be cared for.
- Evacuation operations by providing available personnel and equipment to expedite controlled movement of evacuees.

DPWH Assistance Team

When requested thru the DPWH Coordinating Body by appropriate agencies during emergencies, shall assist in the:

- Dismantling/demolitions of obstructions to rescue operations specially related to the fire and earthquakes.
- Relief operations of Red Cross/Social Services by providing vehicles and personnel.
- Salvage and Recovery Operations in coordination with other agencies by providing vehicles and personnel.

Fire Control and Technical Team

- Controls fire in office building or assist in controlling fire in adjoining buildings.
- Controls and maintain operation of essential utilities such as water and power supply. Also provides cooperation to technical experts in disarming explosive devices, minimizing the effects of both natural and man-made disasters through physical, chemical, biological and radiological counter or preventive measures.

Restoration and Repair Team

- Repairs and restore damaged roads, bridges and other public infrastructure within the area of jurisdiction.

16.2.2 DPWH Standard Operation Procedure

Standard operation procedure before, during and after the calamity is summarized in Table 16.2-1.

At the first sign or warning of typhoon or other calamity, the Operation Centers at the Central and respective field office are activated and placed on 24 hours operation by three (3) shifts until after the calamity.

DPWH Field Offices in the calamity stricken areas shall undertake the following:

Before Typhoon or Any Other Calamity

1) Road sections prone to damages caused by calamities are identified.

2) Permanent inspectors who are capable of assessing damages and estimating with a high degree of accuracy the cost of restoration work are assigned to identified disaster prone road sections.

3) At the warning or indication of an impending typhoon or calamity, the designated inspectors proceed to their assigned section.

4) Undertake preparatory work to mitigate effects of calamity.

During Typhoon or Any Other Calamity

1) Undertake emergency work

2) Prepare situational reports and submit them to District/City Engineer, Regional Director and the Secretary by the fastest means of communication. The situational report shall include the following:

- Type/nature, location and extent of damage
- Where traffic is disrupted, possible detour routes
- What restoration activities are being done
- Estimated date for opening to traffic
- Rough estimate of costs of restoration
- Request and nature of assistance if warranted

3) Provide relief and information to the public.

4) Request DPWH Central Office for disaster-related assistance.

5) Implement orders, directives and instructions from DPWH Central Office.

TABLE 16.2-1 STANDARD PROCEDURE BEFORE, DURING AND AFTER CALAMITY

	DPWH Central Office Operation Center for Disaster	DPWH Regional/District/City Offices Operation Center for Disaster
Before typhoon or other calamity	· Team Leader assembles the Team for a pre-disaster conference and strategy. · Alert thru telex Regional Directors and advise them to activate Operation Center and Disaster Crews.	· Identify road disaster-prone sections and assign permanent inspectors to these sections. · Activate Operation Center and Disaster Crews. · Designated inspectors proceed to assigned sections. · Undertake preparatory work to mitigate effects. · Anticipate relief action needed and information to Central Office.
During typhoon or other calamity	· Receive situational reports from field offices. · Receive request for disaster-related assistance from NDCC or other government agencies including DPWH field offices. · Transmit orders, directives, instructions of National Disaster Coordinating Body of DPWH to field Disaster Coordinating Bodies. · Coordinate with Public Affairs Office for dissemination of relevant disaster related information to Media. · Prepare memorandum for the Secretary 2 or 3 times during the 24-hour period to appraise him of the situational reports.	· Undertake emergency work. · Provide relief and information to the public. · Prepare situational reports. · Request DPWH Central Office Operation Center for disaster-related assistance. · Implement orders, directives, instructions from DPWH Central Office Operation Center.
After typhoon or other calamity	· Consolidates the Initial Damage Assessment Report and submit to the Secretary. Upon approval by the Secretary, Quick Response Fund is released. · Within 2 weeks consolidates the Final Detailed Report and submit to the National Disaster Coordinating Council. · Request of release of Calamity Fund is submitted to the President for approval thru National Disaster Coordinating Council.	· Within 24-hours, undertake an initial damage assessment of at least Priority I group and report them to District Engineer. · Within 48-hours, District Engineer transmit the initial report to the Secretary thru BOM covering at least Priority I Group. · Within 5 days, the District Engineer submits to the Regional Director the Final Detailed Report on the damages for all 3 Priority groups including realistic cost estimates. · Within 2 days after receipt of the District Reports, the Regional Director reviews and validates the damages covered by the Final Report and submits the summarized reports to the Secretary thru BOM.

After Typhoon or Any Other Calamity

1) Immediately assess the damages. Damages shall be categorized into three (3) priority groups as follows:

   Priority I: Involves immediate rehabilitation of collapsed bridges, cut road sections, breached seawalls and dikes to quickly restore mobility and ensure safety of the affected areas.

   Priority II: Involves ordinary repair works such as patching potholes and resurfacing of washed-out roads and slightly destroyed flood control.

   Priority III: Involves minor repair work and/or improvement to prevent further deterioration such as repair of road section.

2) Within 24 hours, the initial assessment report covering at least Priority I group of damages is prepared and submitted to District/City Engineers.

3) Within 48 hours, the District/City Engineer transmits the initial assessment report to the Secretary of DPWH thru the Bureau of Maintenance by the fastest means of communication.

4) Within 5 days, the District/City Engineer submits to the Regional Director the final detailed report on the damages covering all three (3) Priority groups with pictures and the realistic cost estimates for the restoration of the damaged facilities.

5) Within 2 days after receipt of the District/City Engineer's report, the Regional Director reviews and validates the damages reported and submits the summarized report to the Secretary of DPWH thru the Bureau of Maintenance.

The Central Office of DPWH undertakes the following:

1) Consolidates the initial assessment report and submit it to the Secretary. Upon approval of the report by the Secretary, Quick Response Fund is released.

2) Within 2 weeks after receipt, consolidates the final detailed report and submit it to the Secretary of DPWH and the National Disaster Coordinating Council.

3) Prepare a letter requesting release of Calamity Fund and submit it to the President for approval thru the National Disaster Coordinating Council.

16.3 CALAMITY FUND

Calamity Fund is appropriated by the General Appropriations Fund and is utilized for the following purposes:

- For maintenance and other operating expenses, particularly for aid, relief and rehabilitation services to people/areas affected by calamity.

- For capital outlays to repair, restore and reconstruct damaged structures.

Fund will be directly appropriated to implementing agencies in accordance with the recommendation of the National Disaster Coordinating Committee upon approval of the President.

To effect timely and expeditious response for the immediate repair/restoration of calamity damaged infrastructure facilities, "Quick Response Fund" which represents twenty percent (20%) of capital outlay is authorized under Calamity Fund and is immediately released to DPWH.

Guidelines for releasing, utilizing and monitoring Quick Response Fund are prescribed as follows:

1) Priority in the release of the Quick Response Fund is for the emergency repair/restoration of critically damaged infrastructure facilities to restore mobility and ensure safety in the affected areas, such as:

   - Cut or closed road section
   - Collapsed bridges and washout-out approaches
   - Breached river control and shore protection
   - Unroofed school buildings and other public buildings

2) The District/City Engineers shall submit thru the Regional Director and the Director of Bureau of Maintenance to the Secretary, the calamity damaged report within two (2) days after the occurence of the calamity which should incorporate the following:

   - Brief description and location
   - Extent of damage
   - Pictures
   - Programs of work with detailed estimate

3) The Regional Director shall review and validate the damage reports and submit to the Secretary his recommendation within two (2) days after receipt of the reports from the District/City Engineers which will be the basis in the release of Quick Response Fund.

4) The Regional Director and District/City Engineers shall be held responsible for the integrity, validity and accuracy of the reports.

5) The District/City Engineers shall submit thru the Regional Director and then the Director of Bureau of Maintenance to the Secretary, the monthly accomplishment report including statements on utilization of the "Quick Response Fund" until completion of the projects.

6) The Director of Bureau of Maintenance shall compile and collate all monthly progress reports for submittal by the Secretary to the National Disaster Coordinating Council.

CHAPTER 17

IMPLEMENTATION PROGRAM FOR RURAL ROAD RESTORATION PROJECT

17.1 FORMATION OF THE PROJECT

17.1.1 Needs of the Project

1) Government Policy on Highway Sector Development

The government's policies and strategies for highway sector development are as follows:

Priority shall be given to the rehabilitation and restoration of existing facilities to prolong their useful lives, reduce transport operating costs, minimize public inconvenience, and postpone huge investment for their major rehabilitation or replacement. New infrastructure projects shall therefore be selectively undertaken, mainly where they are needed to eliminate the critical bottlenecks that hinder the programmed expansion of production and the provision of basic human needs.

2) Present Status of Rural Road Restoration

Maintenance fund / calamity fund are appropriated for restoration of damaged infrastructure. However, due to lack of the fund, the following problems are often observed:

- Only stopgap measure is taken resulting in repeated occurrence of the same disaster at the same location, as often seen in case of slope failure or debris flow.
- Damaged portion is left unrestored keeping the road section closed to traffic, as seen in washed-out bridge approach.
- Progressive defects in road facilities are left without taking any measure through serious damage is predicted in near future, as seen in bridge foundation being scoured.

3) Proposal of the Project

The rural road restoration project is proposed as a foreign- assisted project with the object of restoring the damaged facilities that are left behind without having been covered by maintenance fund/calamity fund, and reviving the entire road section in which the damage is situated. Thus, the project is just in line with the government policy on highway sector.

17.1.2 Implementation Strategy

1) Type of Loan

The project is composed of many small-scale subprojects. Number and priority of subprojects may vary from time to time depending on natural condition. In order to implement subprojects timely, investment funds shall be flexibly utilized. Therefore, the application of ordinary type of loan may not be practical. Instead, introduction of program type of loan is recommended.

The program type of loan is outlined as follows:

- The program type of loan is a form of assistance for the capital investment needs in a sector in the light of its development perspective, and involves financing of a group of subprojects with the same nature which are consistent with the sector development plan.
- Total amount of loan is determined based on overall implementation program, preferably including a list of candidate subprojects with their preliminary evaluations.
- The selection, formulation and appraisal of subprojects are generally the responsibility of the executing agency. The criteria for the selection and appraisal of subprojects should, however, be specified in advance and mutually agreed upon between the lending institution and the executing agency. The degree of involvement of the lending institution in the selection and appraisal of subprojects may depend upon the maturity and capability of the executing agency.

2) Generation of More Productive Employment

To promote widespread employment, a labor-intensive/equipment supported construction method will be adopted to the fullest extent feasible.

3) Participation of Local Government Units and Rural Communities

In line with the government policy of decentralization, local government units shall be actively participated in the project implementation. Likewise, opportunities of rural communities participation shall be provided as much as practical.

17.2 FRAMEWORK OF THE PROJECT

The project is proposed to be implemented under the following framework:

1) Eligible Roads

Roads to be covered by the project are:

- National secondary road
- Provincial road
- Barangay road

2) Provinces to be covered

40 provinces which were ranked high disaster potential in Chapter 3 are selected as priority provinces to be covered by the project. They are as follows:

CAR	:	Abra, Benguet, Mountain Province, Ifugao, Kalinga-Apayao
Region I	:	Ilocos Norte, Ilocos Sur, La Union, Pangasinan
Region II	:	Batanes, Cagayan, Isabela, Nueva Vizcaya, Quirino
Region III	:	Bataan, Bulacan, Nueva Ecija, Pampanga, Tarlac, Zambales
Region IV	:	Aurora, Batangas, Cavite, Laguna, Marinduque, Occidental Mindoro, Oriental Mindoro, Quezon, Rizal
Region V	:	Albay, Camarines Norte, Camarines Sur, Catanduanes, Sorsogon
Region VIII	:	Leyte, Southern Leyte, Eastern Samar, Northern Samar, Samar
Region XI	:	Surigao del Sur

3) Criteria for Subproject Selection

1. State of Restoration

Any of the following:

- Damage being left unrestored keeping the road section closed to traffic
- Progressive defect in danger of causing serious damage in future even though presently no interference to traffic

- Damage for which only stopgap measure is being taken, needing permanent measure for preventing its recurrence

2. Traffic Demand

Traffic demand shall be more than 100 vehicles per day.

3. Project Scale

Estimated cost shall be more than about 0.5 million pesos, except for the projects to prevent future serious damage, which are eligible irrespectively of cost.

17.3 FUND REQUIREMENT

17.3.1 Proposed Subprojects in Pilot Provinces

In accordance with the selection criteria mentioned above, 19 subprojects were selected in the three pilot provinces as shown in Table 17.3-1. Their total estimated cost is P60 million.

TABLE 17.3-1 SELECTED SUBPROJECTS IN THE PILOT PROVINCES

Province	Spot No.	Disaster Type	1) State of Restoration	Estimated Cost of 2) Restoration (MP)			
				Foreign Component	Local Component	Tax	Total
Benguet	Bt- 2	Rd-D	A	5.391	4.390	1.476	11.257
	Bt-11	L-SL	C	0.261	0.165	0.066	0.492
	Bt-27	PBr-W	A	2.013	1.513	0.509	4.035
	Bt-63	PBr-A	C	0.691	0.525	0.180	1.396
	Bt-70	D-FL	C	2.705	1.610	0.703	5.018
	Province Total			11.061	8.203	2.934	22.198
Batangas	Bs- 5	PBr-D	B	0.240	0.168	0.064	0.472
	Bs- 6	PBr-D	B	0.178	0.126	0.050	0.354
	Bs- 7	PBr-D	B	0.450	0.315	0.120	0.885
	Bs-33	PBr-A	A	7.679	5.697	1.972	15.348
	Bs-47	PBr-D	B	0.619	0.169	0.094	0.882
	Bs-48	PBr-D	B	0.570	0.156	0.086	0.812
	Bs-50	TBr-D	B	0.085	0.071	0.024	0.180
	Bs-51	SW-D	C	0.406	0.253	0.114	0.773
	Bs-62	TBr-W	B	0.505	0.426	0.123	1.054
	Province Total			10.732	7.381	2.624	20.760
Leyte	L-39	D-FL	C	0.931	0.654	0.244	1.829
	L-56	TBr-W	A	3.355	2.522	0.847	6.724
	L-63	TBr-W	A	1.006	0.756	0.255	2.017
	L-74	TBr-W	A	1.845	1.387	0.466	3.698
	L-76	PBr-A	A	1.470	1.091	0.374	2.935
	Province Total			8.607	6.410	2.186	17.203

Note: 1) State of Restoration:
A: left unrestored keeping road closed
B: in danger of serious damage in future
C: only stopgap measures being taken
2) Estimated Cost:
at 1991 price level

17.3.2 Fund Requirement for the Whole Project

In Chapter 3, provinces were classified with regard to disaster potential and likely type of disaster. Assuming that fund requirements in the provinces belonging to the same group are in proportion to the total length of roads, the fund requirement for the whole project covering 40 provinces was roughly estimated arriving at P577 million as shown in Table 17.3-2.

TABLE 17.3-2 ESTIMATE OF TOTAL PROJECT COST

(at 1991 Price level)

Province Group	Province	Total Length of Road (Km)	Construction Cost (MP)			
			Foreign Component	Local Component	Tax	Total
H - M (High Disaster Potential, Mountainous)	(CAR) Benguet	1757.2	11.061	8.203	2.934	22.198
	(CAR) Ifugao	983.2	6.185	4.595	1.640	12.420
	(CAR) Abra	2220.6	13.970	10.379	3.703	28.052
	(CAR) Mountain Province	799.1	5.027	3.735	1.333	10.095
	(2) Nueva Vizcaya	2403.0	15.117	11.232	4.007	30.356
	(4) Aurora	630.7	3.969	2.949	1.051	7.969
	(5) Catanduanes	788.0	4.961	3.686	1.314	9.961
	(CAR) Kalinga-Apayao	1326.3	8.344	6.199	2.212	16.755
	(2) Quirino	672.6	4.232	3.144	1.121	8.497
	Sub-Total	11580.7	72.866	54.122	19.315	146.303
H - MF (High Disaster Potential, Mountainous and Flat Combined)	(3) Zambales	1292.9	3.757	2.587	0.922	7.266
	(8) Southern Leyte	1358.8	3.971	2.735	0.975	7.681
	(8) Samar	753.9	2.254	1.552	0.554	4.360
	(1) Ilocos Sur	2812.2	8.264	5.691	2.030	15.985
	(1) Ilocos Norte	3071.7	9.016	6.208	2.214	17.438
	(4) Rizal	1237.2	3.515	2.612	0.931	7.058
	(5) Albay	1637.6	4.830	3.326	1.186	9.342
	(4) Marinduque	665.1	1.932	1.330	0.475	3.737
	(4) Oriental Mindoro	1320.4	3.864	2.661	0.949	7.474
	(2) Cagayan	3456.8	10.196	7.021	2.505	19.722
	(2) Isabela	3751.0	11.055	7.612	2.716	21.383
	(8) Northern Samar	940.6	2.791	1.922	0.685	5.398
	(8) Eastern Samar	1613.3	4.722	3.252	1.160	9.134
	(4) Batangas	3653.6	10.732	7.381	2.647	20.760
	Sub-Total	27555.1	80.899	55.890	19.949	156.738
H - F (High Disaster Potential, Flat)	(5) Camarines Norte	726.7	1.634	1.219	0.416	3.269
	(4) Occidental Mindoro	1606.5	3.613	2.695	0.917	7.225
	(4) Quezon	2113.5	4.817	3.593	1.224	9.634
	(5) Camarines Sur	3429.5	7.741	5.775	1.967	15.483
	(8) Leyte	3804.7	8.607	6.410	2.186	17.203
	(1) La Union	1228.4	2.752	2.053	0.700	5.505
	(3) Bulacan	2544.6	5.763	4.299	1.464	11.526
	(11) Surigao del Sur	1517.4	3.441	2.567	0.873	6.881
	(4) Laguna	1470.3	3.355	2.368	0.986	6.709
	(3) Bataan	1074.7	2.408	1.797	0.612	4.817
	(3) Nueva Ecija	3228.3	7.311	5.454	1.858	14.623
	(4) Cavite	1608.3	3.613	2.695	0.917	7.225
	(3) Tarlac	2556.2	5.763	4.299	1.464	11.526
	(5) Sorsogon	1025.4	2.322	1.733	0.590	4.645
	(1) Pangasinan	5063.7	11.440	8.534	2.906	22.880
	(2) Batanes	277.2	0.602	0.449	0.153	1.204
	(3) Pampanga	2379.8	5.419	3.826	1.593	10.838
	Sub-Total	35655.2	80.601	59.766	20.826	161.193
Total Construction Cost			234.366	169.778	60.090	464.234
Contingency (10%)			23.437	16.978	6.009	46.424
Cost for Consulting Services (13%)			33.514	24.278	8.593	66.385
Total Project Cost			291.317	211.034	74.692	577.043

17.4 IMPLEMENTATION PROCEDURE

The project will be implemented in several distinct stages, as shown in Table 17.4-1.

1) Project Preparation

This stage includes the following:

- Formulation of the implementation program based on this Study.
- Inclusion of the project in the DPWH Infrastructure Program and the approval of the project by the Investment Coordination Committee (ICC).
- Loan arrangement including application, negotiation and agreement.

The Project Management Office-Feasibility Studies (PMO-FS) of the Department of Public Works and Highways (DPWH) will be in charge of the project preparation.

2) Subproject Selection

- Identification of Subprojects

  Subprojects will be initially identified by the Barangay Development Council, then assessed/reviewed successively by the Municipal Development Council, the Provincial Development Council and the Regional Development Council and finally integrated/consolidated in the regional proposal.

- Evaluation of Subprojects

  The proposed subprojects will be reviewed/evaluated/prioritized in the DPWH Cental Office.

- Selection of Subprojects

  The priority subprojects will be selected and included in the project.

The PMO-FS will take charge of evaluation and selection of subprojects. Consulting services may be required for assisting it.

3) Detailed Engineering Design

Detailed engineering design includes:

- Engineering survey
- Preparation of plans, specifications and tender documents
- Cost estimate

Detailed engineering design will be carried out by a Project Management Office (PMO), hiring consultants to prepare the design. The PMO to take charge will depends on the lending institution and capacity of the PMO.

4) Tendering

Tendering activities including prequalification of contractors, tender evaluation and award of contract will be conducted by the Prequalification, Bids and Award Committee (PBAC) in cooperation with the PMO in charge.

5) Construction

Construction supervision will be conducted by DPWH Regional Office, District Office or Local Government depending on size of subproject and class of road. The PMO in charge will be responsible for coordination, monitoring and communication with the lending institution.

TABLE 17.4-1 IMPLEMENTATION PROCEDURE AND AGENCIES IN CHARGE

Procedure	Program Level		Project Level		
	Project Preparation	Subproject Selection	Detailed Engineering Design	Tendering	Construction
Major Works	· Formulation of Implementation Program · Inclusion in DPWH Infrastructure Program · Loan Arrangement	· Identification of Subprojects · Evaluation of Subprojects · Selection of Subprojects	· Engineering Survey · Preparation of Plans/Specifications/Tender Documents · Cost Estimate	· Prequalification of Contractors · Tender Evaluation · Award of Contract	· Control of Construction Schedule, Quantity and Quality · Monitoring of Construction Progress
Executing Agency	· DPWH PMO-FS	· DPWH PMO-FS	· DPWH PMO	· DPWH PBAC · DPWH PMO	· DPWH PMO (Coordination) · DPWH Regional/ District Office (Construction Supervision) · Local Government (Construction Supervision)
Coordinating/Negotiating Agency	· ICC · Lending Institution	· Local Development Council [1)] · Regional Development Council · Lending Institution		· Lending Institution	· Lending Institution
Professional Group		· Consultants	· Consultants	· Consultants · Contractors	· Consultants · Contractors

Note: 1) General term for Barangay Development Council, Municipal Development Council and Provincial Development Council

17.5 IMPLEMENTATION SCHEDULE

The project is, because of its urgency and feasibility, recommended to be implemented in the earliest possible timing. The assumed implementation schedule and annual fund requirement are presented in Table 17.5-1.

TABLE 17.5-1 IMPLEMENTATION SCHEDULE AND ANNUAL FUND REQUIREMENT

			1992	1993	1994	1995	Total
Project Preparation							
Subproject Selection							
Detailed Engineering Design							
Tendering							
Construction							
Annual 1) Fund Requirement	Cost for Consulting Services 2)	Foreign		11.2	13.1	9.2	33.5
		Local		8.1	9.5	6.7	24.3
		Tax		2.9	3.4	2.3	8.6
		Total		22.2	26.0	18.2	66.4
	Construction Cost including Contingency	Foreign			103.4	154.4	257.8
		Local			74.8	111.9	186.7
		Tax			26.5	39.6	66.1
		Total			204.7	305.9	510.6
	Total	Foreign		11.2	116.5	163.6	291.3
		Local		8.1	84.3	118.6	211.0
		Tax		2.9	29.9	41.9	74.7
		Total		22.2	230.7	324.1	577.0

1) in Million pesos at 1991 price level

2) cost for consulting services are estimated as follows:

For subproject selection	:	1% of construction cost
For detailed engineering design	:	5% "
For tendering	:	1% "
For construction supervision	:	6% "

CHAPTER 18

RECOMMENDATIONS FOR FACILITATING RESTORATION WORKS

As previously mentioned, rural roads in the Philippines are situated in the severe natural environment such as mountainous topography, fragile geology, heavy rain, etc., and often hit by natural calamities like typhoons, earthquakes and volcanic eruptions, causing frequent occurrence of road disaster. Road restoration works are however not carried out quickly and properly. One of the problems hindering the proper execution of restoration works is difficulty in procurement of pertinent materials. To get out of such situation and facilitate restoration works, two projects are proposed in this chapter, which are:

- Establishment of gabion factories
- Stockpile of portable bridges for emergency use.

18.1 ESTABLISHMENT OF GABION FACTORIES

18.1.1 Needs of Establishment of Gabion Factories

1) Characteristics of Gabion

Gabions are composed of diamond patterned net made of zinc coated low carbon steel wire and stones or rocks filled therein. Gabions are classified into three types according to shape as shown in Table 18.1-1.

Gabions have the following advantages:

- Flexibility

  Due to their flexibility, gabions fit irregular site geometry and follow the deformation of ground to a certain extent without any damage unlike other solid structures.

- Permeability

  Gabions are excellently permeable and thus advantageous to drainage behind the structure.

- Constructability

  Gabion work is so easy that a satisfactory work can be expected without difficult quality control. Furthermore, gabion work does not need formwork and cure enabling construction period to be shortened.

- Low Cost

  Gabion work costs about P1,400 per m^3 at 1991 price level, while the cost of class A concrete is about P2,900 per m^3. Thus, gabion work is economical.

2) Usage of Gabion

Due to their advantages, gabions were often adopted in the preliminary design for the selected disaster spots as described in Chapter 14. Table 18.1-2 shows the number of disaster spots where gabion was proposed. Out of 62 selected spots, gabions were adopted at 27 spots.

The usage of gabion is summarized as follows:

- Gabions are widely applicable to restoration work as main material for retaining wall, foot protection, catch work, slope breasting, sabo dam, consolidation, spurdike, etc.

- Gabions are usable to restoration work for almost all types of disaster.

TABLE 18.1-1 TYPE OF GABION

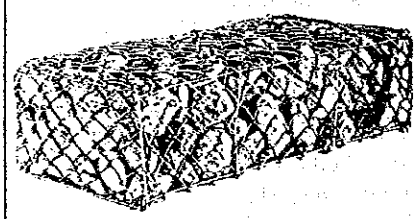
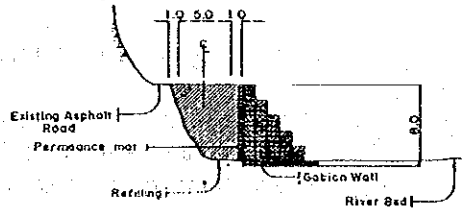
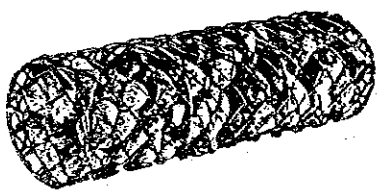
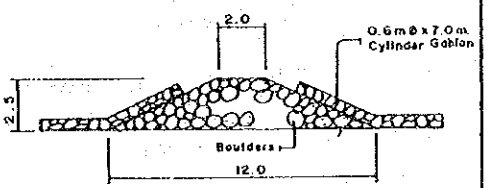
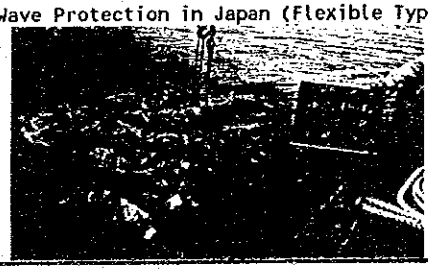
Type of Gabion	S h a p e	Application Example
Rectangular Gabion (Mat Gabion)		Retaining Wall in Benguet Bt-2 
Cylindrical Gabion		Spurdike in Batangas Bs-33 
Deformed Gabion	Diagonal, Triangle, Oval, Waving, Flexible, etc.	Wave Protection in Japan (Flexible Type) 

TABLE 18.1-2 NUMBER OF SPOTS WHERE GABION IS PROPOSED FOR RESTORATION

		Type of Restoration Measure					No. of spots where gabion is adopted	No. of selected spots for F/S
		U4/P6 Retaining Wall	U5/P16 Foot Protection	P8 Catch Work	P14 Consolidation	P17 Spur-dike		
Type of Disaster	C-F	1	-	2	-	-	3	12
	E-F	2	2	-	-	-	4	9
	FALL	-	-	2	-	-	2	5
	L-SL	1	2	-	-	-	3	3
	D-FL	-	-	3	-	-	3	5
	Rd-D	1	-	-	-	-	1	2
	FM-Rd	1	-	-	-	-	1	4
	PBr-W	-	-	-	-	-	0	0
	PBr-A	1	-	-	-	1	1	4
	PBr-D	-	2	-	1	-	2	2
	TBr-W	-	1	-	-	-	1	3
	TBr-A	-	1	-	-	-	1	1
	TBr-D	2	-	-	-	-	1	1
	SPW-D	3	-	-	-	-	3	3
	CLV-D	1	-	-	-	-	1	6
	SW-D	-	-	-	-	-	0	2
Total		13	8	7	1	1	27	62

3) Demand and Supply of Gabion

Table 18.1-3 shows the total quantity of gabion estimated in the preliminary design for the 62 disaster spots.

TABLE 18.1-3 QUANTITY OF GABION IN THE DESIGN OF THE SELECTED SPOTS

Unit: m^3

	Benguet	Batangas	Leyte	Total
Rectangular Gabion	8,065	1,723	992	10,780
Cylindrical Gabion	0	1,040	0	1,040
Total	8,065	2,763	992	11,820

Based on the above figures, the demand of gabion for rural road restoration in the whole Philippines was roughly estimated as shown in Table 18.1-4.

Gabions are in great demand: about 400,000 m^3 in a year for rural road restoration alone in the whole country.

TABLE 18.1-4 ESTIMATED DEMAND OF GABION FOR RURAL ROAD RESTORATION

Region	Volume of Gabions (m^3)
CAR	130,000
I	25,000
II	79,000
III	17,000
IV	44,000
V	26,000
VI	10,000
VII	12,000
VIII	19,000
IX	4,000
X	19,000
XI	10,000
XII	5,000
Total	400,000

On the other hand, the gabion supplying capacity in the Philippines is very low.

In view of the above, some political measures for increase of gabion supplying capacity are recommended to be taken.

18.1.2 Implementation Plan

1) Outline of the Project

As the initial step to promote the spread of use of gabions and the development of gabion industry, it is proposed that gabion factories are established by the government and operated and maintained under the Regional Offices of DPWH. Wire net for gabion will be stored and used for construction/restoration projects, directly in case of projects by administration and as government supply material in case of projects by contract.

2) Disposition Plan and Cost Estimate

Based on the estimated demand shown in Table 18.1-4, the disposition plan of the factories is proposed and the project cost is estimated as shown in Table 18.1-5.

TABLE 18.1-5 DISPOSITION PLAN OF FACTORIES AND ESTIMATE OF PROJECT COST

Region to be covered	No. of Factories	No. of Machines	Cost including factory building, machine, and its installation (Million Pesos)
CAR	1	1	16
I/III	1	1	16
II	1	1	16
IV	1	1	16
V/VIII	1	1	16
VI/VII/IX	1	1	16
X/XI/XII	1	1	16
T o t a l	7	7	112

18.2 STOCKPILE OF PORTABLE BRIDGES FOR EMERGENCY USE

18.2.1 Needs of Stockpile of Portable Bridges

The Philippines has 6,928 bridges with a total length of 235,520 linear meters along the national roads as of 1988, consisting of 181,580 linear meters of permanent bridges and 53,940 linear meters of temporary bridges, as shown in Table 18.2-1. Permanent bridges are made of concrete, steel and similar materials, while temporary bridges are made of bailey, timber, coconut and similar materials. In general, temporary bridges are weak and in danger of collapse or washout.

In the three pilot provinces, bridge or its approach washout was observed at the following number of spots as of November 1990:

• permanent bridge washout	:	1
• permanent bridge approach washout	:	4
• temporary bridge washout	:	15
• temporary bridge approach washout	:	3
total	:	23

Estimating from the fact that the existing bridges in the three Pilot provinces are about 7% of the total bridges in the Philippines, hundreds of bridges will have been damaged in the whole country.

Those spots that are closed due to bridge washout are in urgent need of being opened to traffic by constructing a temporary bridge. For this purpose, such bridges as are disintegrated into pieces, transported and assembled at site, like bailey bridges, are suitable but there is no stockpile of bailey bridge for emergency use.

The project for procurement and stockpile of portable bridges for emergency use is proposed to cope with the above situation.

18.2.2 Implementation Plan

1) Outline of the Project

The project is to procure and stockpile bridge components for emergency use and to organize working crews with complete set of equipment. The priciples of the project are as follows:

- The bridge components shall be used only for emergency and temporary replacement of bridges damaged by natural calamities.

- Temporary bridges constructed with the bridge components shall be removed immediately after the completion of permanent bridges, since the components are designed only for temporary use, not for permanent use.

- The bridge components shall be properly stored in the designated places (depots) and maintained to be always ready for emergency use.

- The working crew shall be well trained to be skilled in emergency construction of temporary bridges with the bridge components using tools and equipment kept in the depots.

2) Type of Bridge

The requirements of the portable bridges to be constructed quickly are as follows:

- The bridge components shall include parts for substructure as well as for superstructure.

- Number of components shall be as few as possible.

- The components shall be easily transported and assembled only by the tools and equipment kept in the depot.

- The bridge shall be easily diasssembled.

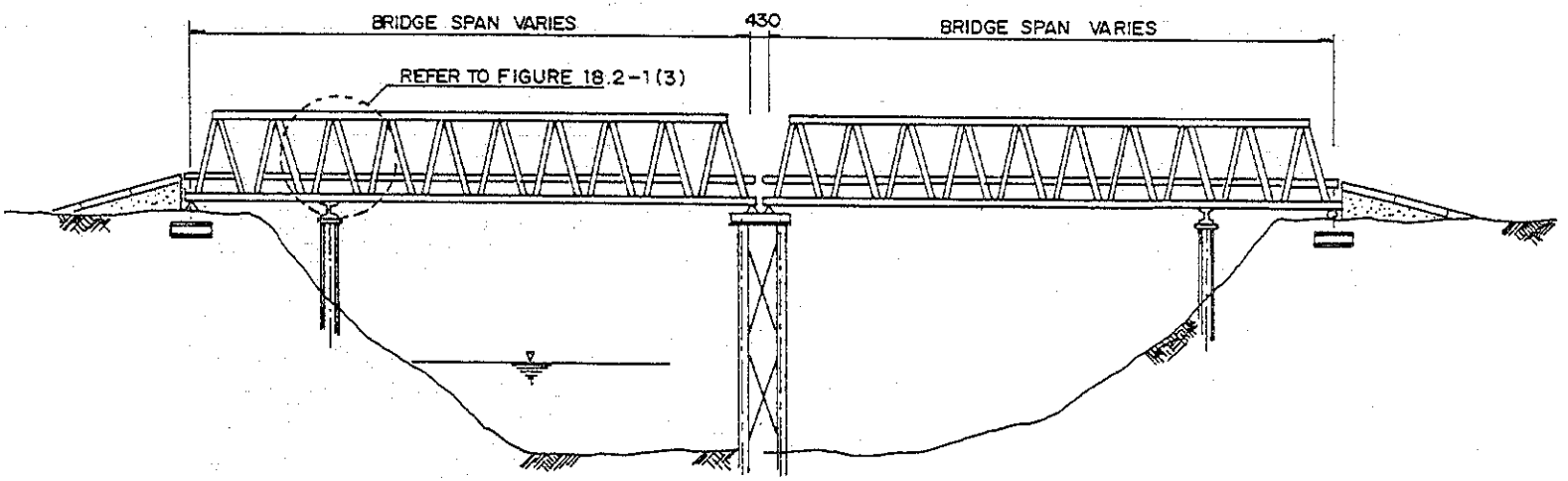
- The components shall be structurally sound to withstand repeated use.

- The bridge shall be capable of supporting more than 10 ton loads.

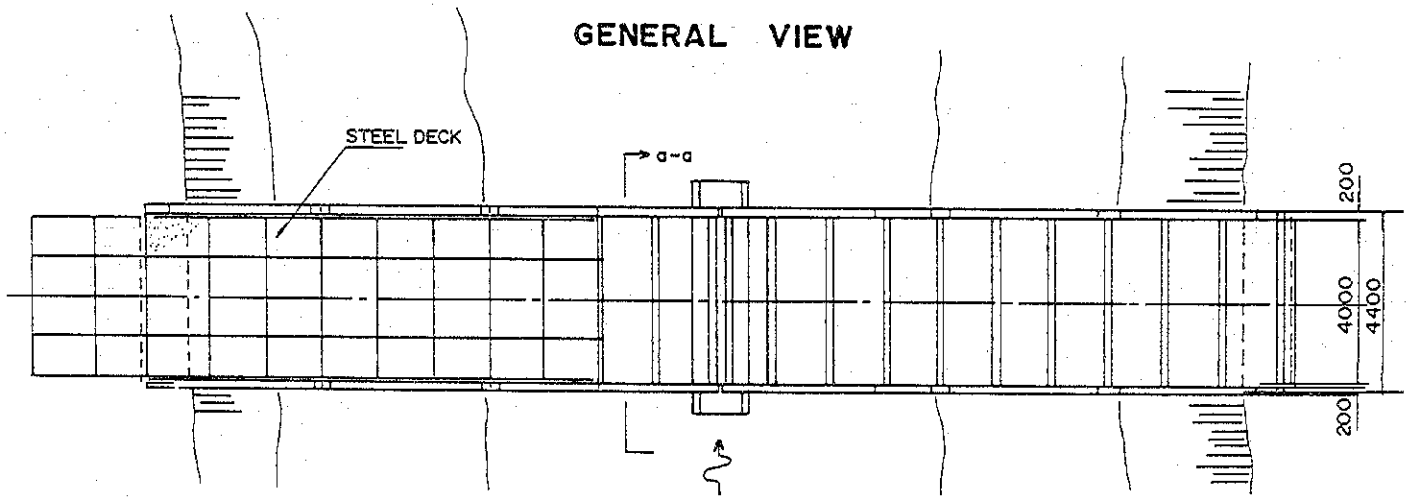
A preliminary design of portable bridge is shown in Figure 18.2-1 (1) to (5).

TABLE 18.2-1 EXISTING BRIDGES BY CLASSIFICATION (ALONG NATIONAL ROADS ONLY)

Region	Total Number of Bridges	Length (L.M.)						
		Permanent			Temporary			
		Concrete	Steel	Total	Bailey	Timber	Total	TOTAL
NCR	271	12,837.98	495.75	13,333.73 (99%)	97.54		97.54 (1%)	13,431.27
CAR	241	2,821.15	2,113.97	4,935.12 (65%)	2,429.20	170.50	2,599.70 (35%)	7,534.82
I	430	10,031.77	8,281.03	18,312.80 (95%)	937.64	92.60	1,030.24 (5%)	19,343.04
II	425	7,220.79	8,165.25	15,386.04 (84%)	1,350.48	1,588.10	2,938.58 (16%)	18,324.62
III	521	16,285.54	1,862.06	18,147.60 (93%)	770.25	627.00	1,397.25 (7%)	19,544.86
IV-A	568	10,022.45	2,485.05	12,507.50 (88%)	1,166.79	458.52	1,625.31 (12%)	14,132.81
IV-B	526	9,009.02	1,309.18	10,318.20 (68%)	2,614.44	2,141.55	4,755.99 (32%)	15,074.19
V	325	9,077.05	1,598.75	10,675.80 (73%)	2,425.80	1,547.34	3,973.14 (27%)	14,648.94
VI	606	14,165.73	3,207.80	17,373.53 (72%)	4,463.59	2,163.79	6,627.38 (28%)	24,000.91
VII	485	7,475.61	2,090.16	9,565.77 (73%)	2,717.84	884.31	3,602.15 (27%)	13,167.92
VIII	894	10,997.03	4,207.91	15,204.94 (61%)	3,692.94	6,194.37	9,887.31 (39%)	25,092.25
IX	260	5,516.34	1,442.39	6,958.73 (80%)	1,214.40	530.10	1,744.50 (20%)	8,703.23
X	596	10,479.69	3,166.59	13,646.28 (75%)	2,137.13	2,525.42	4,662.55 (25%)	18,308.83
XI	461	7,013.58	1,535.67	8,549.25 (58%)	3,068.80	3,124.64	6,193.44 (42%)	14,742.69
XII	319	5,745.04	916.55	6,661.59 (70%)	2,339.11	468.60	2,807.71 (30%)	9,469.30
Total	6,928	138,698.77	42,878.11	181,576.88 (77%)	31,425.95	22,516.84	53,942.79 (23%)	235,519.67



GENERAL VIEW



PLAN

FIGURE 18.2-1 (1) PORTABLE BRIDGE
GENERAL VIEW AND PLAN

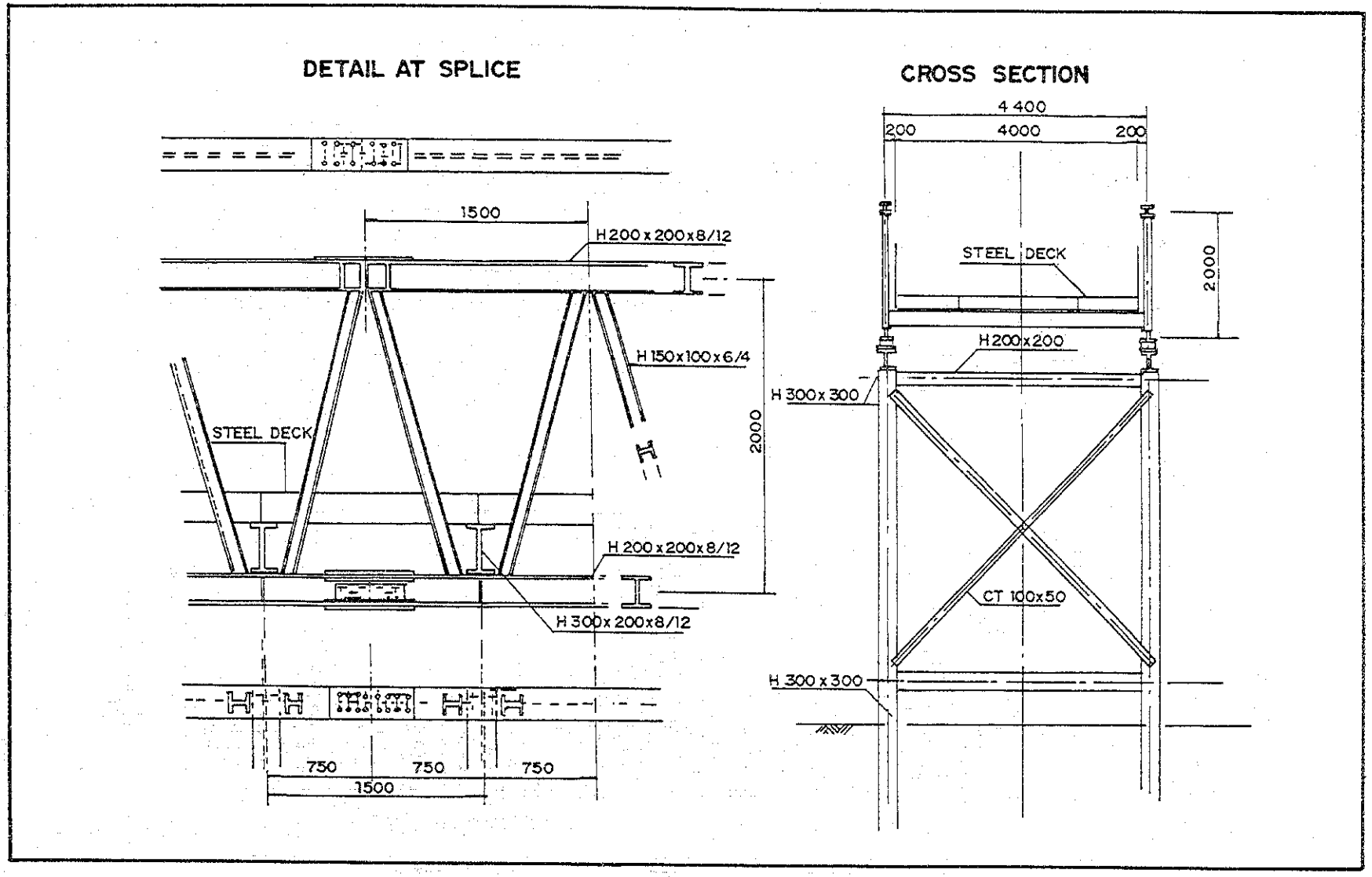


FIGURE 18.2-1 (2) PORTABLE BRIDGE
STANDARD PANEL

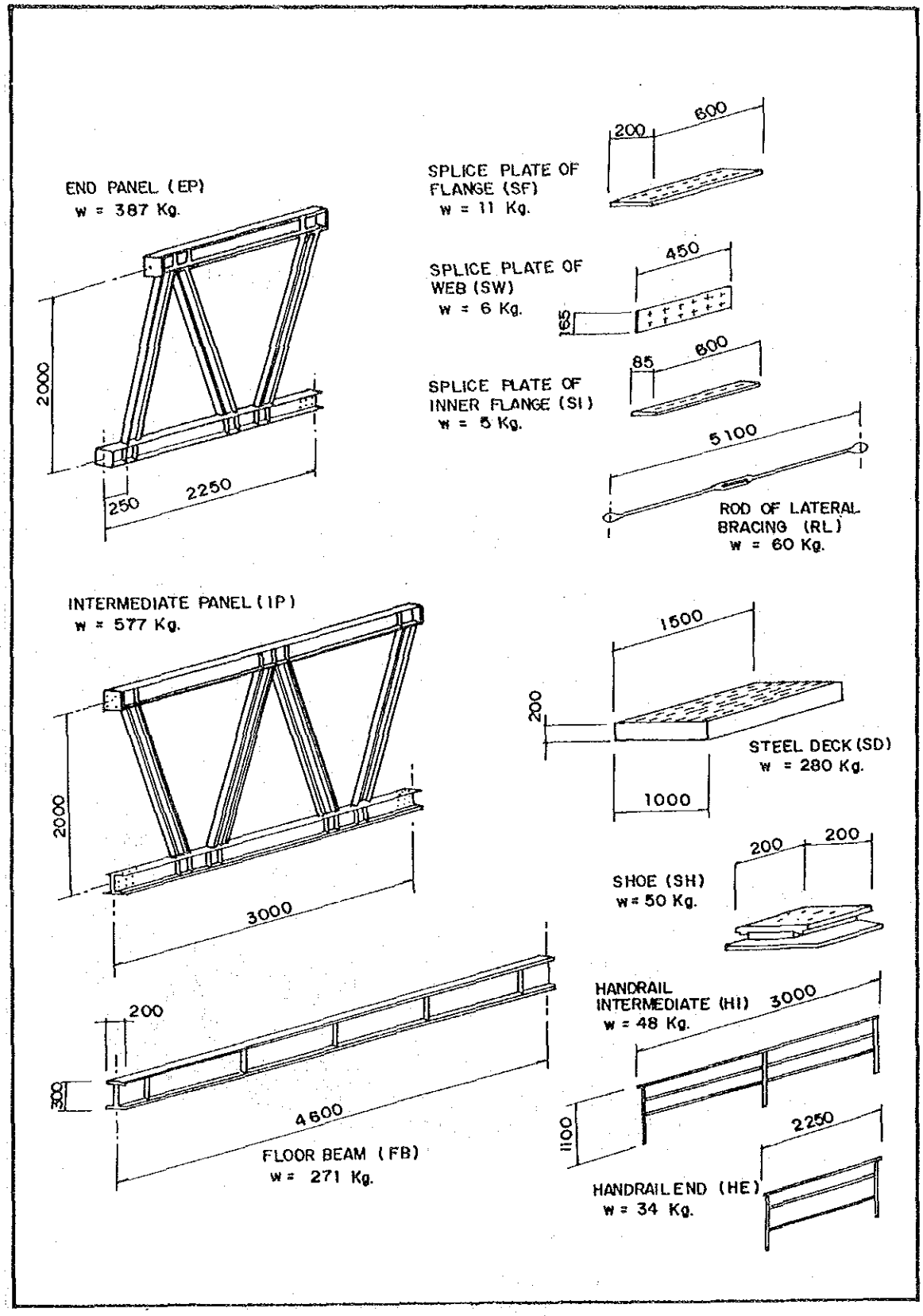


FIGURE 18.2-1 (3) PORTABLE BRIDGE MEMBERS AND PARTS

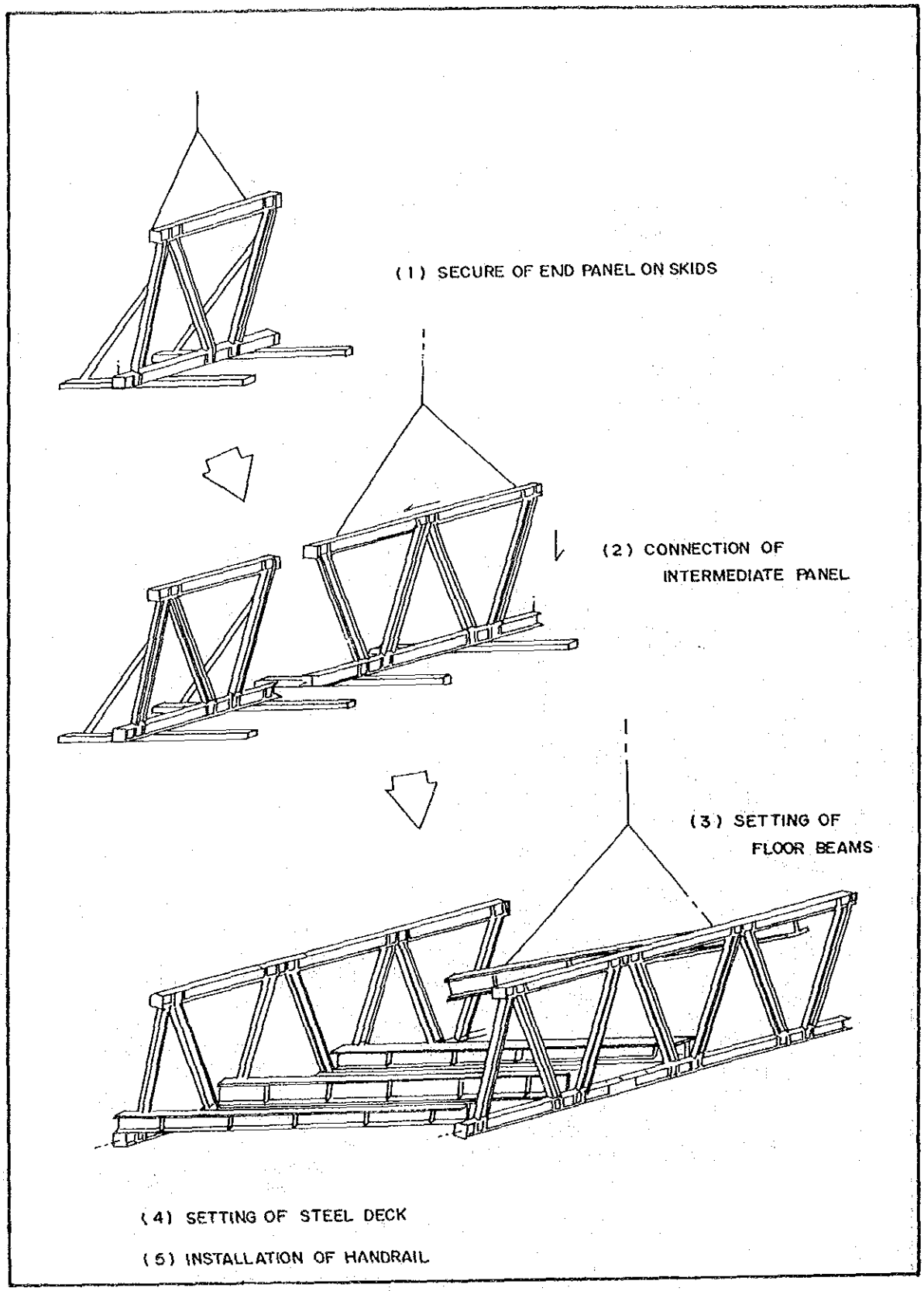


FIGURE 18.2-1(4) PORTABLE BRIDGE ASSEMBLE SEQUENCE

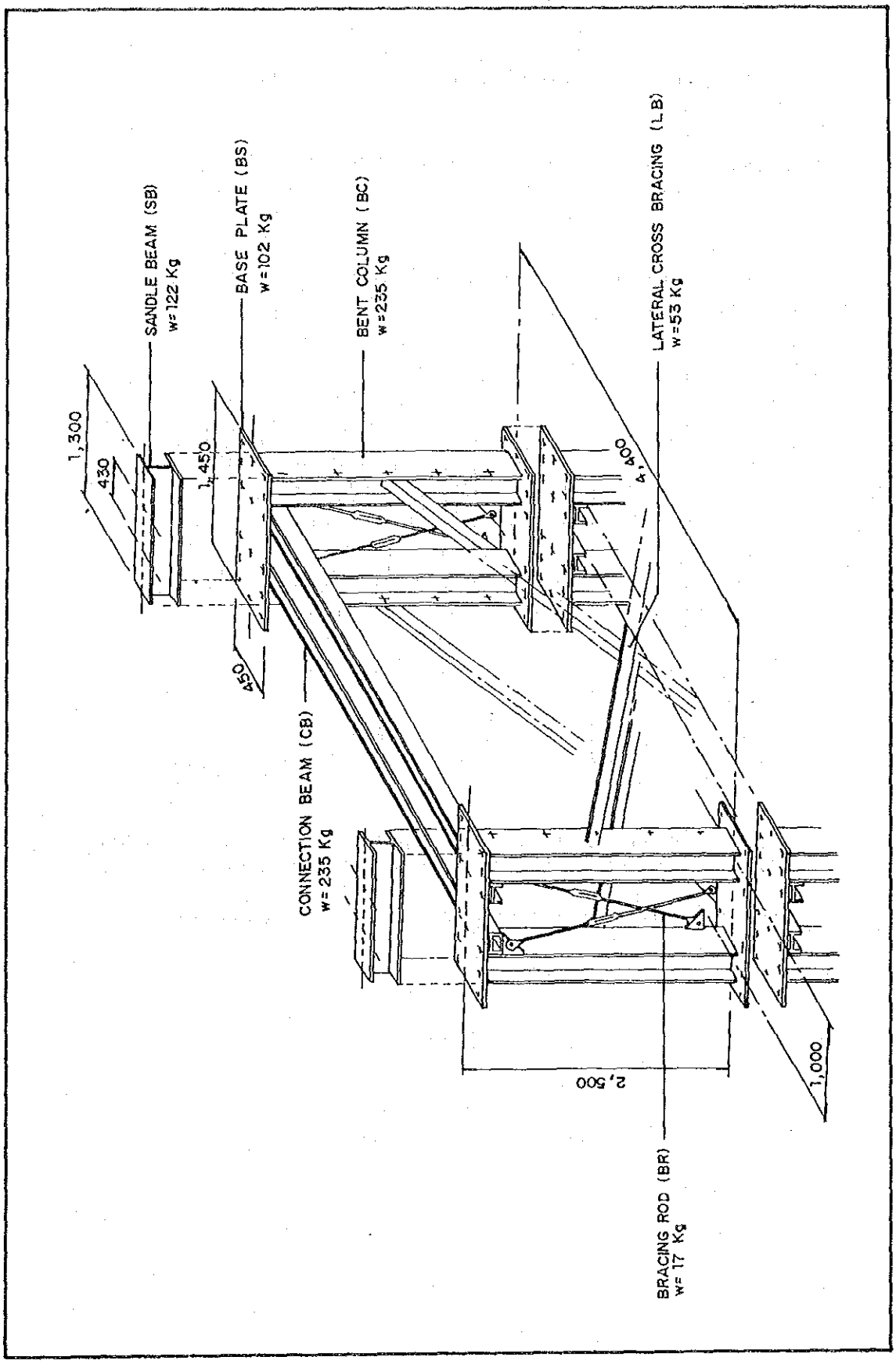


FIGURE 18.2-1(5) PORTABLE BRIDGE
BENT SUPPORT

3) Disposition Plan

Demand of portable bridges by region is roughly estimated based on number of existing temporary bridges and frequency of typhoons, and then the disposition plan is proposed as shown in Table 18.2-2.

TABLE 18.2-2 DISPOSITION PLAN OF PORTABLE BRIDGES

Regions to be covered	No. of Depots	Quantity of Bridge Components
CAR/I	1	10 sets of 19-m span bridge
II	1	10 sets of 19-m span bridge
III	1	10 sets of 19-m span bridge
IV-A	1	10 sets of 19-m span bridge
IV-B	1	10 sets of 19-m span bridge
V	1	10 sets of 19-m span bridge
VI	1	10 sets of 19-m span bridge
VII	1	10 sets of 19-m span bridge
VIII	2	20 sets of 19-m span bridge
IX/XII	1	10 sets of 19-m span bridge
X	1	10 sets of 19-m span bridge
XI	1	10 sets of 19-m span bridge
Total	13	130 sets of 19-m span bridge

4) Cost Estimate

The project cost is roughly estimated as shown in Table 18.2-3, amounting to P57 million per depot and totalling to P741 million for the whole country.

The project may be implemented by phasing depending on the availability of fund.

TABLE 18.2-3 ROUGH ESTIMATE OF PROJECT COST

		Unit	Unit Cost	Quantity	Cost	Remarks
I. Cost per Depot						
Bridge Components	Superstructure	m_2	85	19 m x 10 = 190 m	16,150	14.4 t/bridge
	Deck Plate	m^2	18	4 m x 19 x 10 = 760 m	13,680	16 t/bridge
	Bent Support	pc.	200	20	4,000	1 pc/abutment
	Sub-Total				33,830	
Warehouse	Steel Frame	m_2^2	5	680	3,400	40 t (40 x 17m)
	Roofing and Siding	m^2	1	2,600	2,600	Colored Sheet
	Door, etc.	set	1,050	1	1,050	
	Sub-Total				7,050	
	20 Ton Truck Trailer	Veh.	1,600	2	3,200	
	10 Ton Truck Crane	Veh.	3,200	1	3,200	
	Hose	m	100	12	1,200	12 t
	Manual Winch	set	300	2	600	
	Wire Rope and Accessories	set	1,000	1	1,000	
	Rail, Roller, etc.	set	1,400	1	1,400	
	Minor Tools	set	100	1	100	
	Sub-Total				10,700	
Engineering Fee		L.S.			5,158	
Total					56,738	App. ₱57 Million
II. Cost for 13 Depots					741,000