付録4-3　代替案の工事費（橋梁）

B－ 1

Point A　(Poute ①)　Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	5,095	8.48	43,206	
(Soft Rock)		m^3	20,379	12.13	247,197	ΣV=25,474m^2
(Hard Rock)		m^3		-	-	
Pavement (Carriage Way)		m^2	1,555	16.68	25,937	
Sub-Total					316,340	
Bridge (Superstructure)		m^2	1,235	1,370	1,691,950	ℓ=130m
(Abutment)		m^3	130.2	278.4	36,248	
(Pier)		m^3	738.8	251.5	185,808	
Sub-Total					1,914,006	
Total					2,230,346	

B－ 2

Point A　(Poute ②)　Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	591	8.48	5,012	
(Soft Rock)		m^3	2,366	12.13	28,700	ΣV=2,957m^2
(Hard Rock)		m^3	-	-	-	
Pavement (Carriage Way)		m^2	808	16.68	13,477	
Sub-Total					47,189	
Bridge (Superstructure)		m^2	1,283	1,370	1,751,710	ℓ=135m
(Abutment)		m^3	130.2	278.4	36,248	
(Pier)		m^3	996.0	251.5	250,494	
Sub-Total					2,044,452	
Total					2,091,641	

B－ 3

Patuni (Poute ①) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	17,220	8.48	146,026	
(Soft Rock)		m^3	43,050	12.13	522,197	$\Sigma V=86,100m^3$
(Hard Rock)		m^3	25,870	15.03	388,826	
Pavement (Carriage Way)		m^2	7,015	16.68	117,010	
Sub-Total					1,174,059	
Bridge (Superstructure)		m^2	312	830	258,960	$\ell=30m$
(Abutment)		m^3	215.6	278.4	60,023	
(Pier)		m^3	-	-	-	
Sub-Total					318,983	
Total					1,493,042	

B－ 4

Patuni (Poute ②) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	7,820	8.48	66,314	
(Soft Rock)		m^3	19,550	12.13	237,142	
(Hard Rock)		m^3	11,730	15.03	176,302	$\Sigma V=39,100m^3$
Pavement (Carriage Way)		m^2	6,325	16.68	105,501	
Sub-Total					585,259	
Bridge (Superstructure)		m^2	468	830	398,440	$\ell=45m$
(Abutment)		m^3	215.6	278.4	60,023	
(Pier)		m^3	221.5	251.5	55,707	
Sub-Total					514,170	
Total					1,099,429	

B－ 5

Patuni (Poute ③) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	3,449	8.48	29,248	
(Soft Rock)		m^3	8,623	12.13	104,597	$\Sigma V=17,246m^3$
(Hard Rock)		m^3	5,174	15.03	77,765	
Pavement (Carriage Way)		m^2	3,335	16.68	55,628	
Sub-Total					267,238	
Bridge (Superstructure)		m^2	797	1,370	1,091,890	$\ell=90m$
(Abutment)		m^3	118.8	2778.4	33,074	
(Pier)		m^3	1,045.0	251.5	262,818	
Sub-Total					1,387,782	
Total					1,655,020	

B－ 6

Challa (Poute ①) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	23,740	8.48	201,315	
(Soft Rock)		m^3	12,002	12.13	145,584	$\Sigma V=35,742m^3$
(Hard Rock)		m^3	-	-	-	
Pavement (Carriage Way)		m^2	6,785	16.68	113,174	
Sub-Total					460,073	
Bridge (Superstructure)		m^2	312	830.0	258,960	$\ell=30m$
(Abutment)		m^3	118.8	278.4	33,074	
(Pier)		m^3	-	-	-	
Sub-Total					292,034	
Total					752,107	

B－ 7

Challa (Poute ②) Unit :US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	12,220	8.48	103,626	
(Soft Rock)		m^3	10,137	12.13	122,962	$\Sigma V=22,357m^3$
(Hard Rock)		m^3	-	-	-	
Pavement (Carriage Way)		m^2	5,980	16.68	99,746	
Sub-Total					326,334	
Bridge (Superstructure)		m^2	570	830	473,100	$\ell=60m$
(Abutment)		m^3	143.4	278.4	39,922	
(Pier)		m^3	150.9	251.5	37,951	
Sub-Total					550,973	
Total					877,307	

B－ 8

Challa (Poute ③) Unit :US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	15,480	8.48	131.270	
(Soft Rock)		m^3	5,834	12.13	70.766	$\Sigma V=21,314m^3$
(Hard Rock)		m^3	-	-	-	
Pavement (Carriage Way)		m^2	3,196	16.68	53,209	
Sub-Total					255,245	
Bridge (Superstructure)		m^2	946	1,370.0	1,296,020	$\ell=110m$
(Abutment)		m^3	115.4	278.4	32,127	
(Pier)		m^3	351.2	251.5	88,327	
Sub-Total					1,416,474	
Total					1,671,719	

B－ 9

San Silverio (Poute ①) Unit :US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	1,030	8.48	8,734	
(Soft Rock)		m^3	8,950	12.13	108,563	ΣV=9,980m^3
(Hard Rock)		m^3	-	-	-	
Pavement (Carriage Way)		m^2	2,280	16.68	38,030	
Sub-Total					155,327	
Bridge (Superstructure)		m^2	380	830	315,400	ℓ=60m
(Abutment)		m^3	118.8	278.4	33,074	
(Pier)		m^3	150.9	251.5	37,951	
Sub-Total					386,425	
Total					541,752	

B－ 10

San Silverio (Poute ②) Unit :US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	680	8.48	5,766	
(Soft Rock)		m^3	3,584	12.13	43,474	ΣV=4,264m^3
(Hard Rock)		m^3	-	-	-	
Pavement (Carriage Way)		m^2	1,805	16.68	30,107	
Sub-Total					79,347	
Bridge (Superstructure)		m^2	760	830.0	361,000	ℓ=50m
(Abutment)		m^3	143.4	278.4	39,923	
(Pier)		m^3	150.9	251.5	37,951	
Sub-Total					438,874	
Total					518,221	

B－ 11

San Lorenzo (Poute ①) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	87,300	8.48	740,304	
(Soft Rock)		m^3	52,380	12.13	635,369	
(Hard Rock)		m^3	34,920	15.03	524,848	ΣV=174,600m^3
Pavement (Carriage Way)		m^2	7,125	12.90	91,913	
Sub-Total					1,992,434	
Bridge (Superstructure)		m^2	475	830	394,250	ℓ=50m
(Abutment)		m^3	129.0	278.4	35,914	
(Pier)		m^3	183.8	251.5	46,226	
Sub-Total					476,390	
Total					2,468,824	

B－ 12

Sqan Lorengo (Poute ②) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	56,330	8.48	477,678	
(Soft Rock)		m^3	33,798	12.13	409,970	
(Hard Rock)		m^3	22,532	15.03	338,656	ΣV=112,660m^3
Pavement (Carriage Way)		m^2	6,650	12.90	85,785	
Sub-Total					1,312,089	
Bridge (Superstructure)		m^2	570	830	473,100	ℓ=60m
(Abutment)		m^3	167.3	278.4	46,576	
(Pier)		m^3	183.8	251.5	42,226	
Sub-Total					565,902	
Total					1,877,991	

B－ 13

San Lorenzo (Poute ③) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	33,669	8.48	285,513	
(Soft Rock)		m^3	20,201	12.13	245,038	
(Hard Rock)		m^3	13,467	15.03	202,409	ΣV=67,337m^3
Pavement (Carriage Way)		m^2	2,850	12.90	36,765	
Sub-Total					769,725	
Bridge (Superstructure)		m^2	1,118	1,370	1,531,660	ℓ=130m
(Abutment)		m^3	167.3	278.4	46,576	
(Pier)		m^3	630.3	251.5	158,520	
Sub-Total					1,736,756	
Total					2,506,481	

B－ 14

Espiritú (Poute ①) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	15,500	8.48	131,440	
(Soft Rock)		m^3	15,792	12.13	191,552	ΣV=31,292m^3
(Hard Rock)		m^3	-	-	-	
Pavement (Carriage Way)		m^2	2,871	12.90	37,035	
Sub-Total					360,027	
Bridge (Superstructure)		m^2	364.0	830.0	302,120	ℓ=35m
(Abutment)		m^3	105.8	278.4	29,455	
(Pier)		m^3	164.0	251.5	41,246	
Sub-Total					372,821	
Total					732,848	

B－ 15

Espiritú (Poute ②) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	5,248	8.48	44,503	
(Soft Rock)		m^3	5,100	12.13	61,863	ΣV=10,348m^3
(Hard Rock)		m^3	-	-	-	
Pavement (Carriage Way)		m^2	2,876.6	12.90	37,109	
Sub-Total					143,475	
Bridge (Superstructure)		m^2	475	830	394,250	ℓ=50m
(Abutment)		m^3	123.0	278.4	34,243	
(Pier)		m^3	286.5	251.5	72,055	
Sub-Total					500,548	
Total					643,220	

B－ 16

Espiritú (Poute ③) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	1,300	8.48	11,024	
(Soft Rock)		m^3	1,100	12.13	13,343	ΣV=2,400m^3
(Hard Rock)		m^3	-	-	-	
Pavement (Carriage Way)		m^2	1,490	12.90	19,217	
Sub-Total					43,584	
Bridge (Superstructure)		m^2	920	1,370	1,260,400	ℓ=100m
(Abutment)		m^3	123.0	278.4	34,243	
(Pier)		m^3	351.2	251.5	88,327	
Sub-Total					1,382,970	
Total					1,426,554	

B－ 17

Pto Leon (Poute ①) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m³	-	-	-	
(Soft Rock)		m³	8,647	12.13	104,888	
(Hard Rock)		m³	-	-	-	
Stone Masonry		m²	532	28.56	15,208	
Pavement (Carriage Way)		m²	1,155	16.68	19,265	
Sub-Total					139,361	
Bridge (Superstructure)		m²	523	730	381,790	I -Section ℓ=55m
(Abutment)		m³	118.8	278.4	33,073	
(Pier)		m³	-		414,863	
Sub-Total					554,224	
Total						

B－ 18

Pto Leon (Poute ②) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m³	-	-	-	
(Soft Rock)		m³	23,060	12.13	279,718	
(Hard Rock)		m³	-	-	-	
Pavement (Carriage Way)		m²	1,710	16.18	28,523	
Sub-Total					308,241	
Bridge (Superstructure)		m²	312.0	830.0	258,960	ℓ=30m
(Abutment)		m³	135.8	278.4	37,806	
(Pier)		m³	-	-	-	
Sub-Total					296,766	
Total					605,007	

B－ 19

Carrasco (Poute ①) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	41,123	8.48	348,723	
(Soft Rock)		m^3	-	12.13	-	
(Hard Rock)		m^3	-	15.03	-	
Seed Spraying		m^2	6,388	1.31	8,368	
Pavement (Carriage Way)		m^2	2,647	12.90	34,151	
Sub-Total					391,242	
Bridge (Superstructure)		m^2	126.5	584.0	73,876	ℓ=65m
(Abutment)		m^3	281.4	278.4	78,342	
(Pier)		m^3	-	-	-	
Sub-Total					152,218	
					543,460	

B－ 20

Carrasco (Poute ②) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	5,473	8.48	46,411	
(Soft Rock)		m^3	-	12.13	-	
(Hard Rock)		m^3	-	15.03	-	
Seed Spraying		m^2	1,254	1.31	1,643	
Pavement (Carriage Way)		m^2	1,980	12.90	25,543	
Sub-Total					73,597	
Bridge (Superstructure)		m^2	354.0	584.0	206,736	ℓ=30m
(Abutment)		m^3	316.2	278.4	88,030	
(Pier)		m^3	-	251.5	-	
Sub-Total					294,766	
					368,363	

B－ 21

Carrasco (Poute ③) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3	4,289	8.48	36,371	
(Soft Rock)		m^3	-	12.13	-	
(Hard Rock)		m^3	-	15.03	-	
Seed Spraying		m^2	1,026	1.31	1,344	
Pavement (Carriage Way)		m^2	1,547	12.90	19,959	
Sub-Total					57,674	
Bridge (Superstructure)		m^2	585.0	584.0	341,640	ℓ=23m
(Abutment)		m^3	281.4	278.4	78,342	
(Pier)		m^3	39.3	251.5	9,884	
Sub-Total					429,866	
Total					487,540	

B－

(Poute) Unit : US$

Name of Work	Type	Unit	Volume	Unit Cost	Cost	Remarks
Excavation (Soil)		m^3				
(Soft Rock)		m^3				
(Hard Rock)		m^3				
Pavement (Carriage Way)		m^2				
Sub-Total						
Bridge (Superstructure)		m^2				
(Abutment)		m^3				
(Pier)		m^3				
Sub-Total						
Total						

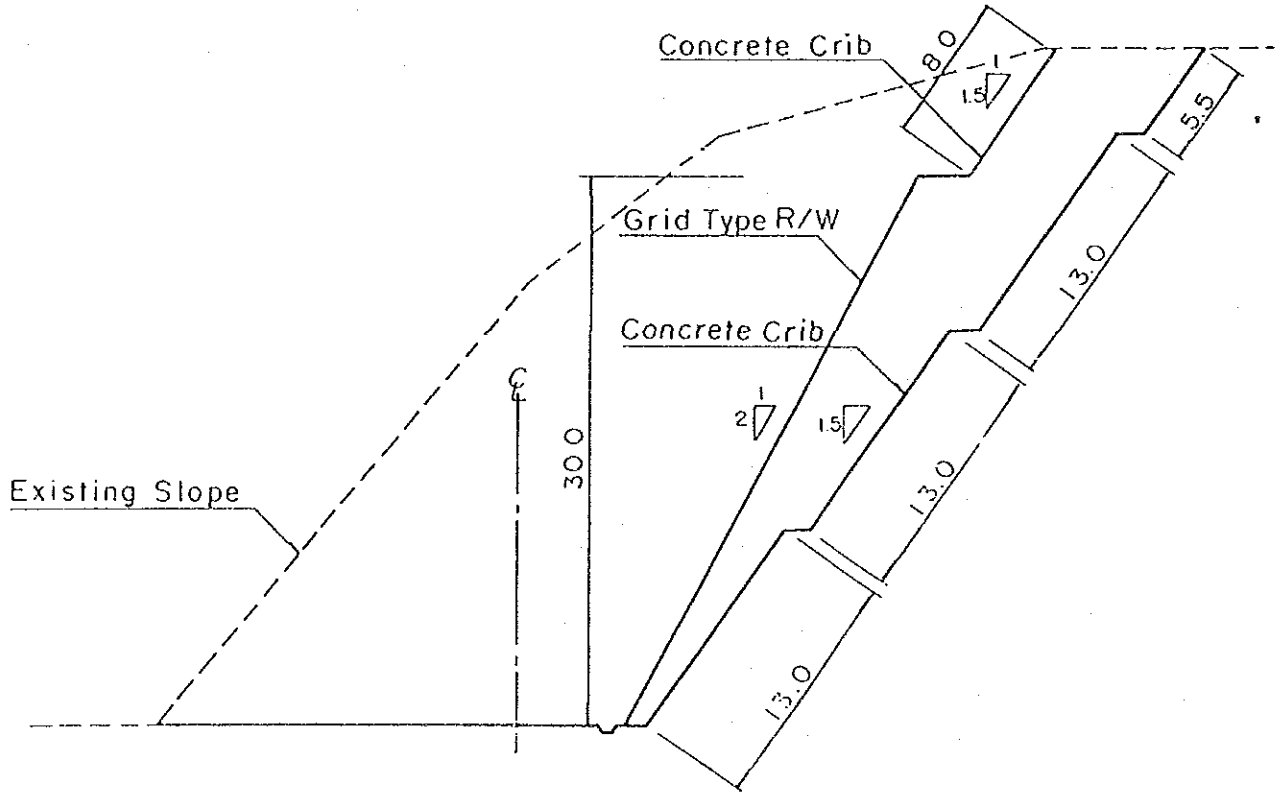
付録4-4　最適な災害対策工

(1) Selection for S.B. + 0.8 / No.0 + 700

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring　1)
- Grid Type Concrete Retaining Wall + Concrete Crib　2)

Optimum Countermeasure:
As described below, Grid Type Concrete Retaining Wall (+) Concrete Crib is advantageous to the location in economical view point.

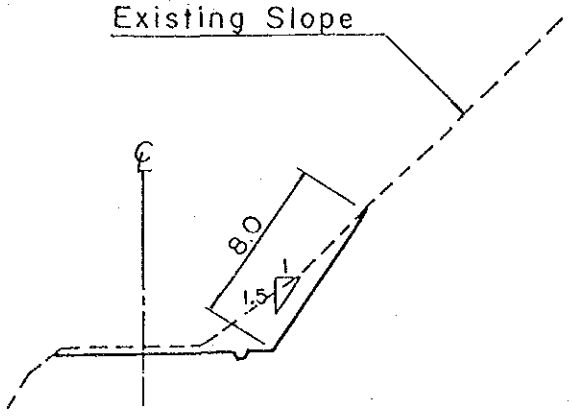
		Unit	Quantity	Unit Cost	Cost	Remarks
1)	Concrete Crib	m^2	2,225	51.08 US	113,653 US	
	Excavation	m^3	46,362	12.13	562,371	
	Total				676,024	
2)	Retaining Wall	m^2	1,677	124.95	209,541	
	Concrete Crib	m^2	400	51.08	20,432	
	Excavation	m^3	36,150	12.13	438,499	
	Total				668,472	



(2) Selection for S.B. + 2.3 / No.2 + 200

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

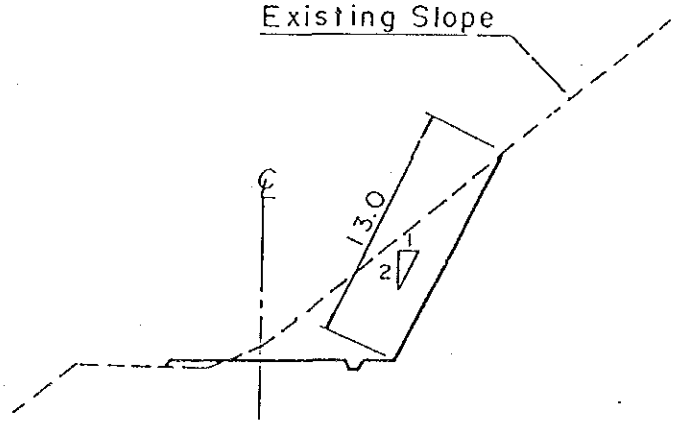
Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.



(3) Selection for B + 1.9 / No.8 + 100

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

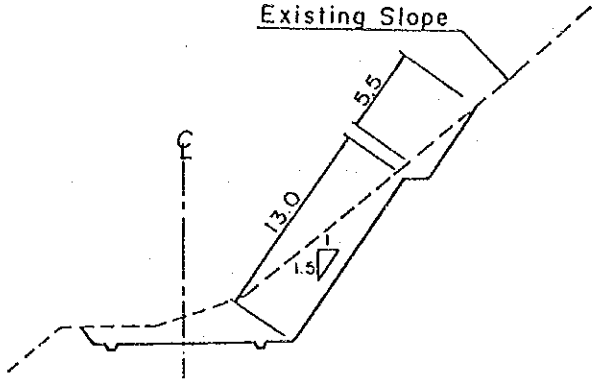
Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.



(4) Selection for C + 0.4 / No.10 + 900

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

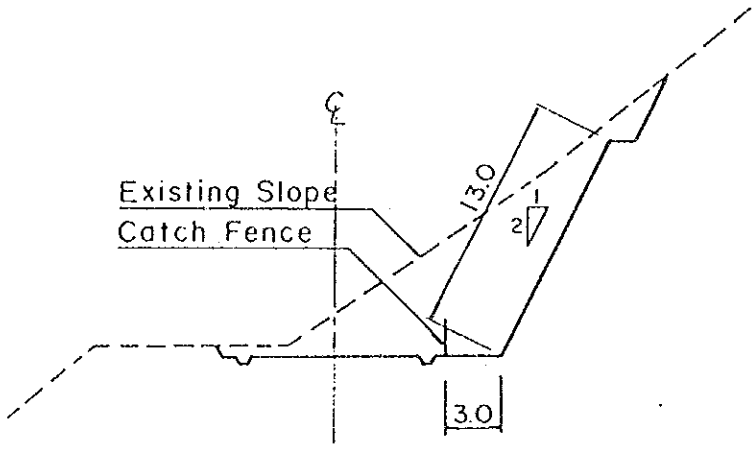
Optimum Countermeasures:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.



(5) Selection for C + 2.6 / No.12 + 780

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring + Catch Fence installed at road side
- Grid Type Concrete Retaining Wall + Catch Fence installed at road side

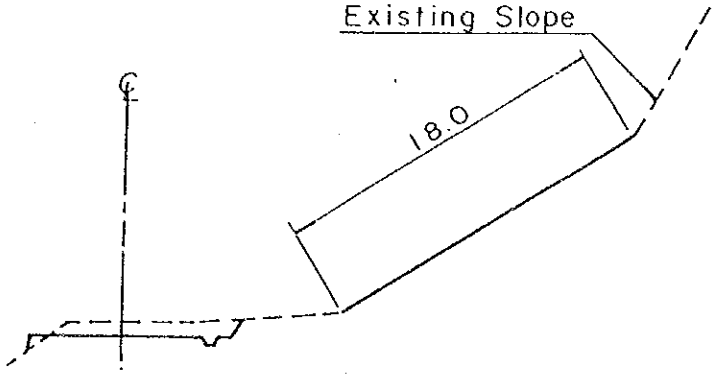
Optimum Countermeasures:
As illustrated below, Concrete Crib + Catch Fence is adaptable to the location in topographical view point.



(6) Selection for F + 4.2 / No.29 + 500

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.

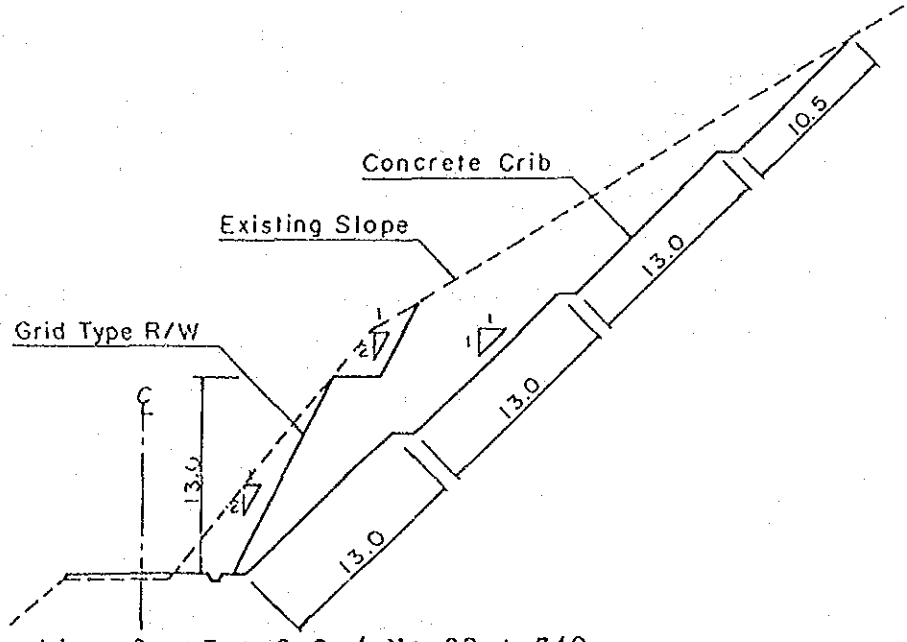


(7) Selection for H + 1.0 / No.33 + 700

Applicable Countermeasures:
- Concrete Crib with stone pitching and Anchoring + Gabion Catch Wall
- Grid Type Concrete Retaining Wall + Gabion Catch Wall

Optimum Countermeasure:
As described below, Grid Type Concrete Retaining Wall + Gabion Catch Wall is advantageous to the location in economical and topographical view points.

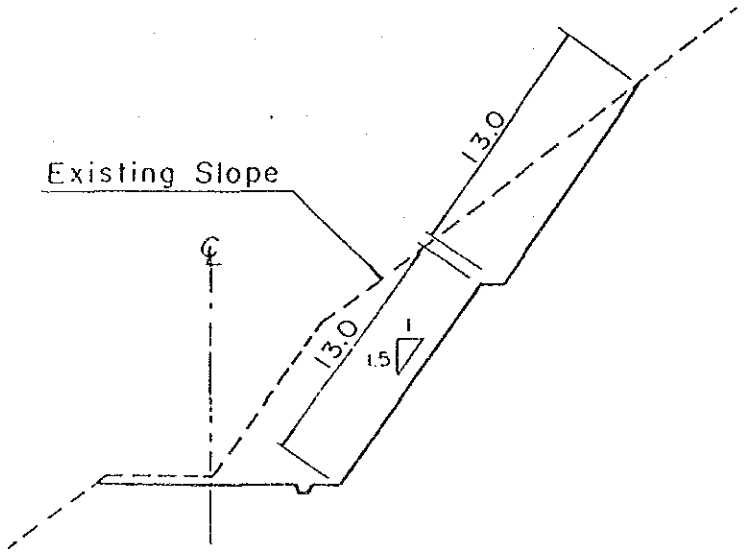
	Unit	Quantity	Unit Cost	Cost	Remarks
Concrete Crib	m^2	1,980	52.40 US	103,752 US	
Excavation	m^3	7,340	12.13	89,034	
Total				192,786	
Retaining Wall	m^2	581	124.95	72,595	
Excavation	m^3	1,539	12.13	18,668	
Total				91,263	



(8) Selection for I + 3.0 / No.38 + 740

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.

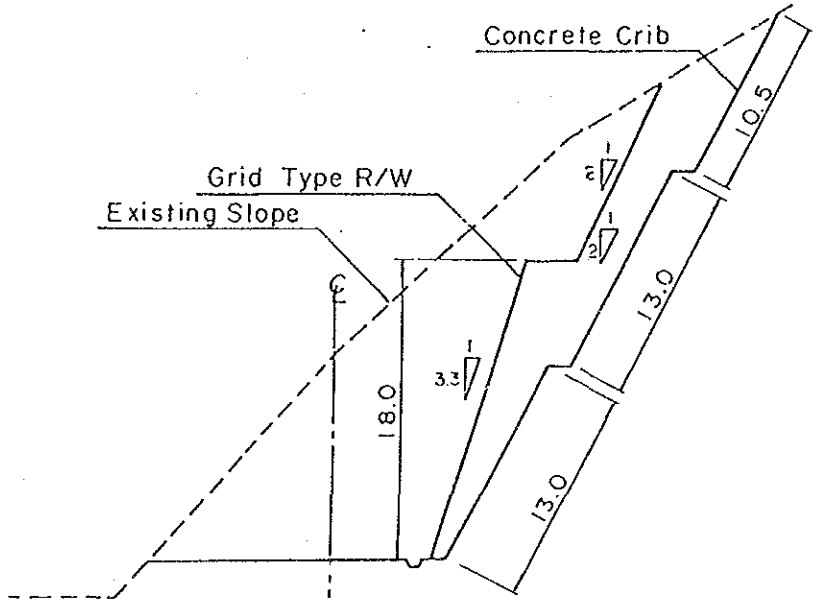


(9) Selection for I + 3.3 / No.39 + 30

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

Optimum Countermeasure:
As described below, Grid Type Concrete Retaining Wall is advantageous to the location in economical view point.

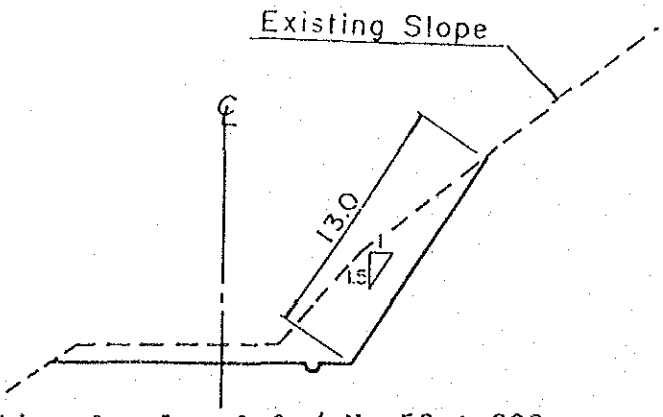
	Unit	Quantity	Unit Cost	Cost	Remarks
Concrete Crib	m^2	2,555	51.08 US	130,509 US	
Excavation	m^3	25,182	12.13	305,457	
Total				435,966	
Grid Type R/W	m^2	1,408	124.95	175,929	
Excavation	m^3	17,290	12.13	209,727	
Total				385,656	



(10) Selection for J + 4.9 / No.44 + 400

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

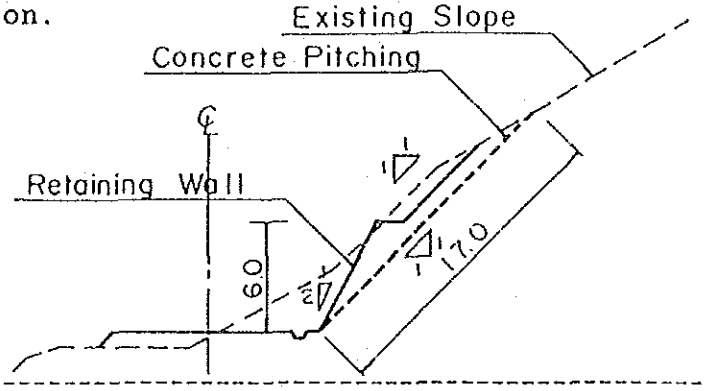
Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.



(11) Selection for L + 3.0 / No.52 + 200

Applicable Countermeasures:
- Stone Masonry Retaining Wall
- Concrete Pitching and Anchoring
- Grid Type Concrete Retaining Wall

Optimum Countermeasure:
As illustrated below, since Concrete Pitching is not adaptable to the location in topographical view point, Stone Masonry Retaining Wall or Grid Type Concrete Retaining Wall should be applied. Comparing those retaining walls with the cost, Stone Masonry Retaining Wall is advantageous to the location.

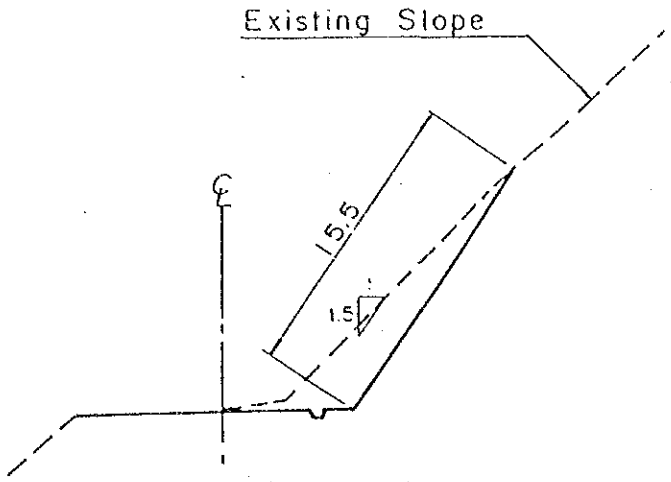


	Unit	Quantity	Unit Cost	Cost
Stone Masonry R/W	m^2	313	54.38 US	17,020 US
Grid Type R/W	m^2	268	124.95	33,486

(12) Selection for L + 6.1 / No.55 + 500

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

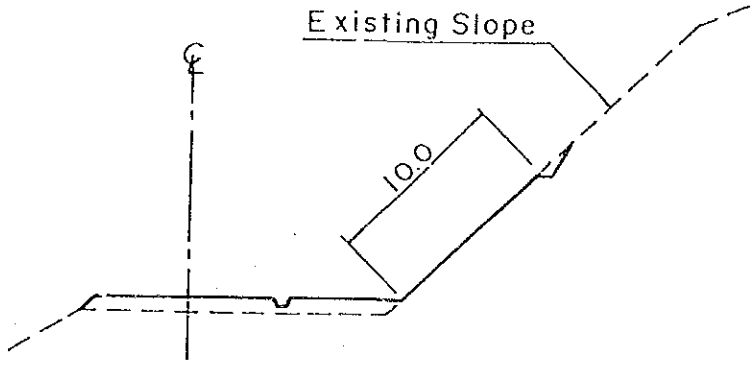
Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.



(13) Selection for M + 1.6 / No.58 + 200

Applicable Countermeasures:
- Concrete Pitching and Anchoring
- Grid Type Concrete Retaining Wall
- Supported Type Concrete Retaining Wall

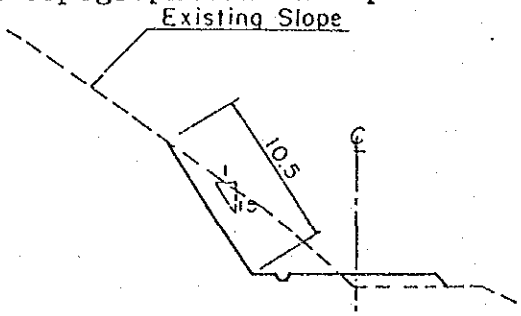
Optimum Countermeasure:
As illustrated below, Concrete Pitching and Anchoring is adaptable to the location in topographical view point.



(14) Selection for N + 2.0 / No.66 + 500

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

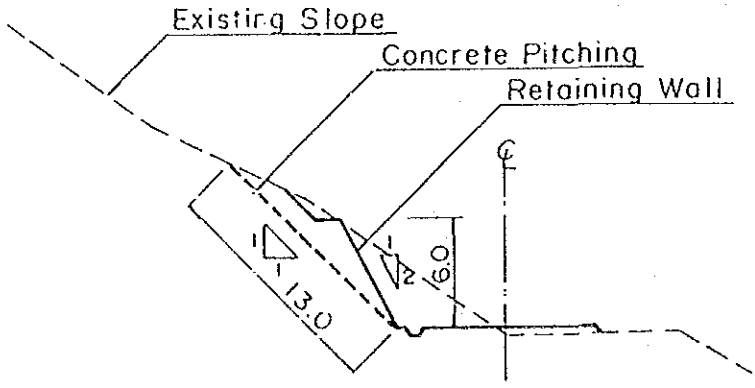
Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.



(15) Selection for N + 3.0 / No.68 + 440

Applicable Countermeasures:
- Concrete Pitching and Anchoring
- Grid Type Concrete Retaining Wall
- Supported Type Concrete Retaining Wall

Optimum Countermeasure:
As illustrated below, since Concrete Pitching is not adaptable to the location in topographical view point, Grid Type Concrete Retaining Wall or Supported Type Concrete Retaining Wall should be applied. Comparing those retaining walls with the cost, Grid Type Concrete Retaining Wall is advantageous to the location.

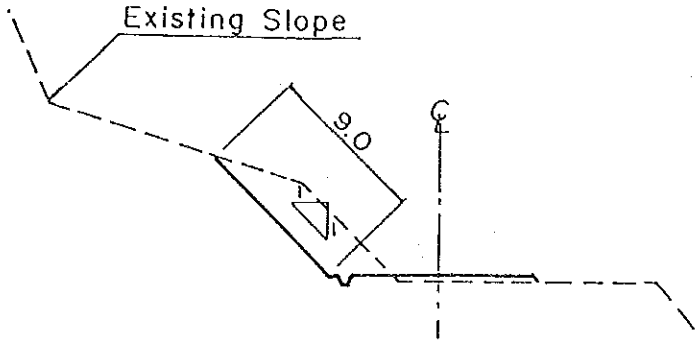


	Unit	Quantity	Unit Cost	Cost	Remarks
Grid Type R/W	m^2	1,006	124.95 US	125,699 US	
Supported Type R/W	m^2	1,173	216.42	253,860	

(16) Selection for N + 4.7 / No.70 + 100

Applicable Countermeasures:
- Stone Masonry Retaining Wall
- Concrete Pitching and Anchoring
- Grid Type Concrete Retaining Wall

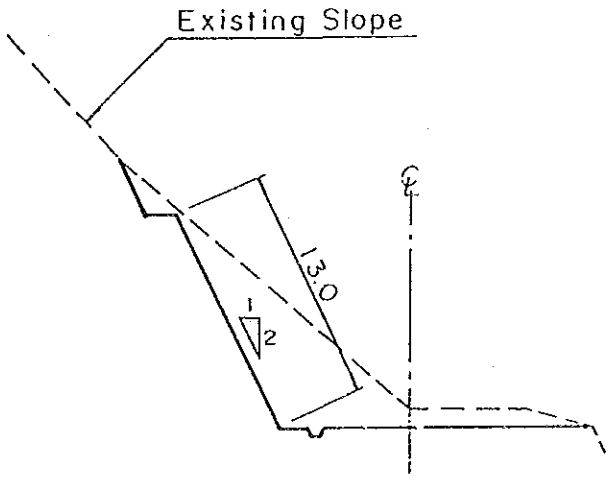
Optimum Countermeasure:
As illustrated below, Concrete Pitching is adaptable to the location in topographical view point.



(17) Selection for P + 0.9 / No.75 + 570

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

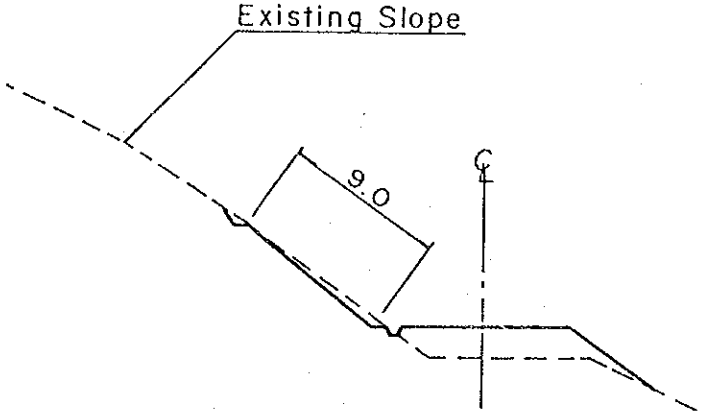
Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.



(18) Selection for P + 3.6 / No.77 + 800

Applicable Countermeasures:
- Concrete Pitching and Anchoring
- Grid Type Concrete Retaining Wall
- Supported Type Concrete Retaining Wall

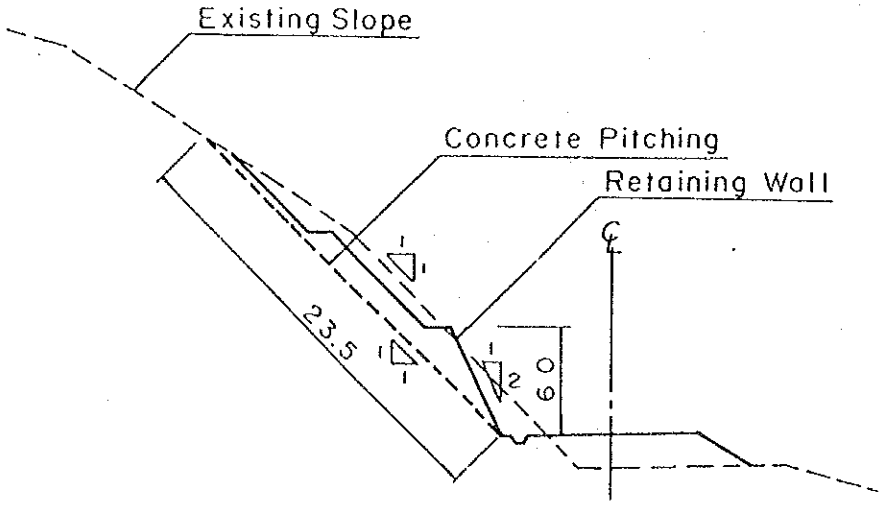
Optimum Countermeasure:
As illustrated below, Concrete Pitching is adaptable to the location in topographical view point.



(19) Selection for P + 3.7 / No.78 + 100

Applicable Countermeasures:
- Stone Masonry Retaining Wall
- Concrete Pitching and Anchoring
- Grid Type Concrete Retaining Wall

Optimum Countermeasure:
As illustrated below, since Concrete Pitching is not adaptable to the location in topographical view point, Stone Masonry Retaining Wall or Grid Type Retaining Wall should be applied. Comparing those retaining walls with the cost, Stone Masonry Retaining Wall is advantageous to the location.

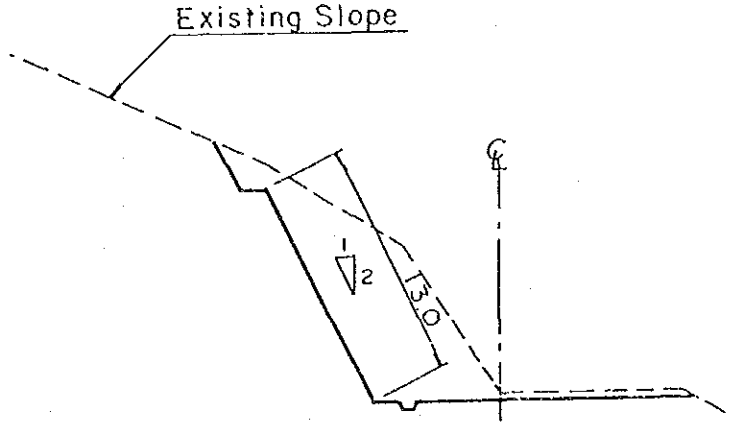


	Unit	Quantity	Unit Cost	Cost	Remarks
Stone Masonry R/W	m^2	626	54.38 US	34,041 US	
Grid Type R/W	m^2	536	124.95	66,973	

(20) Selection for P + 4.0 / No.78 + 600

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

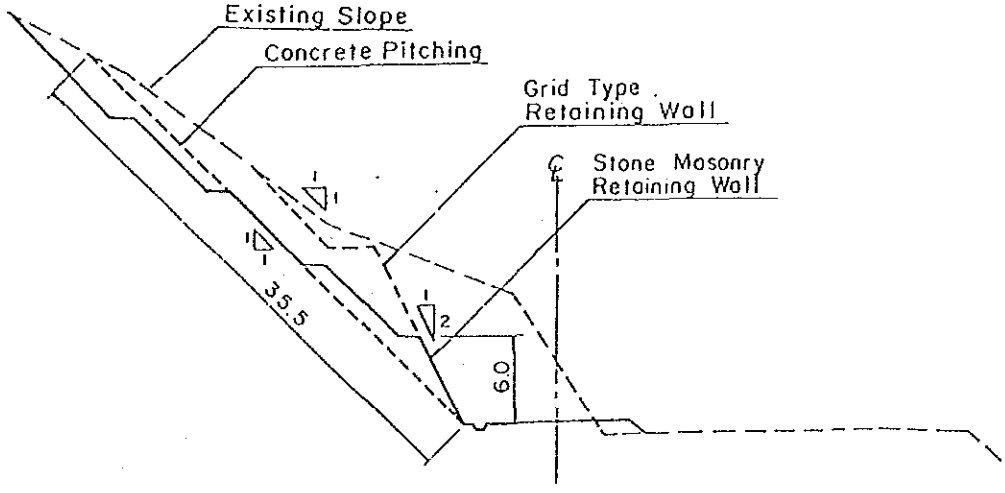
Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.



(21) Selection for P + 4.9 / No.79 + 500

Applicable Countermeasures:
- Stone Masonry Retaining Wall
- Concrete Pitching and Anchoring
- Grid Type Concrete Retaining Wall

Optimum Countermeasure:
As illustrated below, since Concrete Pitching is not adaptable to the location in topographical view point. Stone Masonry Retaining Wall or Grid Type Retaining Wall should be applied. Comparing those retaining walls with the cost, Stone Masonry Retaining Wall is Advantageous to the location.

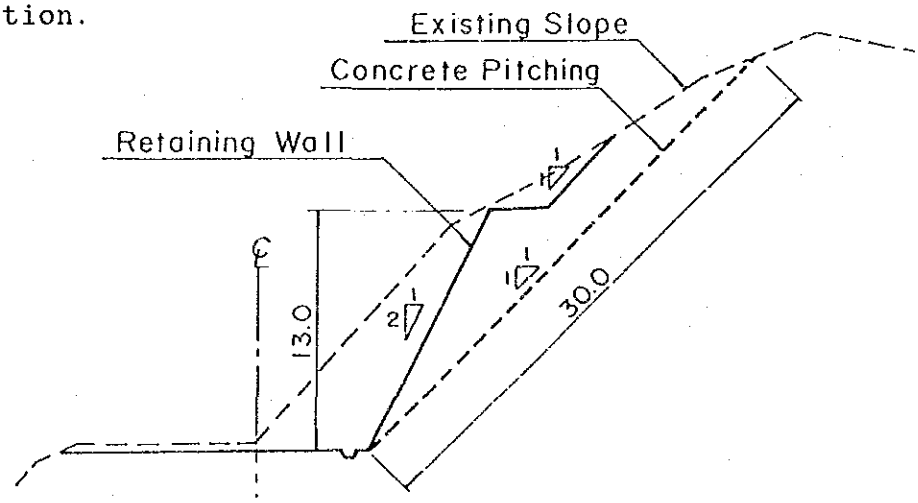


	Unit	Quantity	Unit Cost	Cost	Remark
Stone Masonry R/W	m2	355	54.38us	18.217us	
Excavation	m3	8,137	3.04	24.736	
Total				42.953	
Grid Type R/W	m2	670	124.95us	83.716	
Excavation	m3	4,447	3.04	13.518	
Total				97.234	

(22) Selection for Q + 0.6 / No.80 + 350

Applicable Countermeasures:
- Concrete Pitching and Anchoring
- Grid Type Concrete Retaining Wall
- Supported Type Concrete Retaining Wall

Optimum Countermeasure:
As illustrated below, since Concrete Pitching is not adaptable to the location in topographical view point, Grid Type Retaining Wall or Supported Type Retaining Wall should be applied. Comparing those retaining walls with the cost, Grid Type Concrete Retaining Wall is advantageous to the location.



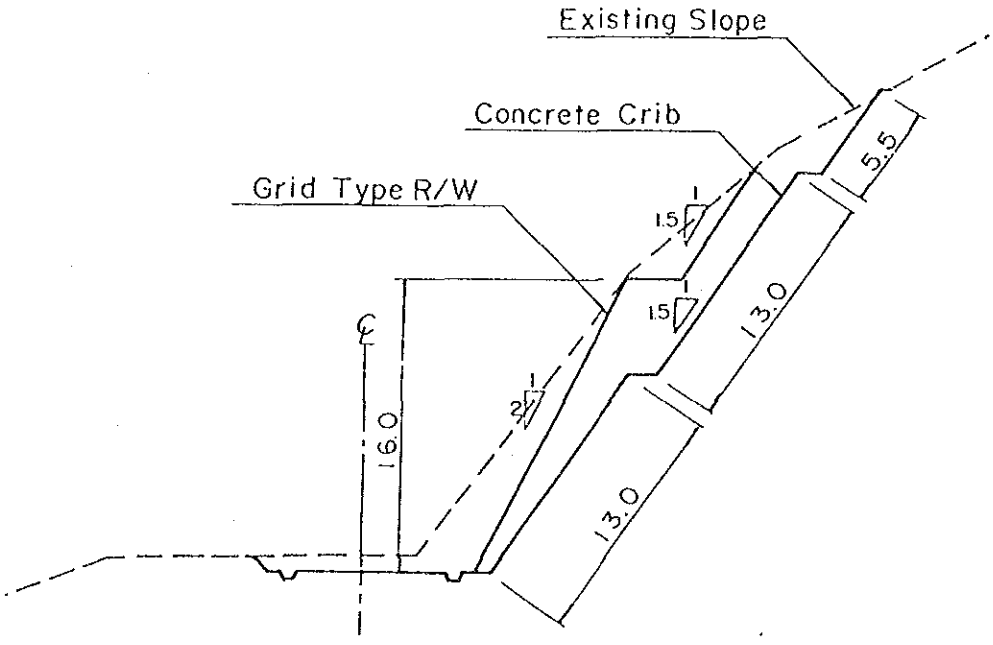
	Unit	Quantity	Unit Cost	Cost
Grid Type R/W	m^2	2,180	124.95 US	272,391 US
Supported Type R/W	m^2	2,515	216.42	544,296

(23) Selection for R + 0.3 / No.82 + 400

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

Optimum Countermeasure:
As described below, Grid Type Concrete Retaining Wall is advantageous to the location in economical view point.

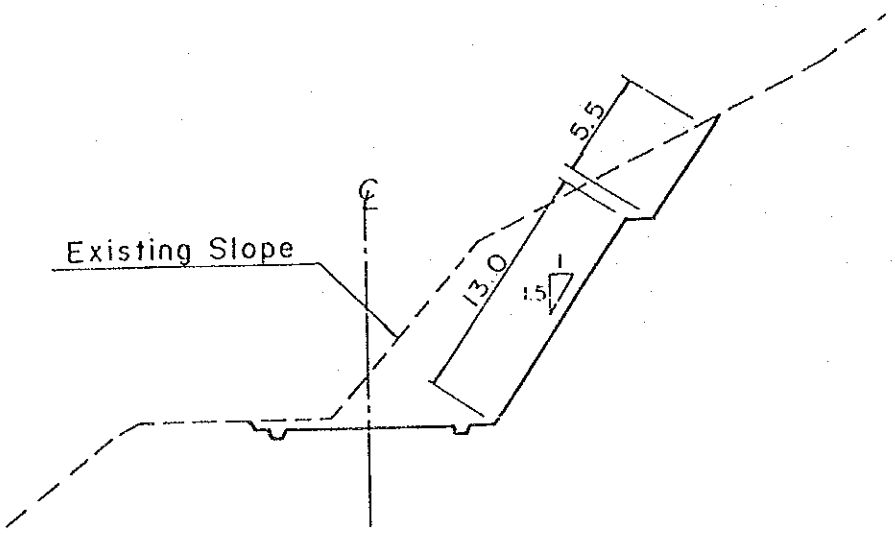
	Unit	Quantity	Unit Cost	Cost	Remarks
Concrete Crib	m^2	1,260	51.08 US	64,360 US	
Excavation	m^3	4,620	12.13	56,040	
Total				120,400	
Grid Type R/W	m^2	715	124.95	89,339	
Excavation	m^3	1,910	12.13	23,168	
Total				112,507	



(24) Selection for R + 1.8 / No.84 + 350

Applicable Countermeasures:
- Concrete Crib with concrete spraying and Anchoring
- Grid Type Concrete Retaining Wall

Optimum Countermeasure:
As illustrated below, Concrete Crib is adaptable to the location in topographical view point.



付録5-1　　舗装設計

付録5-1(1)　ＥＳＡＬの算出

ESAL Factors were based on an assumed terminal serviceability of 2.5 and structural number (SN) of 5.0. In most cases, such an assumption provides information sufficiently accurate for design purposes.

Vehicle Type	Axle Load Distribution (front/rear)		ESAL Factor	
	(tons)	(Kips)	(front/rear)	(Total)
Passenger Car	S 0.6813	1.5	0.0002	0.0004
	S 0.6174	1.4	0.0002	
Bus	S 4.7248	10.4	0.088	1.598
	S 9.0752	20.0	1.51	
Light Truck	S 1.5916	3.5	0.002	0.004
	S 2.0084	4.4	0.002	
Medium Truck	S 2.5084	5.5	0.010	0.044
	S 3.6916	8.1	0.034	
Heavy Truck	S 5.073	11.2	0.189	0.553
	T 11.927	26.3	0.364	

Note : S = Single Axle, T = Tandem Axle

Table Axle load equivalency factors for flexible pavements, tandem axles and p of 2.5.

Axle Load (kips)	Pavement Structural Number (SN)					
	1	2	3	4	5	6
2	.0001	.0001	.0001	.0000	.0000	.0000
4	.0005	.0005	.0004	.0003	.0003	.0002
6	.002	.002	.002	.001	.001	.001
8	.004	.006	.005	.004	.003	.003
10	.008	.013	.011	.009	.007	.006
12	.015	.024	.023	.018	.014	.013
14	.026	.041	.042	.033	.027	.024
16	.044	.065	.070	.057	.047	.043
18	.070	.097	.109	.092	.077	.070
20	.107	.141	.162	.141	.121	.110
22	.160	.198	.229	.207	.180	.166
24	.231	.273	.315	.292	.260	.242
26	.327	.370	.420	.401	.364	.342
28	.451	.493	.548	.534	.495	.470
30	.611	.648	.703	.695	.658	.633
32	.813	.843	.889	.887	.857	.834
34	1.06	1.08	1.11	1.11	1.09	1.08
36	1.38	1.38	1.38	1.38	1.38	1.38
38	1.75	1.73	1.69	1.68	1.70	1.73
40	2.21	2.16	2.06	2.03	2.08	2.14
42	2.76	2.67	2.49	2.43	2.51	2.61
44	3.41	3.27	2.99	2.88	3.00	3.16
46	4.18	3.98	3.58	3.40	3.55	3.79
48	5.08	4.80	4.25	3.98	4.17	4.49
50	6.12	5.76	5.03	4.64	4.86	5.28
52	7.33	6.87	5.93	5.38	5.63	6.17
54	8.72	8.14	6.95	6.22	6.47	7.15
56	10.3	9.6	8.1	7.2	7.4	8.2
58	12.1	11.3	9.4	8.2	8.4	9.4
60	14.2	13.1	10.9	9.4	9.6	10.7
62	16.5	15.3	12.6	10.7	10.8	12.1
64	19.1	17.6	14.5	12.2	12.2	13.7
66	22.1	20.3	16.6	13.8	13.7	15.4
68	25.3	23.3	18.9	15.6	15.4	17.2
70	29.0	26.6	21.5	17.6	17.2	19.2
72	33.0	30.3	24.4	19.8	19.2	21.3
74	37.5	34.4	27.6	22.2	21.3	23.6
76	42.5	39.9	31.1	24.8	23.7	26.1
78	48.0	43.9	35.0	27.8	26.2	28.8
80	54.0	49.4	39.2	30.9	29.0	31.7
82	60.6	55.4	43.9	34.4	32.0	34.8
84	67.8	61.9	49.0	38.2	35.3	38.1
86	75.7	69.1	54.5	42.3	38.8	41.7
88	84.3	76.9	60.6	46.8	42.6	45.6
90	93.7	85.4	67.1	51.7	46.8	49.7

Table Axle load equivalency factors for flexible pavements, single axles and p, 2.5.

Axle Load (kips)	Pavement Structural Number (SN)					
	1	2	3	4	5	6
2	.0004	.0004	.0003	.0002	.0002	.0002
4	.003	.004	.004	.003	.002	.002
6	.011	.017	.017	.013	.010	.009
8	.032	.047	.051	.041	.034	.031
10	.078	.102	.118	.102	.088	.080
12	.168	.198	.229	.213	.189	.176
14	.328	.358	.399	.388	.360	.342
16	.591	.613	.646	.645	.623	.606
18	1.00	1.00	1.00	1.00	1.00	1.00
20	1.61	1.57	1.49	1.47	1.51	1.55
22	2.48	2.38	2.17	2.09	2.18	2.30
24	3.69	3.49	3.09	2.89	3.03	3.27
26	5.33	4.99	4.31	3.91	4.09	4.48
28	7.49	6.98	5.90	5.21	5.39	5.98
30	10.3	9.5	7.9	6.8	7.0	7.8
32	13.9	12.8	10.5	8.8	8.9	10.0
34	18.4	16.9	13.7	11.3	11.2	12.5
36	24.0	22.0	17.7	14.4	13.9	15.5
38	30.9	28.3	22.6	18.1	17.2	19.0
40	39.3	35.9	28.5	22.5	21.1	23.0
42	49.3	45.0	35.6	27.8	25.6	27.7
44	61.3	55.9	44.0	34.0	31.0	33.1
46	75.5	68.8	54.0	41.4	37.2	39.3
48	92.2	83.9	65.7	50.1	44.5	46.5
50	112.	102.	79.	60.	53.	55.

付録5-1(2)　舗装厚指数の推定

The estimations of this design method used the recommend nomogram are presented by each layer on page AP-38 to AP-44.

On the other hand, a method of "AASHTO Interim Guide for Design of Pavement Structures 1972" is that the value is estimated by assuming the CBR value as presented on page AP-45 to AP-46. The results of this estimations are summarized below:

Section	No.0(Santa Barbara) -No.48	No.48 -No.60(Caranavi)	No.60(Caranavi) -End Point(Bella Vista)
Design CBR of Roadbed Soil	10.0	7.0	7.0
Roadbed	2.5 (2.9)	3.0 (3.0)	2.7 (2.7)
Sub-base Course	2.3	(2.3)	2.0 (2.0)
Base Course	1.7	(1.7)	1.5 (1.5)

Note: Parenthesized figures indicate the values estimated by AASHTO Interim Guide Method. Underlined figures indicate the adopted values.

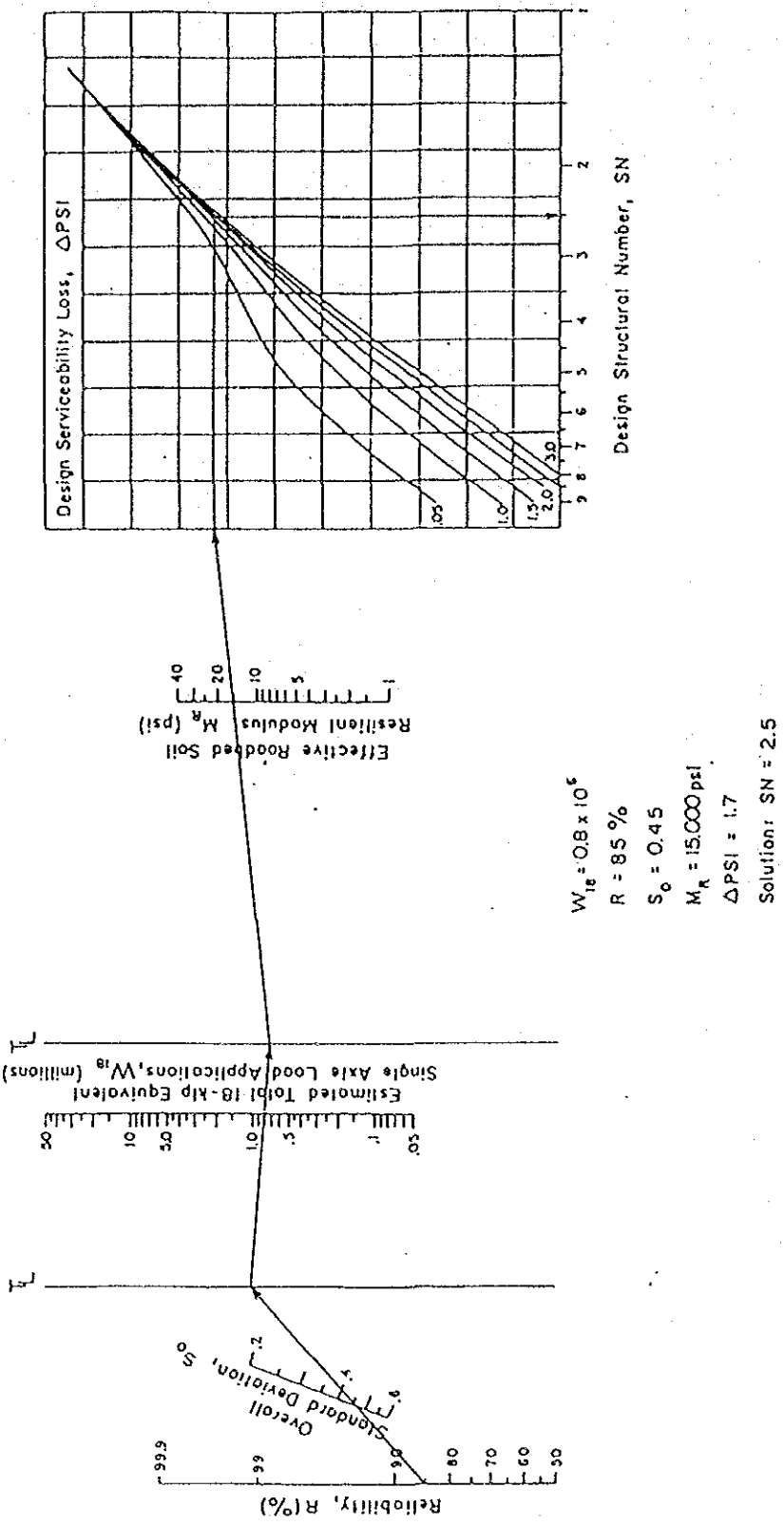
Reference: The adopted value (2.9) of roadbed in the section between No.0 (Santa Barbara) and No.48 corresponds to the elastic resilient modulus of 12,000psi.(AP-47)

I. Estimations by This Vesign Method

SN for Roadbed

Highway Pavement Structural Design

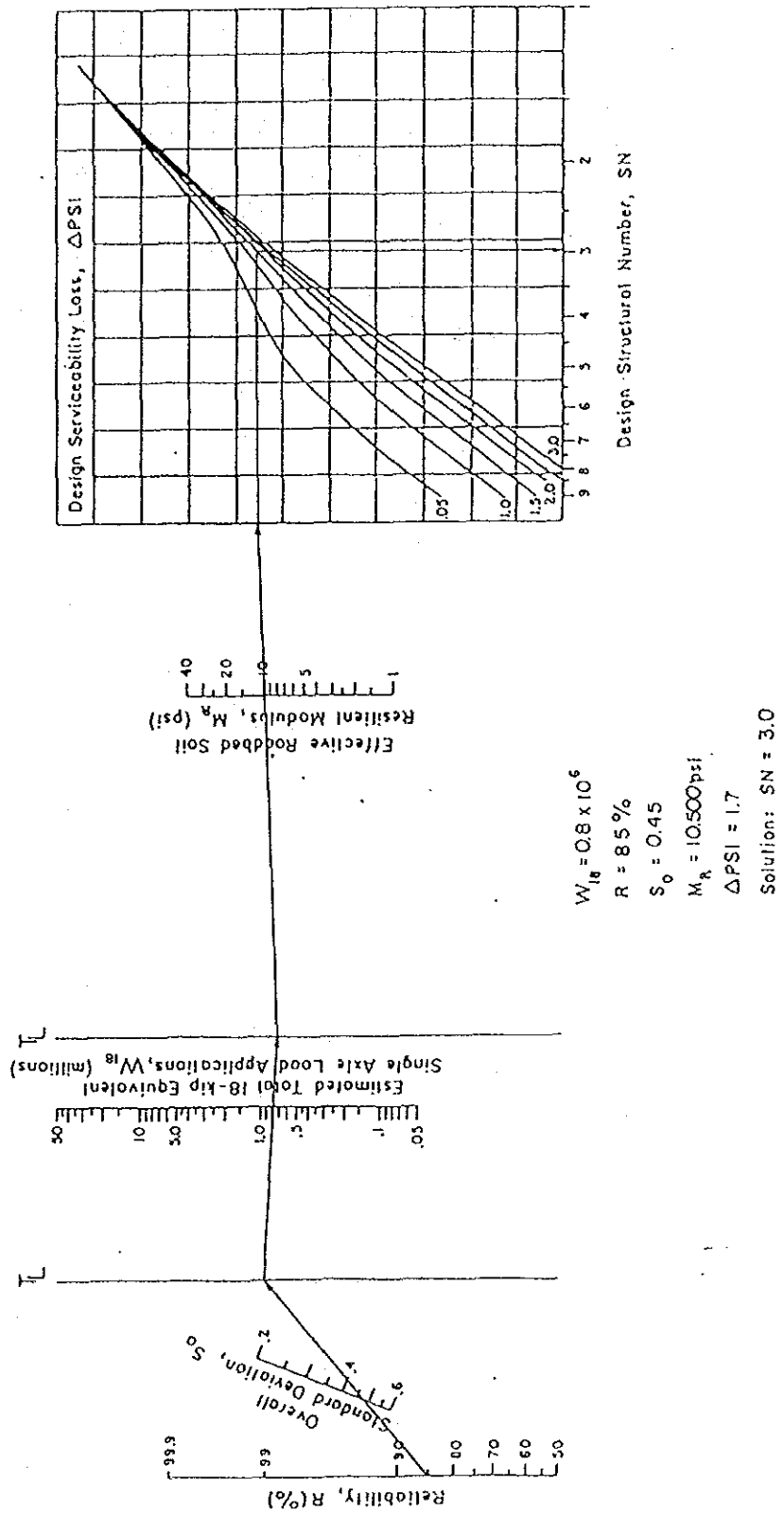
No. 0 (Sta. Barbara) - No. 48



SN for Roadbed

Highway Pavement Structural Design

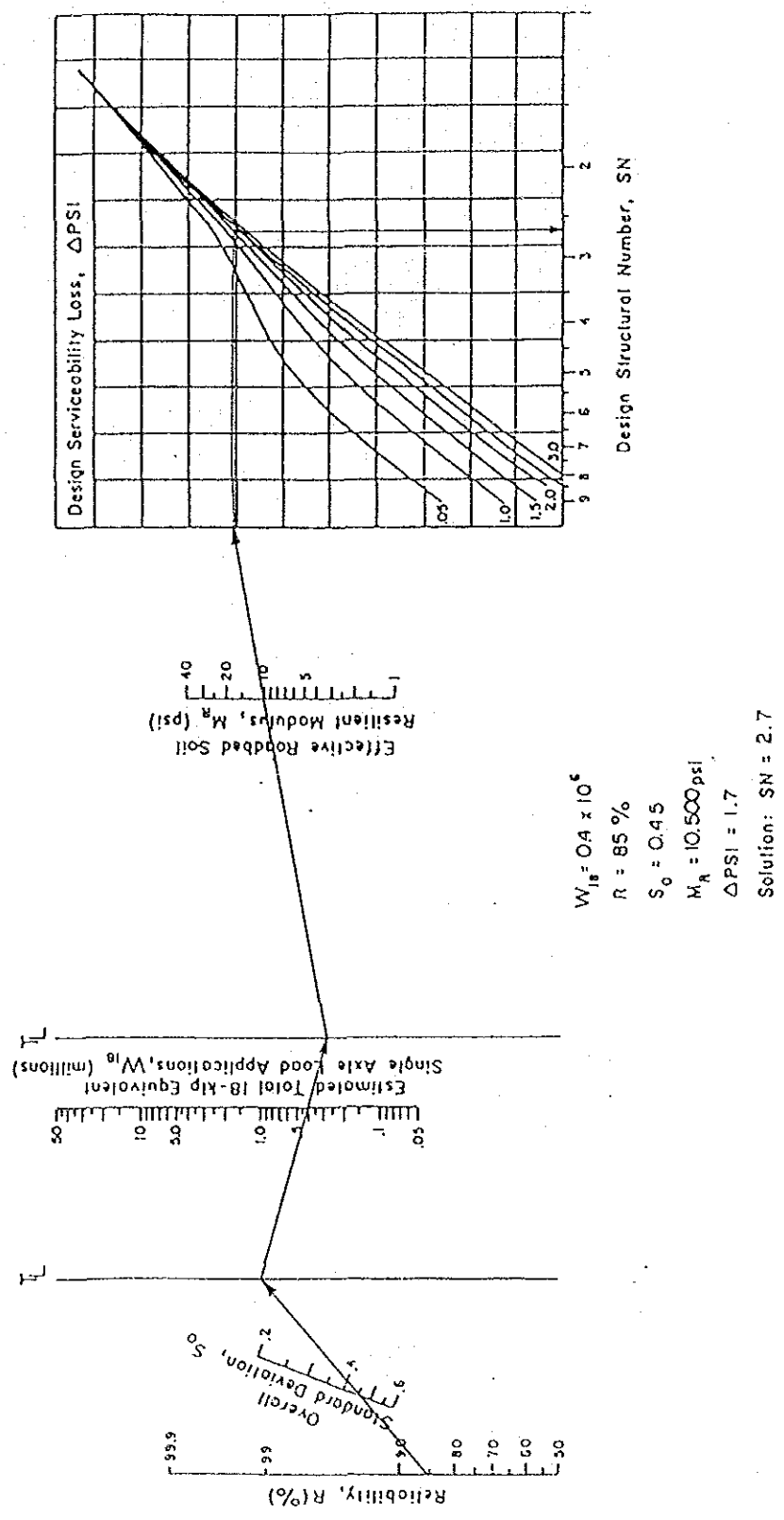
No. 48 – No. 60 (Caranavi)



SN for Roadbed

Highway Pavement Structural Design

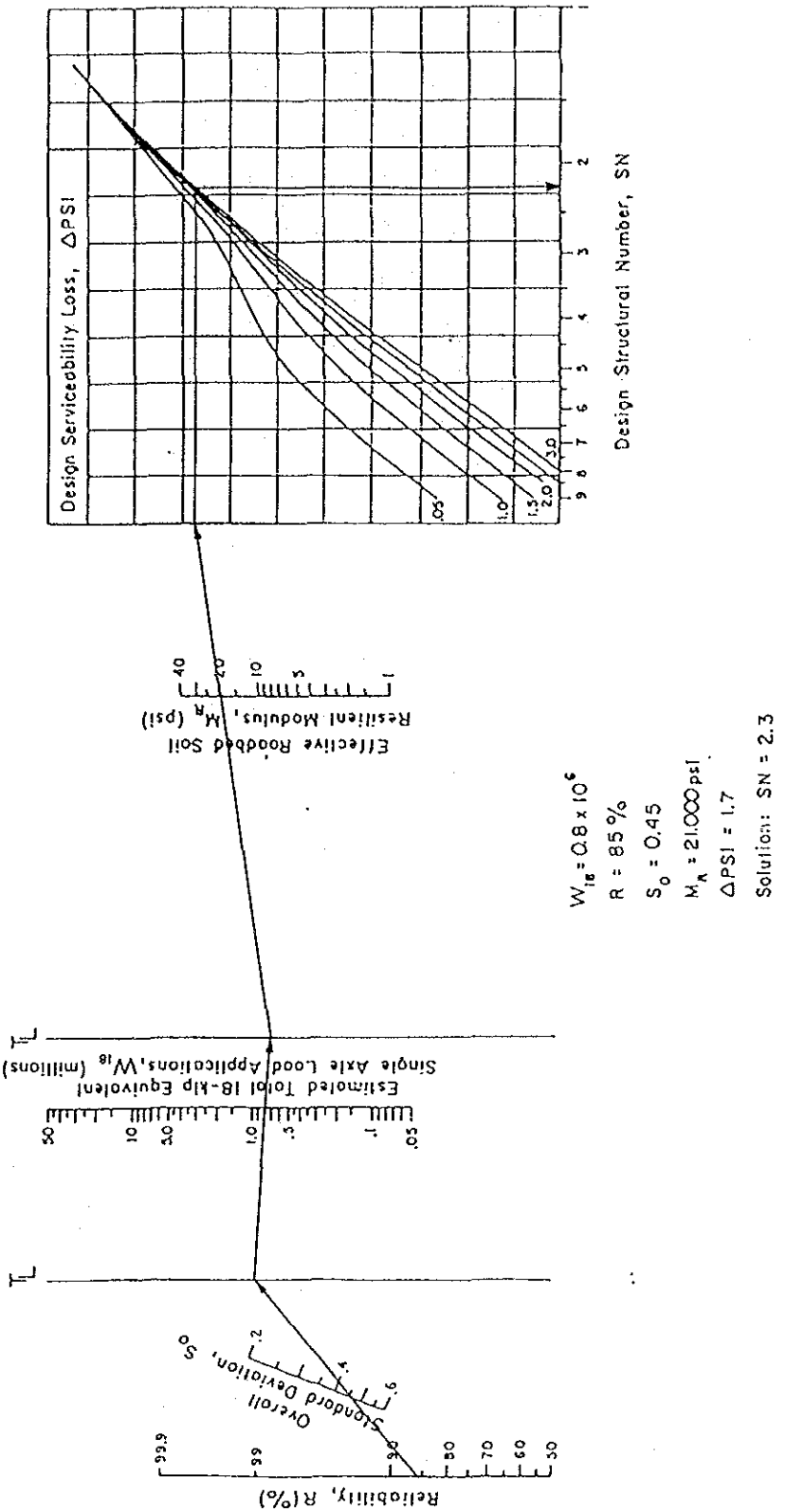
No. 60 (Caranavi) - End Point (Bella Vista)



SN for Subbase Course

Highway Pavement Structural Design

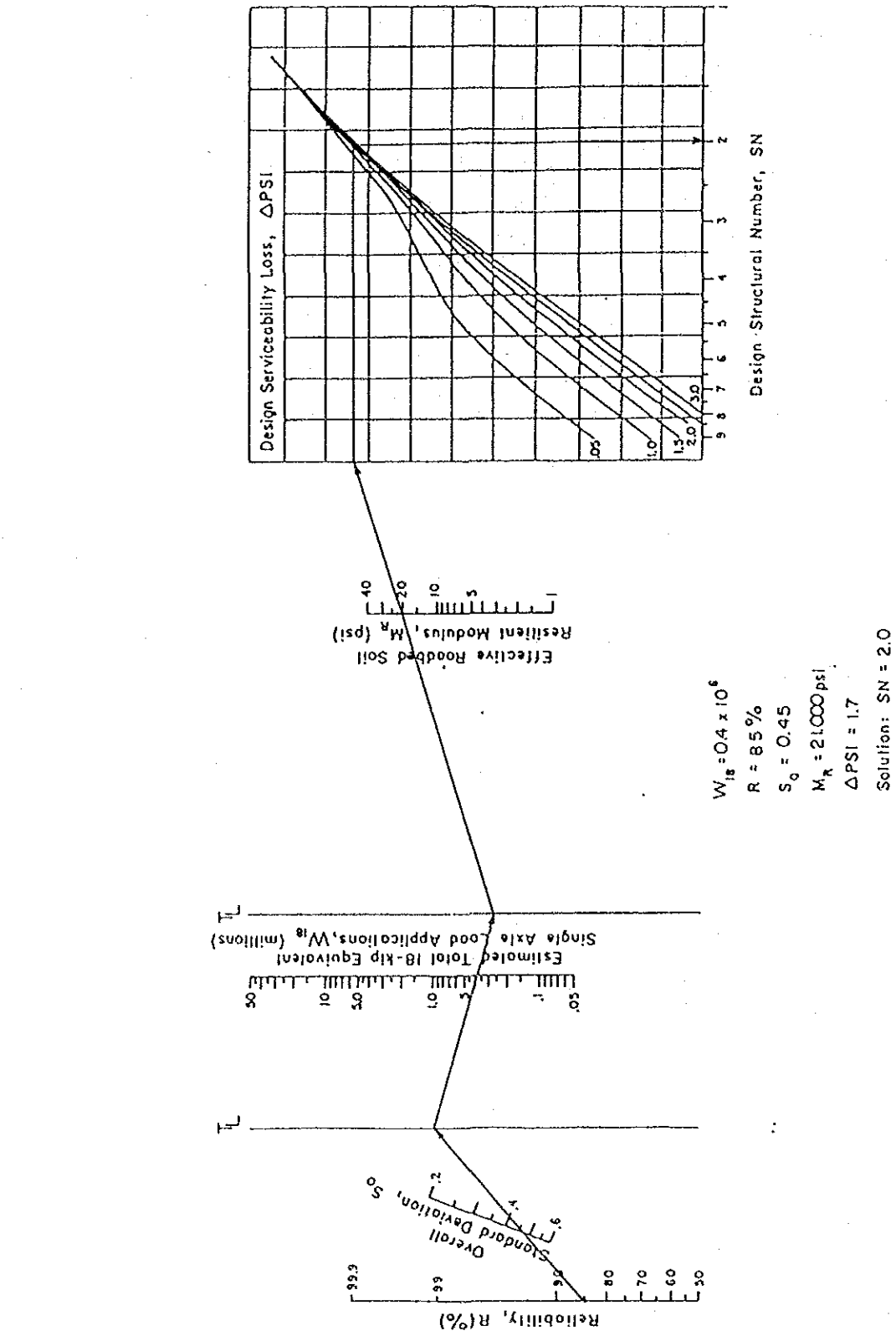
No.0 (Sta. Barbara) - No.60 (Caranavi)



SN for Subbase Caurse

Highway Pavement Structural Design

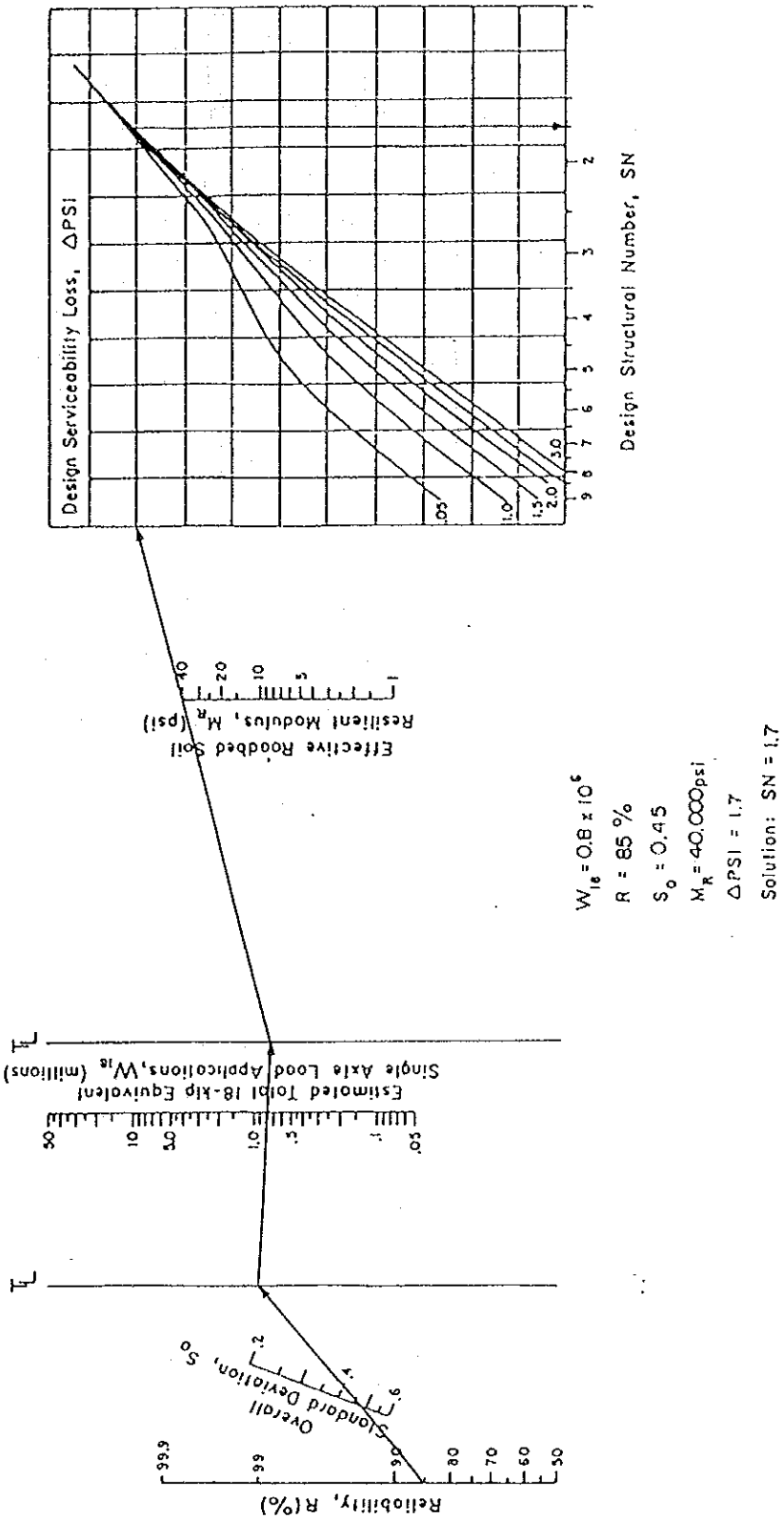
No. 60 (Caranavi) - End Point (Bella Vista)



SN for Base Course

Highway Pavement Structural Design

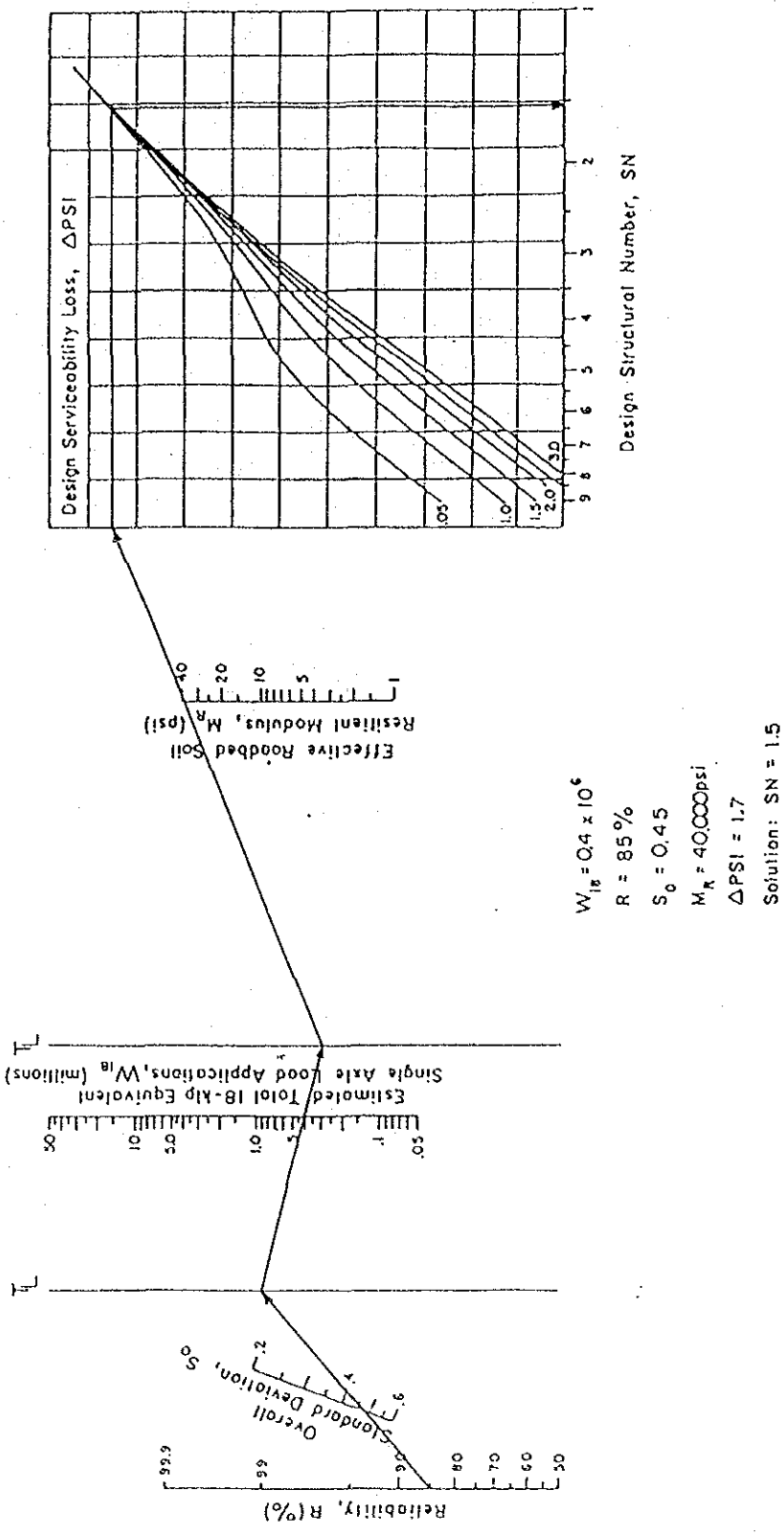
No. 0 (Sta. Barbara) - No. 60 (Caranavi)



SN for Base Course

Highway Pavement Structural Design

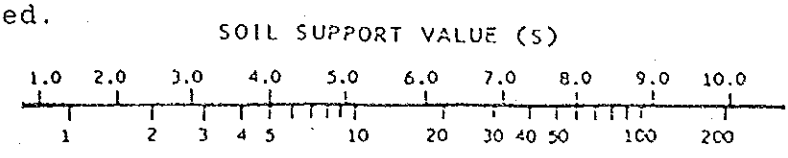
No. 60 (Caranavi) - End Point (Belle Vista)



II Estimation by AASHTO Interim Guide Method

Step 1

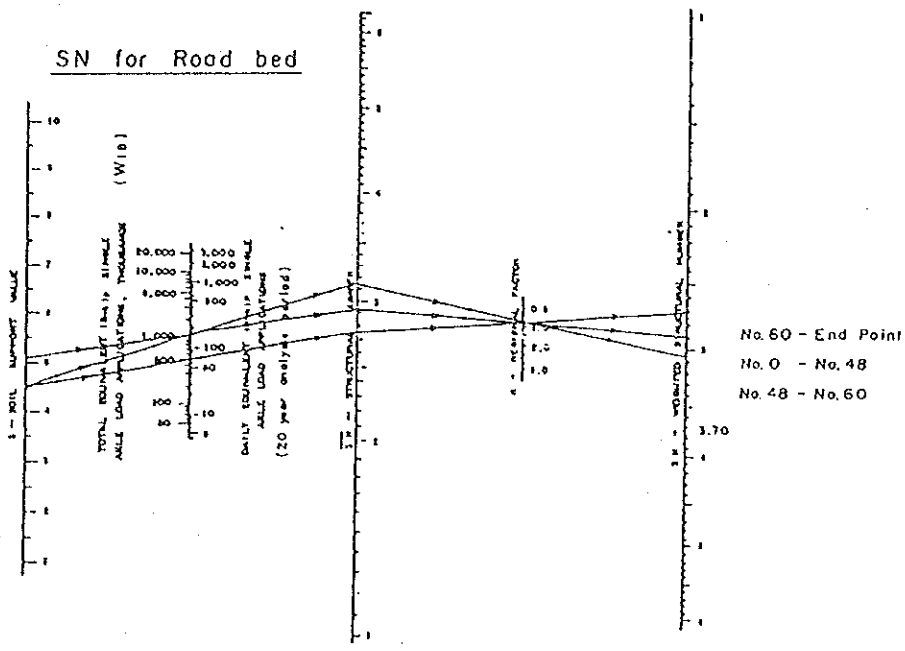
The Soil support values for roadbed, base course and sub-base course were estimated using the following scale established.



	Design CBR(%)	Soil Support Value	Remarks
Roadbed	10.0	5.1	No.0 - No.48
	7.0	4.5	No.48 - End Point
Sub-base Course	30.0	6.8	The CBR value was determined by the availability on site.
Base Course	80.0	8.5	- ditto -

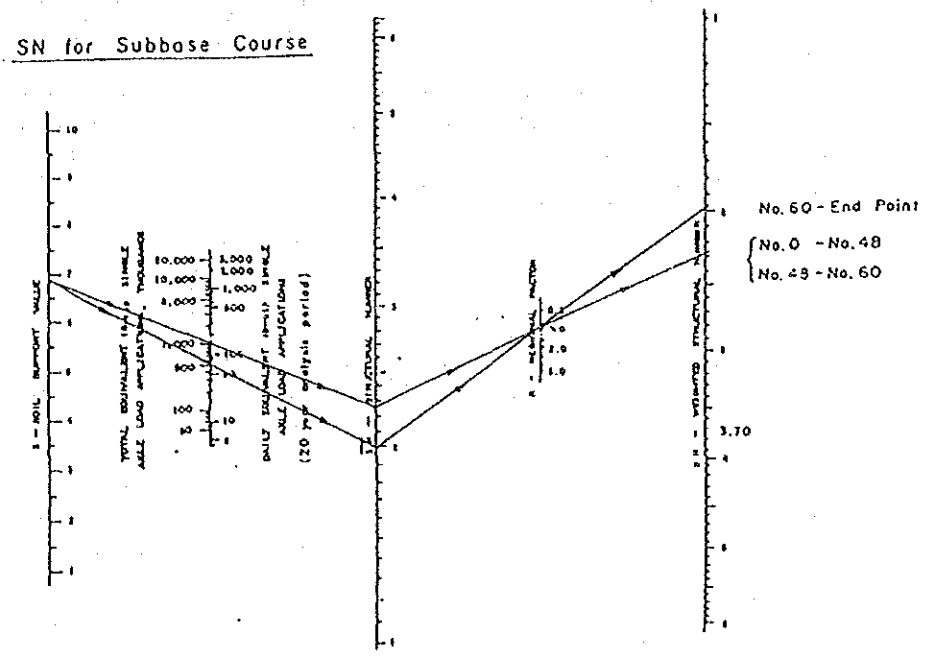
Step 2

SN for Road bed



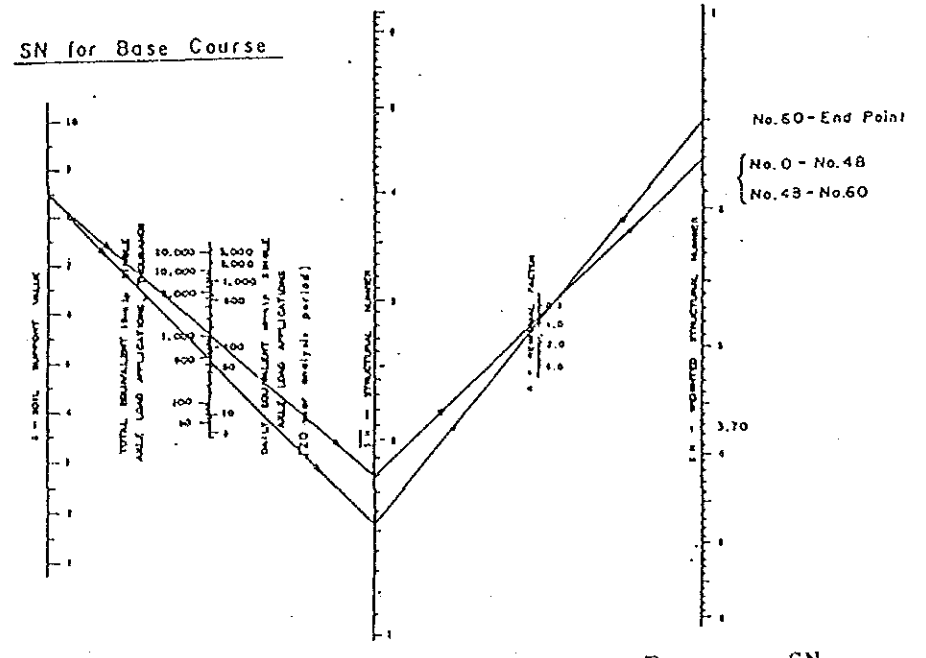
	S	W_{18}	R	SN
No. 0 - No.48	5.1	861.066	0.9	2.9
No.48 - No.60	4.5	861.066	0.9	3.0
No.60 - End Point	4.5	409.645	0.9	2.7

SN for Subbase Course

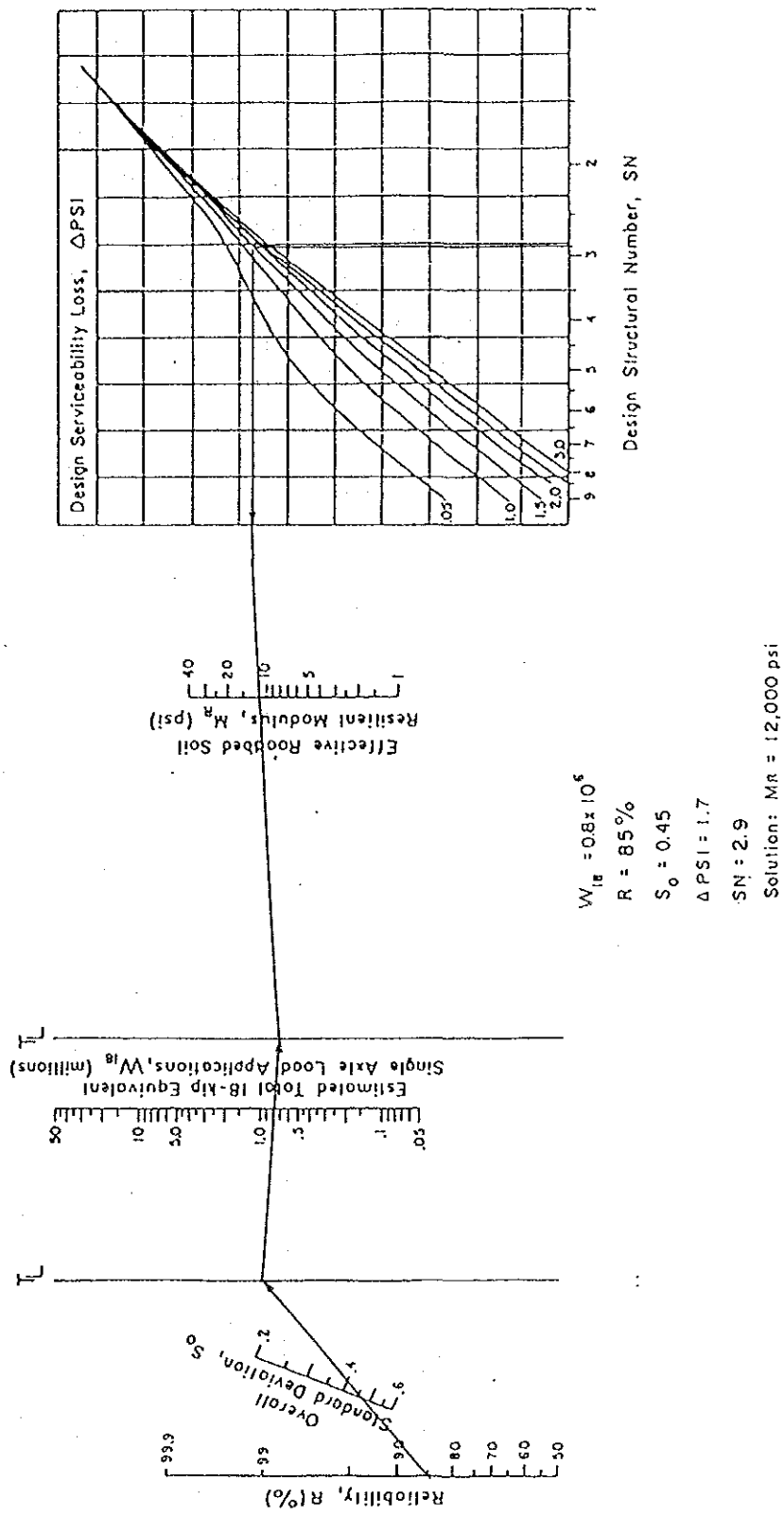


	S	W_{18}	R	SN
No. 0 - No.48	6.8	861.066	0.9	2.3
No.48 - No.60	6.8	861.066	0.9	2.3
No.60 - End Point	6.8	409.645	0.9	2.0

SN for Base Course



	S	W_{18}	R	SN
No. 0 - No.48	8.5	861.066	0.9	1.7
No.48 - No.60	8.5	861.066	0.9	1.7
No.60 End Point	8.5	409.645	0.9	1.5



Design chart for flexible pavements based on using mean values for each input.

付録5-1(3) 舗装厚の決定

No. 0 (Santa Barbara) - No.48

$SN_1 / a_1 = 1.7 / 0.44 = 3.86 < \underline{D_1^* = 4}$

$SN_1^* = a_1 D_1^* = 0.44 \times 4 = 1.76 > SN_1 = 1.7$

$(SN_2 - SN_1^*) / a_2 m_2 = (2.3 - 1.76 / 0.14 \times 1.0 = 3.86 < \underline{D_2^* = 6}$

$SN_2^* = a_2 D_2^* m_2 = 0.14 \times 6 \times 1.0 = 0.84$

$SN_1^* + SN_2^* = 1.76 + 0.84 = 2.6 > SN_2 = 2.3$

$(SN_3 - (SN_1^* + SN_2^*)) / a_3 m_3 = (2.9-2.6) / 0.11 \times 1.0 = 2.73 < \underline{D_3^* = 6}$

No.48 - No.60 (Caranavi)

$SN_1 / a_1 = 1.7 / 0.44 = 3.86 < \underline{D_1^* = 4}$

$SN_1^* = a_1 D_1^* = 0.44 \times 4 = 1.76 > SN_1 = 1.7$

$(SN_2-SN_1^*)/a_2 m_2=(2.3-1.76)/0.14 \times 1.0 = 3.86 < \underline{D_2^* = 6}$

$SN_2^* = a_2 D_2^* m_2 = 0.14 \times 6 \times 1.0 = 0.84$

$SN_1^* + SN_2^* = 1.76 + 0.84 = 2.6 > SN_2 = 2.3$

$(SN_3 - (SN_1^* + SN_2^*)) / a_3 m_3 = (3.0 - 2.6) / 0.11 \times 1.0 = 3.64 < \underline{D_3^* = 6}$

No.60 (Caranavi) - End Point (Bella Vista)

$SN_1 / a_1 = 1.5 / 0.44 = 3.41 < \underline{D_1^* = 4}$

$SN_1^* = a_1 D_1^* = 0.44 \times 4 = 1.76 > SN_1 = 1.5$

$(SN_2 - SN_1^*) / a_2 m_2 = (2.0 - 1.76) / 0.14 \times 1.0 = 1.71 < \underline{D_2^* = 6}$

$SN_2^* = a_2 D_2^* m_2 = 0.14 \times 6 \times 1.0 = 0.84$

$SN_1^* + SN_2^* = 1.76 + 0.84 = 2.6 > SN_2 = 2.0$

$(SN_3 - (SN_1^* + SN_2^*)) / a_3 m_3 = (2.7-2.6) / 0.11 \times 1.0 = 0.91 < \underline{D_3^* = 6}$

Note: In the AASHTO Guide (1986), a minimum thickness of 6 inches is recommended to aggregate base. Furthermore, a minimum thickness of base and subbase should be 2.5 to 3.0 times of maximum aggregate diameter from previous experience. Assuming that the maximum aggregate diameter is 2 inches, the minimum thicknesses should be 6 inches. As described above, all of the estimated thickness of base and subbase were less than the minimum thickness. Thus, the design layer thickness of base and subbase adopted 6 inches of minimum thickness.

付録6-1　　土工および橋梁の数量総括表

QUANTITY ESTIMATES

Section of Project			1	2	3	4	5	6	Total
Station No		Unit	0+000 - 25+300	25+300 - 46+760	46+760 - 60+000	60+000 - 79+550	79+550 - 101 +300	101+300 - 108 +630	0+000 - 108 +639
Proposed Road Length		m	25,042	20,543	13,059	19,418	21,725	7,330	107,115
Total Tunnel Length		m	0	745	0	0	0	0	745
Total Bridge Length		m	258	172	181	134	25	0	770
Total Section Length		m	25,300	21,460	13,240	19,550	21,750	7,330	108,630
Earth Work	Clearing and Grubbing	ha	48.13	38.38	20.85	30.30	36.85	7.98	182.49
	Excavation A	m³	120,786	143,289	319,367	203,723	643,364	167,421	1,597,950
	Excavation B	m³	2,757,124	2,492,559	516,378	1,681,222	1,659,738	139,966	8,707,087
	Finished Rolling of Subgrade	m²	253,755	208,162	132,327	196,742	220,139	74,275	1,085,401
	Slope: Seed Spraying	m²	20,527	15,104	41,430	55,703	75,375	25,107	233,246
	Slope: Concrete Spraying	m²	18,184	37,113	6,660	24,475	8,229	794	95,455
	Slope: Cribworks	m²	2,627	3,773	890	2,500	1,790		11,544
	Slope: Concrete Pitching	m²			400	1,810			2,210
	Retaining Wall: Gravity(4")	m	50						50
	Retaining Wall: Stone Masonry	m²	2,947	1,230	14,373	2,623	2,869	712	24,754
	Retaining Wall: Grid Type	m²	6,206	5,222	2,343	3,573	26,304	1,612	45,260
	Culvert: Box 3.0X3.0	m	50	50	75	40	160		375
	Culvert: Box 4.0X4.0	m	35	10					45
	Culvert: Pipe Φ1.0	m	1,997	1,643	1,045	1,553	1,738	584	8,560
	Disaster: Catch Netting	m²		800		2,000	1,040		3,840
	Disaster: Gabion	m		42		102			144
	Disaster: Catch Fence	m	51	42			54		147
	Disaster: Gabion Dam	m³			3,764	5,211		2,179	11,154
	Disaster: Shed	m		62					62
	Disaster: French Drain	m						1,010	1,010
	Drainage	Km	25.0	20.5	13.1	19.5	21.7	7.3	107.1
Pavement	Subbase Course	m²	249,048	204,300	129,872	193,092	216,055	72,897	1,065,264
	Base Course	m²	239,657	196,596	124,975	185,811	207,908	70,148	1,025,095
	Binder Course	m²	232,917	191,071	121,463	180,585	202,005	68,176	996,281
	Surface Course	m²	229,010	187,867	119,426	177,550	198,675	67,033	979,571
Bridge	ℓ ≧ 50m	Set	2	2		2			6
	ℓ < 50m	Set	2	2		1	1		7
Tunnel	Lining	m		120					120
	Unsupported	m		625					625
	Portal	Pcs		4					4
Others	Traffic Sign and Guard Rail	Km	25.0	20.5	13.1	19.5	21.7	7.3	107.1
	Marking	Km	25.0	20.5	13.1	19.5	21.7	7.3	107.1
Pavement	Asphalt Macadam Surface	m²	228,082	187,106	118,941	176,841	197,871	66,762	975,603

Note : Excavation A = Excavation, used for embankment material including compaction

Excavation B = Excavation, waste soil transport

A. Quantities of Earthwork

A.1 Quantity of Clearing and Grubbing

Section	1	2	3	4	5	6	Total
Quantity(ha)	48.13	38.38	20.85	30.30	36.85	7.98	182.49

Section 1 (No.0+000 - No.25+300): 6.00(1)+4.92(2)+7.18(3)+5.60(4)+5.59(6)+6.05(7)+5.60(8)+2.14(9)=48.13ha

Section 2 (No.25+300 - No.46+760): 2.83(9) +5.12(10)+6.7(11)+4.63(12)+5.30(13)+6.00(14)+2.50(16)=38.38ha

Section 3 (No.46+760 - No.60+000): 1.80(16)+6.55(17)+5.20(18)+5.65(19)+1.65(20)=20.85ha

Section 4 (No.60+000 - No.79+550): 4.65(21)+4.28(22)+5.05(23)+5.40(24)+5.40(25)+3.80(26)+1.72(27)=30.30ha

Section 5 (No.79+550 - No.101+300): 1.82(27)+4.25(28)+4.90(29)+3.80(30)+6.38(31)+5.50(32)+6.20(33)+4.00(34)=36.85ha

Section 6 (No.101+300 - No.108+630): 0.78(34)+4.00(35)+3.20(36)=7.98ha

Note: ( ) : Drawing No.
Refer: Drawing of plan (36 sheets)
Calculation by planimeter

A.2 Quantity of Excavation Soil

Section	1	2	3	4	5	6	Total
Item							
Cutting	2,865,515	2,627,084	785,667	1,283,024	2,304,623	330,366	10,196,279
Embankment	120,489	143,289	271,514	204,155	642,126	130,381	1,511,954
Replacement			48,000			37,040	85,040
Excavation A	120,489	143,289	319,514	204,155	642,126	167,421	1,596,994
Excavation B	2,745,026	2,483,795	514,153	1,078,869	1,662,497	199,985	8,684,325

Quantity of Replacement (Improvement of Subgrade)

No. 48 - No.54 6,000m(L) X 8m(W) X 1m(t) = 48,000m3
No.104 - E.P. 4,630m(L) X 8m(W) X 1m(t) = 37,040m3

L : Road Length W : Road Wide t : Thickness

Refer: Earth Volume Calculation sheets (70 sheets)

A.3 Quantity of Rolling of Sub-grade

Unit: m^2

Section	1	2	3	4	5	6	Total
Rolling of Sub-grade	253,756	208,162	132,327	196,742	220,139	74,275	1,085,401

$A(m^2)$ = W(m) X L(m) W : Road Wide L : Road Length

Section 1 A = 10.133 X 25,042.5 = 253,756m^2
Section 2 A = 13.133 X 20,543 = 208,162m^2
Section 3 A = 10.133 X 13,059 = 132,327m^2
Section 4 A = 10.133 X 19,416 = 196,742m^2
Section 5 A = 10.133 X 21,725 = 220,139m^2
Section 6 A = 10.133 X 7,330 = 74,275m^2

A.4 Quantity of Slope Protection

Unit:m^2

Section	1	2	3	4	5	6	Total
Item							
Seed Spraying	20,527	15,104	41,430	55,703	75,375	25,107	233,246
Concrete Spraying	16,184	37,113	6,660	24,475	8,229	794	95,455
Cribworks	2,627	3,773	890	2,500	1,790		11,544
Concrete Pitching			400	1,810			2,210

Seed Spraying All of Embankment Slope
* Refer Calculation Sheets (70 sheets)

Concrete Spraying

Section 1

No. 3+645	-	No. 3+750	1,700m^2
4+375	-		1,305
7+050	-	7+150	2,140
12+600	-	12+700	2,520
14+160	-	14+300	2,520
16+160	-	16+255	792
21+160			2,987
23+ 50	-	23+150	4,220

Section 2

No.25+950	-	No.26+ 50	4,755m^2
26+780	-	26+850	930
28+845	-	29+120	13,588
29+575	-	29+905	10,377
31+850	-	31+950	6,550
45+230	-		913

Section 3

No.47+520	-		510m^2
49+230	-	No.49+230	3,570
49+710	-	49+860	1,260
57+750	-		1,320

Section 4

No.63+ 50 -	No.63+375	8,284m^2
63+850 -	63+950	1,950
66+000		184
69+110 -	69+340	6,120
69+625 -	69+700	1,267
70+250 -	70+350	3,400
70+600 -	70+750	3,270

Section 5

No.90+690 -	No.90+850	4,084m^2
99+ 10 -	99+100	2,570
99+200 -	99+270	1,575

Section 6

No.101+475	794m^2

Crib Works

Section 1

No. 0+700	240m^2
2+200	400
8+100	520
10+900	685
12+780	782

Section 2

No.29+500	1,260m^2
38+740	1,040
44+400	1,437

Section 3

No.55+500	890m^2

Section 4

No.66+500	420m^2
75+570	780
78+600	1,300

Section 5

No.84+350	1,790m^2

Concrete Pitching

Section 3

No.58+200	400m^2

Section 4

No.70+100	900m^2
77+800	910

A.5 Quantity of Retaining Wall

Item	1	2	3	4	5	6	Total
Gravity(m)	50						50
Stone Masonry(m2)	2,947	1,230	14,373	2,623	2,869	712	24,754
Grid Type(m2)	6,206	5,222	2,343	3,573	26,304	1,612	45,260

Gravity (H=4m)

Section 1 No.1+ - No.1+530 50m

Stone Masonry				Grid Type			
Section 1 No.	1+930 - No.	1+960	30m2	Section 1 No.	0+700		3,354
	2+575 -	2+640	240		1+580 - No.	1+649	578
	6+700		520		16+100 -	16+120	667
	13+890 -	14+ 50	1,050		17+380 -	17+420	250
	15+850 -	15+870	50		19+75	19+110	136
	17+250 -	17+320	150		19+130 -	19+150	88
	20+ 75 -	20+120	125		20+500 -	20+540	250
	21+540 -	21+680	467		21+950 -	21+990	388
	23+740 -	23+770	50		24+300 -	24+390	495
	24+460 -	24+540	175				
Section 2 No.	33+ 70 -	33+120	355	Section 2 No.	25+350 -	25+365	70
	33+200 -	33+250	300		33+700		1,252
	34+780 -	34+850	175		35+510 -	35+580	578
	42+710 -	42+735	50		37+240 -	37+260	829
	46+350 -	46+450	300		39+ 30		2,493
	46+700 -	46+730	50				

Section 3 No.	46+790	46+800	50
	50+220	50+900	7,280
	50+900	51+ 50	2,280
	51+850	52+300	3,375
	52+870	52+960	338
	54+170	54+270	375
	54+320	54+350	150
	55+510	55+650	525
Section 4 No.	61+270	61+340	263
	63+300	63+445	315
	66+ 50	66+155	263
	66+670	66+780	360
	76+680	76+730	63
	76+820	76+860	100
	77+470	77+520	188
	78+100		411
	79+470	79+51	630
	79+510	79+520	30
Section 5 No.	79+580	No. 79+600	50
	83+145	83+230	300
	83+300	83+455	465
	83+525	83+630	202
	84+930	85+000	158
	86+530	86+670	525
	86+720	86+870	225
	87+790	87+850	184
	89+ 60	89+100	120
	89+200	89+235	120
	89+540	89+600	145
	92+180	92+285	375
Section 6 No.	102+475	No. 102+520	85
	103+ 20	103+150	368
	104+400	104+440	79
	105+325	105+390	180

Section 3 No.	47+270		448
	49+700		1,895
Section 4 No.	66+780	No. 66+840	490
	68+440		872
	74+750	74+790	308
	75+630	76+ 50	1,150
	78+380	78+460	640
Section 5 No.	79+855	No. 79+900	670
	80+240	80+300	244
	80+350		2,012
	82+400		715
	83+650	83+690	290
	85+770	85+870	625
	89+345	89+470	630
	89+620	89+800	878
	89+980	90+ 50	640
	90+660	90+680	105
	91+250	91+260	93
	91+320	91+430	760
	91+960	92+ 70	1,460
	92+340	92+550	3,235
	92+710	92+760	173
	94+300	94+375	700
	94+470	94+520	740
	94+550	94+630	135
	97+420	97+490	790
	97+670	97+680	288
	97+730	97+790	908
	98+ 25	98+210	8,170
	98+960	99+ 00	433
	99+130	99+190	525
	99+700	99+745	641
	100+320	100+400	444
Section 6 No.	101+400	No. 101+455	438
	101+840	101+855	240
	102+670	102+720	244
	103+150	103+210	282
	103+385	103+450	408

A.6 Quantity of Culvert

Section	1	2	3	4	5	6	Total
Item							
Box - 3.0 X 3.0	50	50	75	40	160		375
Box - 4.0 X 4.0	35	10					45
Pipe 600	3,339	2,739	1,741	2,589	2,897	977	14,282

Box Culvert

	3.0m(B) X 3.0m(H)		4.0m(B) X 4.0m(H)	
Section1	No. 20+540	L=50m	No. 14+160	L=35m
Section2	No. 28+145	L=15m	No. 30+180	L=10m
	43+700	L=35m		
Section3	No. 49+210	L=35m		
	49+685	L=40m		
Section4	No. 64+630	L=40m		
Section5	No. 96+490	L=70m		
	97+225	L=40m		
	98+420	L=50m		

Pipe Culvert

Average Interval 150^{m} Average Length 20^{m}

Section1	26,963^{m}	X	1/250^{m}	X	20^{m}	= 1,997^{m}
Section2	20,543^{m}	X	1/250^{m}	X	20^{m}	= 1,643^{m}
Section3	13,059^{m}	X	1/250^{m}	X	20^{m}	= 1,045^{m}
Section4	19,416^{m}	X	1/250^{m}	X	20^{m}	= 1,553^{m}
Section5	21,725^{m}	X	1/250^{m}	X	20^{m}	= 1,738^{m}
Section6	7,300^{m}	X	1/250^{m}	X	20^{m}	= 584^{m}

A.7 Quantity of Disaster

Section	1	2	3	4	5	6	Total
Item							
Catch Netting(m2)		800		2,000	1,040		3,840
Gabion (m)		42		102		144	
Catch Fence (m)	51	42			54	147	
Gabion Dam (m3)			3,764	5,211		2,179	11,154
Shed (m)		62					62
French Drain (m)						1,010	1,010

Catch Netting	Section 2	No. 35+560	800m2
	Section 4	No. 76+320	2,000m2
Gabion	Section 2	No. 33+700	42m
	Section 4	No. 76+320	102m
Catch Fence	Section 1	No. 12+780	51m
	Section 2	No. 76+320	42m
	Section 5	No. 92+900	54m
Gabion Dam	Section 3	No. 49+210	3,764m3
	Section 4	No. 68+820	1,274m3
		No. 73+890	1,098m3
	Section 6	No.103+190	2,179m3
Shed	Section 2	No. 40+300	62m
French Drain	Section 6	No.104+ 20	290m
		No.104+670	270m
		No.105+840	120m
		No.107+500	330m

A.8 Quantity of Drainage

Section 1	25 Km	Type 1+Type 2
Section 2	20.5Km	Type 1+Type 2
Section 3	13.1Km	Type 1+Type 2
Section 4	19.5Km	Type 1+Type 2
Section 5	21.7Km	Type 1+Type 2
Section 6	7.3Km	Type 1+Type 2

Type 1 : Road side drain and Top of Slope
Type 2 : Drain ditch on berm

A.9 Quantity of Pavement

Unit:m^2

Section	1	2	3	4	5	6	Total
Item							
Sub-base Course	249,048	204,300	129,872	193,092	216,055	72,897	1,065,264
Base Course	239,657	196,596	124,975	185,811	207,908	70,148	1,025,095
Binder Course	232,917	191,071	121,463	180,589	202,065	68,176	996,281
Surface Course	229,010	187,867	119,426	177,550	198,675	67,033	979,571
Asphalt Macadam	228,082	187,106	118,941	176,841	197,871	66,762	975,603

Typical cross-section

9.0m

t=5cm Surface Course
t=5cm Binder Course
t=15cm Base Course
t=15cm Sub-base Course

A = W1.L + W2.L.
A : Area W1 : Standard side W2 : Greatest widening(1.4m)
L : Road Length : Widening Portion for Road Length(5%)

Surface Course A=(9+0.075)L+(1.4X0.05)L=9.075L+0.07L=9.145L
Binder Course A=(9+0.231)L+0.07L=9.231L+0.07L=9.301L
Base Course A=(9+0.500)L+0.07L=9.500L+0.07L=0.57L
Sub-base Course A=(9+0.875)L+0.07L=9.875L+0.07=9.945L

Sub-base Course	Section 1	9.945 X 25,042.5	=	249,048m^2
	Section 2	9.945 X 20,543	=	204,300m^2
	Section 3	9.945 X 13,059	=	129,872m^2
	Section 4	9.945 X 19,416	=	193,092m^2
	Section 5	9.945 X 21,725	=	216,055m^2
	Section 6	9.945 X 7,330	=	72,897m^2
Base Course	Section 1	9.57 X 25,042.5	=	239,657m^2
	Section 2	9.57 X 20,543	=	196.596m^2
	Section 3	9.57 X 13,059	=	124,975m^2
	Section 4	9.57 X 19,416	=	185,811m^2
	Section 5	9.57 X 21,725	=	207,908m^2
	Section 6	9.57 X 7,330	=	70,148m^2
Binder Course	Section 1	9.301 X 25,042	=	232,917m^2
	Section 2	9.301 X 20,543	=	191,071m^2
	Section 3	9.301 X 13,059	=	121,463m^2
	Section 4	9.301 X 19,416	=	180,589m^2
	Section 5	9.301 X 21,725	=	202,065m^2
	Section 6	9.301 X 7,330	=	68,176m^2
Surface Course	Section 1	9.145 X 25,042	=	229,010m^2
	Section 2	9.145 X 20,543	=	187,867m^2
	Section 3	9.145 X 13,059	=	119,426m^2
	Section 4	9.145 X 19,416	=	177,550m^2
	Section 5	9.145 X 21,725	=	198,675m^2
	Section 6	9.145 X 7,330	=	67,033m^2
Asphalt Macadam	Section 1	9.108 X 25,042	=	228,082m^2
	Section 2	9.108 X 20,543	=	187,106m^2
	Section 3	9.108 X 13,059	=	118,941m^2
	Section 4	9.108 X 19,416	=	176,841m^2
	Section 5	9.108 X 21,725	=	197,871m^2
	Section 6	9.108 X 7,330	=	66,762m^2

A.10 Quantity of Tunnel

Two Nos Tunnels were designed between No.35+610 and No.36+430 in this project. (See Drawing (12) and (13))

Tunnel(1)	Lining	30m + 30m = 60m
	Unsupported	300m
	Total	360m
	Portal	2 pieces
Tunnel(2)	Lining	30m + 30m = 60m
	Unsupported	325m
	Total	385m
	Portal	2 pieces
Total	Lining	120m
	Unsupported	625m
	Portal	4 pieces

A.11 Quantity of Others

Traffic Sign and Guard Rail

Traffic Sign	Type R-19	11 pieces
	Type P	22 pieces
	Identif.	11 pieces
	Destino.	11 pieces
	B.M.	21 pieces

Guard Rail All of River or Valley Side

Section 1	25.0Km
Section 2	20.5Km
Section 3	13.1Km
Section 4	19.5Km
Section 5	21.7Km
Section 6	7.3Km

Marking(W=10cm) Two straight lines for both road side one line for Road Center

Section 1	25.0Km
Section 2	20.5Km
Section 3	13.1Km
Section 4	19.5Km
Section 5	21.7Km
Section 6	7.3Km

Bridges Quantity

1. Quantity of Superstructure

		Unit	Point A	Patuni	Challa	Cascada	Alto Choro	Pto.Leon	Cajones	Chojna	San Silverio	San Lorenzo	Espiritu	Carrasco	Avaroa
Concrete	P	m^3	1207.40	70.80	35.4	26.912	280.218	138.00	46.00	30.028	280.180	294.490	294.490	80.385	147.25
	A	m^3	—	111.838	55.649	45.995	—	203.301	70.544	49.96	—	—	—	106.423	—
Form		m^2	4193.06	(61.719) 544.218	(61.719) 272.109	(57.082) 222.597	1171.282	(97.535) 884.754	(97.535) 317.548	(65.742) 241.173	1171.282	1236.450	1236.450	(133.303) 454.848	585.640
Rainforcement Bar		ton	205.26	(0.779) 19.906	(0.779) 9.953	(0.740) 8.163	47.637	(1.265) 36.161	(1.265) 12.563	(0.826) 8.861	47.637	50.063	50.063	(1.768) 18.870	25.033
PC-Cable		kg	48296.0	4602.0	2301.0	1749.3	9807.6	8970.0	2990.0	1951.8	9807.6	10307.2	10307.2	5225.0	5153.7
Shoe		Set	4	20	10	8	8	24	8	8	8	8	8	10	4
Handrail		m	265.00	79.76	39.88	36.88	96.076	96.076	49.88	43.88	96.076	101.556	101.556	59.88	47.338
Expantion		m	22.0	24.8	24.8	22.0	23.0	23.0	22.0	22.0	23.0	23.0	23.0	27.0	23.0
Drainage		Pce	28.0	10	6	6	12	12	6	6	12	12	12	6	6
Newel Post		Set	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Erection		m^3	1207.40	—	—	—	—	—	—	—	—	—	—	—	—
		ton	—	177.0	88.5	67.28	701.0	701.0	115.0	75.07	701.0	737.0	737.0	200.96	350.0

※ Quantity of I-Girder is shown in ( )

2. Quantity of Substructure

(Abutment)

	Excavation (m^3)	Concrete (m^3)	Form (m^2)	Reinforcement Bar (ton)	Leveling concrete (m^2)	Staging (Spc.m^3)
Point A	247.4	122.10	236.86	6.72	6.60	181.06
Patuni	851.0	147.71	236.76	8.12	12.83	195.28
Challa	279.7	159.14	262.07	8.75	8.07	265.52
Cascada	506.7	102.36	202.38	5.63	8.06	161.40
Alto Choro	534.7	167.71	283.90	9.22	7.70	217.28
Pto Leon	712.4	228.73	370.54	12.58	9.68	497.56
Cajous	161.6	154.88	266.80	8.52	7.36	295.27
Chojna	142.6	142.88	229.65	7.86	8.40	108.66
San Silverio	748.3	284.48	414.46	15.65	11.00	361.84
San Lorenzo	912.1	204.58	340.60	11.25	9.35	281.52
Espiritu	878.2	159.52	259.88	8.77	9.35	190.78
Carrasco	1962.7	370.14	545.21	20.36	15.67	540.13
Avaroa	219.2	62.86	155.30	3.46	6.26	161.40

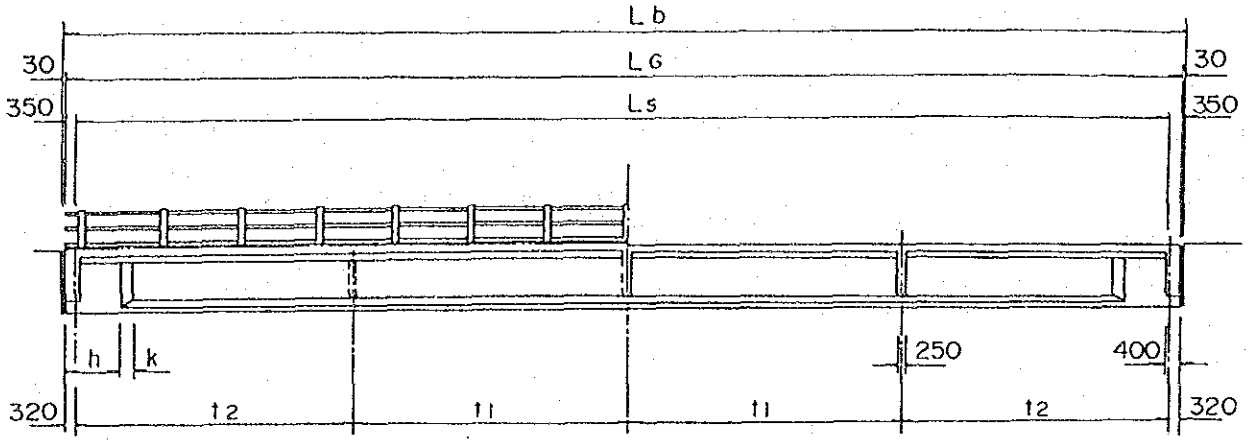
(Pire)

	Excavation (m^3)	Concrete (m^3)	Form (m^2)	Reinforcement Bar (ton)	Leveling concrete (m^2)	Staging (Spc.m^3)
Point A	334.0	1117.10	742.60	78.20	28.62	1287.0
Patuni	205.2	89.98	139.58	6.30	3.00	147.12
Alto Choro	113.9	83.18	129.03	5.82	3.20	136.00
Pto Leon	318.0	162.21	192.04	11.35	6.00	401.28
San Silverio	209.7	115.83	183.02	8.11	4.00	206.00
San Lorenzo	370.4	205.50	295.57	14.39	4.80	336.60
Espiritu	307.4	243.24	327.72	17.03	5.60	381.10

Quantity

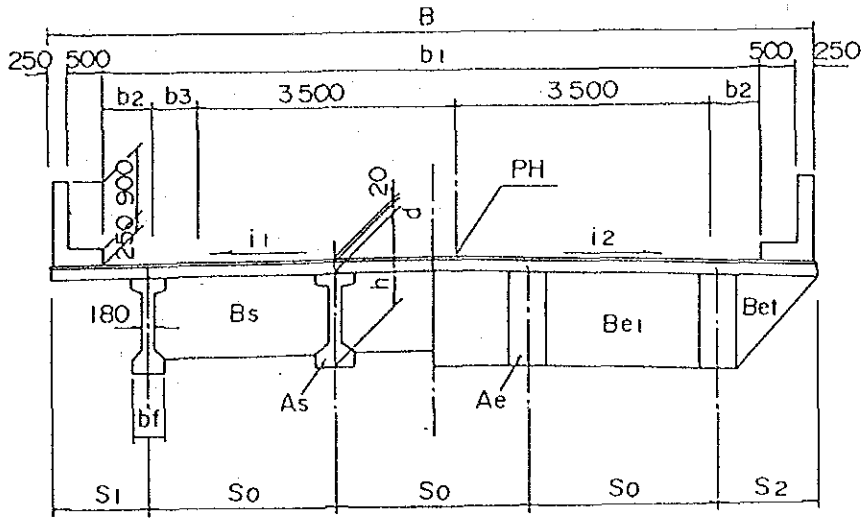
1. Superstructure

1.1 I-Girder



(Unit : m)

Name of Bridges	Total Bridge Length (L_B)	Girder Length (L_G)	Span (L_S)	Cross Beam				K
				T_1	T_2	h_t	m	
Patuni	40.000	19.94×2	19.65×2	6.400	6.450	0.770	2	0.40
Challa	20.000	19.94	19.3	6.400	6.450	0.770	2	0.40
Cascada	18.500	18.44	17.8	6.140	6.150	0.770	2	0.40
Pto.Leon	75.000	24.94×3	24.65×3	6.000	6.150	0.975	3	0.40
Cajones	25.000	24.94	24.3	6.000	6.150	0.975	3	0.40
Chojña	22.000	21.94	21.3	7.100	7.100	0.870	2	0.40
Carrasco	30.000	29.94	29.3	7.350	7.300	1.115	3	0.50



Name of Bridges	Width				Spaceing of Girder			Slab	Girder		
	B	b_1	b_2	b_3	S_o	S_1	S_2	d	h	b_f	n
Patuni	11.90	10.40	0.60	2.00	2.40	0.800 ~ 1.700	1.700 ~ 0.800	0.19	1.10	0.51	5
Challa	11.90	10.40	0.60	2.00	2.40	0.64~ 1.804	1.660 ~ 0.753	0.19	1.10	0.51	5
Cascada	10.50	9.00	1.00	—	2.60	1.35	1.35	0.19	1.10	0.51	4
Pto.Leon	8.80	7.30	0.15	—	2.20	1.10	1.10	0.18	1.50	0.51	4
Cajones	10.50	9.00	1.00	—	2.60	1.35	1.35	0.19	1.50	0.51	4
Chojña	10.50	9.00	1.00	—	2.60	1.35	1.35	0.19	1.20	0.51	4
Carrasco	13.00	12.00	2.50	—	2.60	1.30	1.30	0.19	1.70	0.56	5

Cross Section Area (Unit : m²)

	Patuni	Challa	Cascada	Pto.Leon	Cajones	Chojña	Carrasco
End of Girder (A_e)	0.561	0.561	0.561	0.772	0.772	0.612	0.962
Center of Girder (A_s)	0.317	0.317	0.317	0.412	0.412	0.337	0.472
End Cross Beam (Be_1)	2.079	2.079	2.229	2.528	3.128	2.508	3.458
End Cross Beam (Be_2)	0.602	0.602	0.602	0.821	0.821	0.657	0.862
Inner Cross Beam (B_s)	1.665	1.665	1.882	2.302	2.770	2.064	3.218

(1) Concrete Volume

1) Girder (Type P)

$$V_G = A_S \times (L_G - 2\cdot h - 2\cdot K) + 2 \times A_e \times h + \tfrac{1}{2}(A_S + A_e) \times K \times 2$$

2) Cross Beam (Type A)

$$V_C = 3 \times B_S \times 0.25 + 3 \times Be_1 \times 0.400 + 2 \times Be_2 \times 0.400$$

(4) (4)

3) Slab (Type A)

$$V_S = B \times d \times L_G$$

4) Pavement (Type A)

$$V_P = 0.02 \times b_1 \times L_G$$

Concrete Volume (Unit : m³)

	Patuni	Challa	Cascada	Pto.Leon	Cajones	Chojna	Carrasco	Sub Total
V_G	(7.080) 70.800	(7.080) 35.400	(6.728) 26.912	(11.500) 138.000	(11.500) 46.000	(7.507) 30.028	(16.077) 80.385	(67.472) 472.525
V_C	11.162	11.162	9.761	13.523	16.300	10.785	25.585	98.278
V_S	40.339	40.339	32.915	49.755	49.755	35.593	73.952	322.648
V_P	4.148	4.148	3.319	4.489	4.489	3.582	6.886	31.061
Total	111.298	55.919	45.995	203.301	70.544	49.960	106.423	648.440

(2) Volume of Form Area

1) Girder (Per 1 Girder)

$$A_G = a_1 \times (L_G - 2h - 2k) + a_2 \times (h - 0.40) + \tfrac{1}{2}(a_1 + a_2) \times K + 2 \times Ae$$

2) Cross Beam

$$Ac_1 = (n-1) \times 2 \times B_S \times m + (n-1) \times (S_o - b_f) \times 0.25 \times m$$

$$Ac_2 = (n-1) \times 2 \times Be_1 \times 2 + (n-1) \times (S_o - b_f) \times 0.40 \times 2$$

$$Ac_3 = 2 \times Be_2 \times 2 \times 2 + \sqrt{(S_1 - b_f/2)^2 + h^2} + 2 \times \sqrt{(S_2 - b_f/2)^2 + h^2}$$

$$Ac = Ac_1 + Ac_2 + Ac_3$$

3) Slab

$As_1 = (n-1) \times (S_o - b_f/2) \times (L_G - 2 \times 0.40 - 0.25m)$

$As_2 = S_1 \times (L_G - 0.40 \times 2) + S_2 \times (L_G - 0.40 \times 2)$

$As_3 = (d + 0.02) \times (L_G + B) \times 2$

$As = As_1 + As_2 + As_3$

(Per 1 Span)

	Unit	Patuni	Challa	Cascada	Pto.Leon	Cajones	Chojña	Carrasco
a_1	m^2/m	3.092	3.092	3.092	3.918	3.918	3.291	4.451
a_2	m^2/m	2.710	2.710	2.710	3.510	3.510	2.910	4.018
A_G	m^2	61.719	61.719	57.082	97.535	97.535	65.742	133.303
A_C	m^2	193.458	193.458	156.470	195.039	208.983	169.080	295.571
A_S	m^2	78.651	78.651	66.127	99.715	108.565	72.093	159.277
Total	m^2	272.109	272.109	222.597	294.754	317.548	241.173	454.848

Reinforcement Bar

1) Girder (110 kg/m³)

$W_G = V_G \times 110$ / Girder

2) Cross Beam (145 kg/m³)

$W_C = V_C \times 145$

3) Slab (205 kg/ m³)

$W_S = V_S \times 205$

(Per 1 Span)

	Unit	Patuni	Challa	Cascada	Pto.Leon	Cajones	Chojña	Carrasco
W_G	t	0.779	0.779	0.740	1.265	1.265	0.826	1.768
W_C	t	1.684	1.684	1.415	1.961	2.363	1.564	3.710
W_S	t	8.269	8.269	6.748	10.200	10.200	7.297	15.160
Total	t	9.953	9.953	8.163	12.161	12.563	8.861	18.870

4) PC-Cable (65kg/m³)

$W_P = V_G \times 65$

5) Handrail

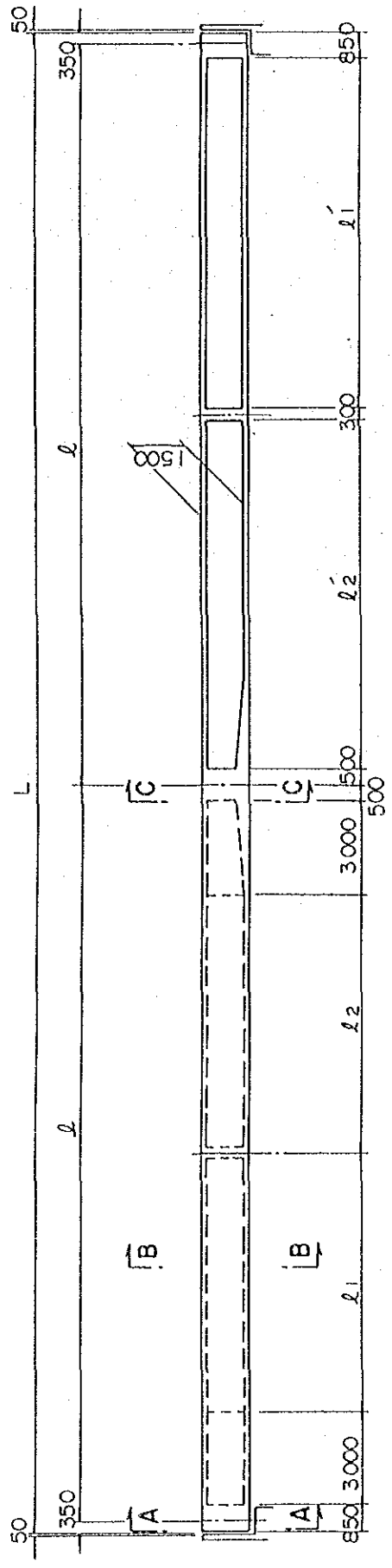
$L = L_B \times 2$

6) Expantion

$L = B \times 2$

7) Drainage (1Pce/10m)

$n = LB/10 + 1$


50
350
850
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ℓ1
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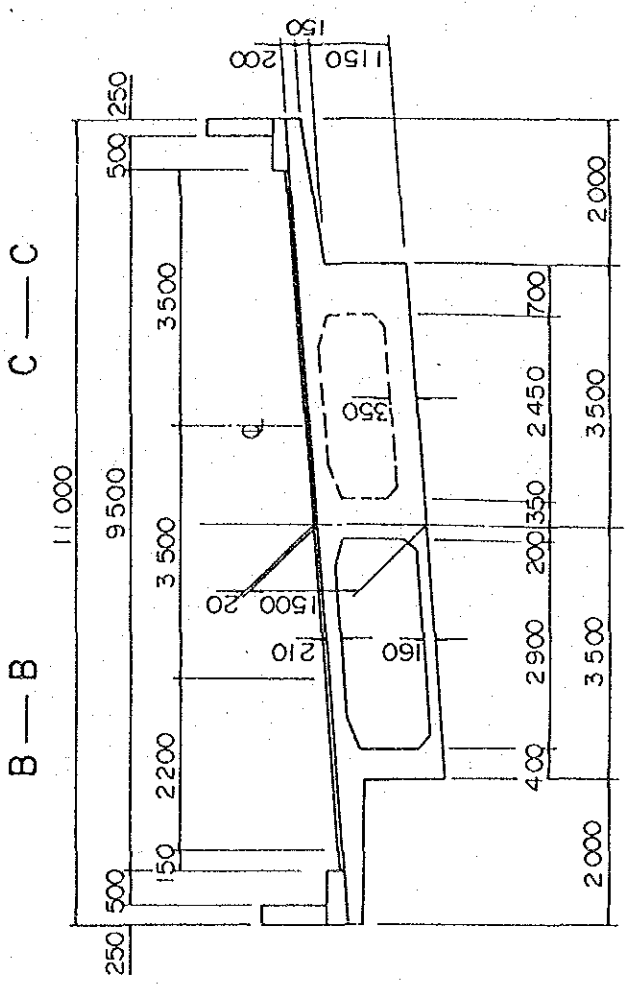
L
C
B
A
350
50


C — C
B — B
150
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1150
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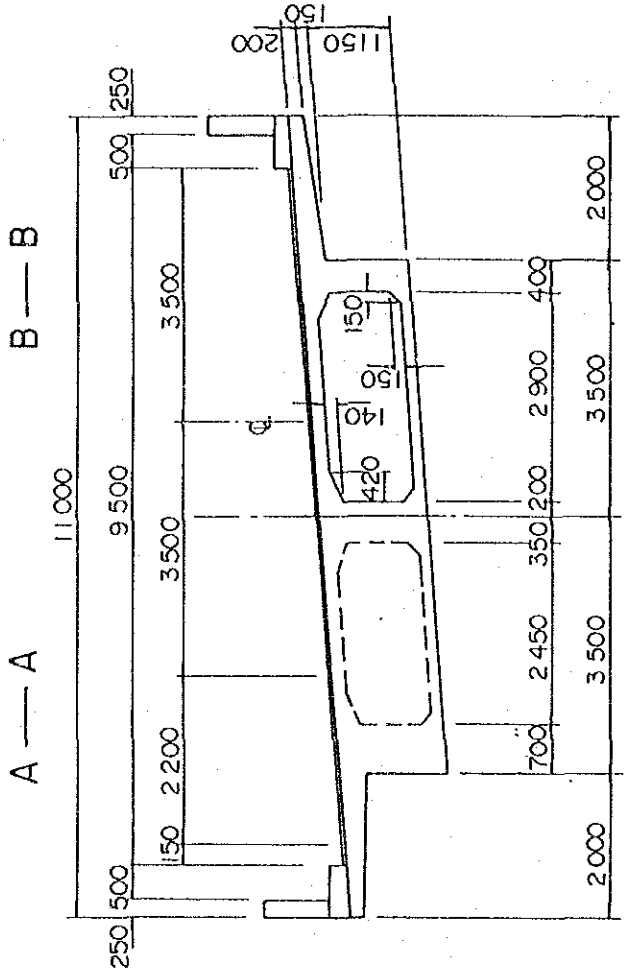
150
d
150
160
210
1500
20


B — B
A — A
150
200
1150
250
500
3500
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2900
200
350
2450
700
2000
11000
9500
3500
2200
150
d
150
150
140
420

Name of Bridge	Bridge Length	Center of Girder (m²)				Areas (m²)		
		L	ℓ	ℓ_1	ℓ_2	A_1 (A-A)	A_2 (B-B)	A_3 (C-C)
Alto Choro	50.000	48.038	23.669	8.400	8.269	6.226	5.209	7.157
San Silverio	50.000	48.038	23.669	8.400	8.269	6.226	5.209	7.157
San Lorenzo	52.000	50.778	25.039	9.100	8.939	6.226	5.209	7.157
Espiritu	52.000	50.778	25.039	9.100	8.939	6.226	5.209	7.157
Avaroa	25.00	24.019	23.319	8.160	8.160	6.226	5.209	——

1. Concrete Volumes

1) Girder (V_A)

$V_1 = A_1 \times 0.85$

$V_2 = 1/2 \times (A_1 + A_2) \times 3.00$

$V_3 = A_1 \times (\ell_1 + \ell_2)$

$V_4 = 1/2 \times (A_2 + A_3) \times 3.00$

$V_5 = A_3 \times 0.50$

$$V_A = V_1 + V_2 + V_3 + V_4 + V_5$$

2) Cross Beam (V_B)

$V_1 = \{1.13 \times 2.45 \times 2 - (a+b)\} \times 0.85$

$V_2 = \{1.13 \times 2.90 \times 2 - (a+b)\} \times 0.30$

$V_3 = \{0.94 \times 2.45 \times 2 - (a+b)\} \times 0.50$

$a = 1/2 \times 0.14 \times 0.42 \times 4 = 0.118 \ (m^2)$

$b = 1/2 \times 0.15 \times 0.15 \times 4 = 0.045 \ (m^2)$

$$V_B = V_1 + V_2 + V_3$$

$$\Sigma V = V_A + V_B$$

Name of Bridge	Per 1 Span		Per Bridge		
	V_A	V_B	V_A	V_B	ΣV
Alto Choro	131.402	8.707	262.804	17.414	280.218
San Silverio	131.402	8.707	262.804	17.414	280.218
San Lorenzo	138.538	8.707	277.076	17.414	294.490
Espiritu	138.538	8.707	277.076	17.414	294.490
Avaroa	138.538	8.707	138.538	8.707	147.245

2. Form Areas

Upper Slab (A_a)

$$a_1 = (0.20+\sqrt{0.15^2+2.00^2})\times L/2 \times 2$$
$$a_2 = 1/2\times\{(2.45-2\times0.42)+(2.90-2\times0.42)\times 3.00\times 4$$
$$a_3 = (2.90-2\times0.42)\times(\ell_1+\ell_2-0.3)\times 2$$
$$a_4 = \sqrt{0.14^2+0.42^2}\times(2\times3.0+\ell_1+\ell_2-0.3)\times 4$$
$$A_a = a_1+a_2+a_3+a_4$$

Web (A_b)

$$a_1 = 1.15\times L/2\times 2$$
$$a_2 = 0.84\times(3.00+\ell_1+\ell_2-0.3)\times 4$$
$$a_3 = 1/2\times(0.84+0.65)\times 3.00\times 4$$
$$a_4 = \sqrt{0.15^2+0.15^2}\times(2\times3.00+\ell_1+\ell_2-0.3)\times 4$$
$$A_b = a_1+a_2+a_3+a_4$$

Lower Slab (A_c)

$$A_c = 7.00\times L/2$$

Cross Beam (A_d)

$$a_1 = (1.13\times2.45-1/2\times0.14\times0.42\times 2-1/2\times0.15^2\times2)\times2$$
$$a_2 = (1.13\times2.90-1/2\times0.14\times0.42\times 2-1/2\times0.15^2\times2)\times4$$
$$a_3 = (0.94\times2.45-1/2\times0.14\times0.42\times 2-1/2\times0.15^2\times2)\times2$$
$$A_d = a_1+a_2+a_3$$

End of Girder (A_e)

$$a_1 = 1/2(0.20+0.35)\times2.0\times2$$
$$a_2 = 1.50\times7.00$$
$$A_e = a_1+a_2$$

$$\Sigma A = A_a+A_b+A_c+A_d+A_e$$

Name of Bridge	For 1 Span						For Bridge
	A_a	A_b	A_c	A_d	A_e	ΣA	ΣA
Alto Choro	235.063	148.245	168.133	22.600	11.600	585.641	585.641 × 2 = 1171.282
San Silverio	235.063	148.245	168.133	22.600	11.600	585.641	585.641 × 2 = 1171.282
San Lorenzo	249.141	157.161	177.723	22.600	11.600	618.225	618.225 × 2 = 1236.450
Espiritu	249.141	157.161	177.723	22.600	11.600	618.225	618.225 × 2 = 1236.450
Avaroa	235.063	148.245	168.133	22.600	11.600	585.641	585.641 × 1 = 585.641

3) Reinforcement Bar (170kg/m³)
W = ΣV × 0.170 (ton)

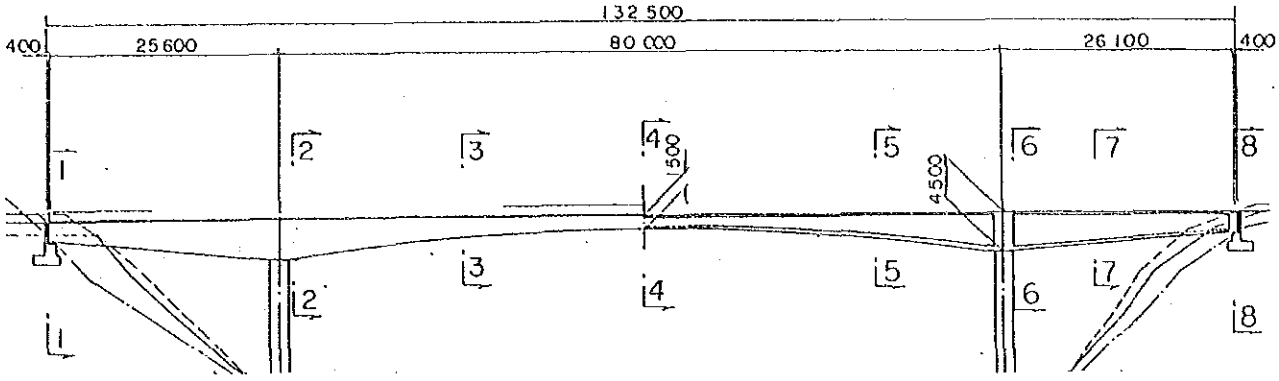
4) PC-Cable (35kg/m³)
W = ΣV × 35 (kg)

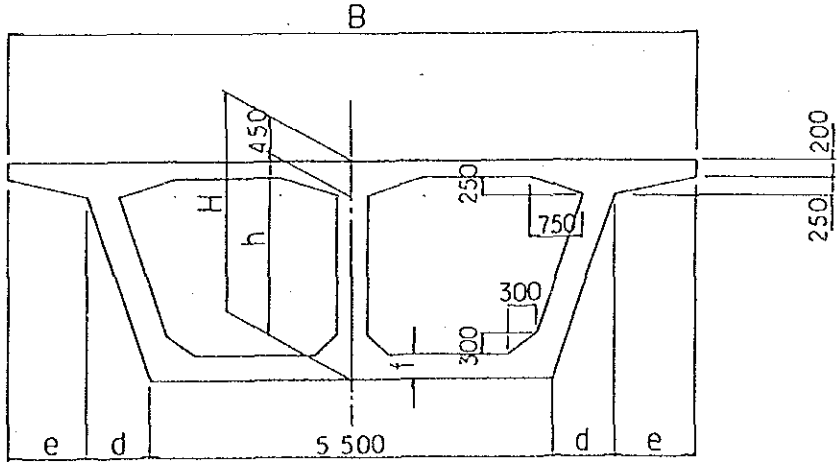
5) Handrail
L = L × 2 (m)

6) EXpantion
L = 11.0×2 = 22.0m

7) Drainage (1Pce/10m)
n = L/10 + 1

1.3 Point A Bridge





Cross Section	B	H	h	d	e	f	l
1 – 1	11.000	2.500	2.05	0.683	2.067	0.300	25.60
2 – 2	11.000	4.500	4.05	1.350	1.400	0.500	20.00
3 – 3	8.800	3.038	2.588	0.863	0.787	——	20.00
4 – 4	8.800	1.500	1.05	0.350	1.300	0.350	27.10
5 – 5	8.800	3.585	3.135	1.045	0.605	——	12.90
6 – 6	10.219	4.500	4.05	1.350	1.400	0.500	7.10
7 – 7	11.000	3.934	3.483	1.161	1.589	——	19.00
8 – 8	11.000	2.500	2.05	0.683	2.067	0.300	

(1) Concrete

1) Upper Slab

V_1 = 11.00×25.60 ×0.20+½(11.00+8.80) ×20×0.20+8.80×20.0×0.20
+8.80×27.10 ×0.20+½(8.80 +10.219) ×12.90 ×0.2 +(10.219 + 11.00) ×7.10×0.20
+11.00 ×19.00 ×0.20 = 257.664

V_2 =½×0.250 ×0.750 ×131.70×4 = 49.388

V_3 =½(2.067+1.400)×25.60 ×0.25+½(1.400+0.787)×20.00 ×0.25
+½(0.787+1.300)×20.0×0.25+½(1.300+0.605)×27.10 ×0.25
+½(0.605+1.400)×12.90 ×0.25+½(1.400+1.589)×7.10×0.25
+½(1.589+2.067)×19.00 ×0.25 = 44.551 ×2 = 89.102

V_U = 396.154m³

2) Lawer Slab

V_1 = 5.50 ×80.0×(0.35 +0.50) ×½ = 187.0

V_2 = 5.50 ×25.6×(0.30 +0.50) ×½ = 56.32

V_3 = 5.50 ×26.1×(0.30 +0.50) ×½ = 57.42

V_4 = 0.30²×½×131.7 ×4 = 23.706

V_L = 324.446m³

3) Web

V_1 = (0.95+3.80) ×0.40×40×½×2 +½(3.80 +2.0)×25.60 × 0.40
+½(3.80 +2.0)×26.10 × 0.40 = 97.972

V_2 =½(0.95 +3.80) ×½(0.422+0.738)×40×½×2 ×2
+½(3.80 +2.0)×0.738 ×25.60 ×2 +½(3.80 +2.0)×26.10 ×0.738 ×2 = 223.818

V_W = 321.790m³

4) Cross Beam

V_1 =½(1.812+2.495)×2.0 ×1.5 ×4 = 25.842

V_2 =½(1.812+3.162)×3.8 ×3.0 ×4 = 113.407

V_C = 139.249m³

5) Pavement

V_P = 257.664×1/10 V_P = 25.766m³

Total V = 1207.4 m³

(2) Form

1) Upper Slab

$A_1 = \frac{1}{2}(2.60 + 1.60) \times 40.0 \times 4 = 336.0$

$A_2 = \frac{1}{2}(2.60 + 1.933) \times (25.6 + 26.1) \times 2 = 234.356$

$A_3 = \frac{1}{2}(2.067 + 1.400) \times 25.60 + \frac{1}{2}(1.40 + 0.787) \times 20.0 + \frac{1}{2}(0.787 + 1.30) \times 20.0$
$+ \frac{1}{2}(1.30 + 0.605) \times 27.10 + \frac{1}{2}(0.605 + 1.40) \times 12.90 + \frac{1}{2}(1.40 + 1.589) \times 7.10$
$+ \frac{1}{2}(1.589 + 2.067) \times 19.0 = 171.206 \times 2 = 342.411$

$A_4 = \sqrt{0.25^2 + 0.75^2} \times 131.70 \times 4 = 416.472$

$A_S = 1329.239 m^2$

2) Web

$A_1 = \frac{1}{2}(3.25 + 0.40) \times 40 \times 2 \times 2 = 292.0$

$A_2 = \frac{1}{2}(3.25 + 1.45) \times (26.1 + 25.6) \times 2 = 242.99$

$A_3 = \frac{1}{2}(\sqrt{1.35^2 + 4.05^2} + \sqrt{1.05^2 + 0.35^2}) \times 40 \times 2 \times 2 = 430.070$

$A_4 = \frac{1}{2}(\sqrt{1.35^2 + 4.05^2} + \sqrt{2.05^2 + 0.683^2}) \times (26.1 + 25.6) \times 2 = 332.434$

$A_5 = \frac{1}{2}(\sqrt{1.35^2 + 3.25^2} + \sqrt{0.40^2 + 0.35^2}) \times 40 \times 2 \times 2 = 324.059$

$A_6 = \frac{1}{2}(\sqrt{1.35^2 + 3.25^2} + \sqrt{1.45^2 + 0.35^2}) \times (26.1 + 25.6) \times 2 = 259.062$

$A_7 = \sqrt{0.30^2 + 0.30^2} \times 131.70 \times 4 = 223.502$

$A_W = 2114.117 m^2$

3) Lower Slab

$A_1 = 5.50 \times 131.70 = 724.35 m^2$

$A_2 = \frac{1}{2} \times (5.50 + 6.866) \times 2.05 \times 2 = 25.350 m^2$

$A_L = 749.70 m^2$

Total A = $4193.056 m^2$

(3) Reinforcement Bar (170kg/m³)

W = 1207.4 × 0.170 = 205.26 t

(4) PC-Cable (40kg/m³)

W = 1207.4 × 40 = 48296 kg

(5) Handrail

L = 132.5 × 2 = 265 m

(6) Expantion

L = 11.0 × 2 = 22 m

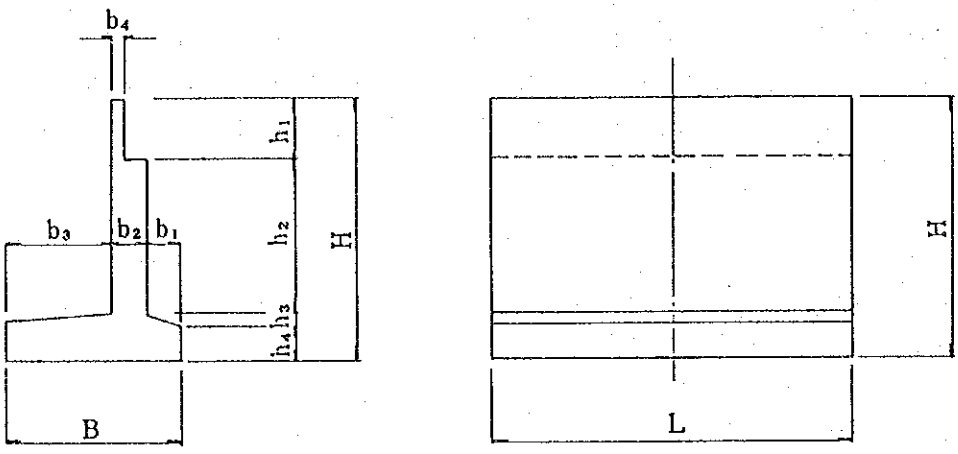
(7) Drainage (1pce/10m)

n = 14pce × 2 = 28 pce

2. Substructure

2-1 Abutment

(1) Type 1



unit : m

A1-Abut.											
	H	h1	h2	h3	h4	B	b1	b2	b3	b4	L
Point A	5.00	2.86	1.14	—	1.00	3.00	0.5	1.00	1.50	0.50	11.00
Patuni	6.00	1.20	3.80	—	1.00	4.00	1.00	1.00	2.00	0.30	12.29
Challa	6.00	1.50	3.50	—	1.00	4.00	1.00	1.00	2.00	0.30	12.29
Casdaca	5.00	1.35	2.45	0.20	1.00	3.00	0.50	1.00	1.50	0.30	11.56
Alto Choro	6.00	1.61	3.19	0.20	1.00	3.50	0.80	1.00	1.70	0.30	11.00
Pto.Leon	8.50	1.72	5.58	0.20	1.00	5.00	1.20	1.20	2.60	0.40	8.80
Cajones	5.40	1.75	2.45	0.20	1.00	3.50	0.80	1.00	1.70	0.40	10.50
San Silverio	8.50	1.81	5.69	0.20	1.00	5.00	1.20	1.20	2.60	0.40	11.00
San Lorenzo	8.00	1.61	5.19	0.20	1.00	5.00	1.20	1.00	2.80	0.30	11.00
Espiritu	6.70	1.61	4.09	—	1.00	3.50	0.80	1.00	1.50	0.30	11.00
Carrasco	8.00	1.95	4.85	0.20	1.00	4.50	1.00	1.00	2.50	0.40	13.98
A2-Abut.											
	H	h1	h2	h3	h4	B	b1	b2	b3	b4	L
Point A	5.00	2.86	1.14	—	1.00	3.00	0.50	1.00	1.50	0.50	11.00
Patuni	5.00	1.20	2.80	—	1.00	3.00	0.50	1.00	1.50	0.30	12.92
Challa	5.50	1.50	3.00	—	1.00	3.30	0.80	1.00	1.50	0.30	12.92
Alto Choro	6.00	1.61	3.19	0.20	1.00	3.50	0.80	1.00	1.70	0.30	11.00
Pto.Leon	10.00	1.72	7.08	0.20	1.00	6.00	1.50	1.20	3.30	0.40	8.80
Cajones	6.30	1.75	3.35	0.20	1.00	3.50	0.80	1.00	1.70	0.40	10.50
San Silverio	8.50	1.81	5.69	0.20	1.00	5.00	1.20	1.20	2.60	0.40	11.00
San Lorenzo	6.56	1.61	3.95	—	1.00	3.50	0.80	1.00	1.50	0.30	11.00
Espiritu	8.00	1.61	5.19	0.20	1.00	5.00	1.20	1.00	2.80	0.30	11.00
Carrasco	10.00	1.95	6.85	0.20	1.00	5.00	1.20	1.20	2.50	0.40	13.98

1) Concrete (210Kg/cm²)
$V=(B \times h_4+1/2 \times b_3 \times h_3+1/2 \times b_1 \times h_3+b_2 \times (h_2+h_3)+b_4 \times h_1) \times L \quad (m^3)$

2) Form
$A_1=(2 \times h_1+2h_2+2h_4) \times L$
$A_2=(1/2(b_2+B) \times h_3+B \times h_4+b_2 \times h_2+b_4 \times h_1) \times 2$
$\Sigma A=A_1+A_2 \quad (m^2)$

3) Reinforcement Bar (55Kg/m³)
$W=V \times 0.055 \quad (ton)$

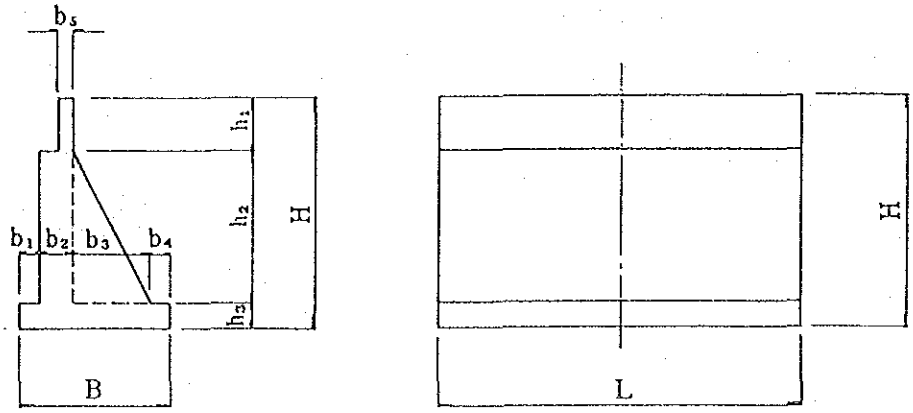
4) Leveling Concrete (t=10cm)
$Ve=B \times L \times 0.10 \quad (m^3)$

5) Staging (Spc. m³)

6) Quantity (Abutment;Type1) unit : m

	Concrete (m^3)	Form (m^2)	Reinforcement Bar (ton)	Leveling Concrete (m^3)	Staging (spc.m^3)
A_1-Abut.					
Point A	61.050	118.432	3.358	3.30	90.53
Patuni	79.23	120.45	4.358	6.08	107.17
Challa	86.426	139.02	4.753	4.11	136.11
Casdaca	70.93	124.73	3.901	4.05	90.53
Alto Choro	83.853	141.95	4.612	3.85	108.64
Pto.Leon	102.925	169.472	5.661	4.40	222.82
Cajones	82.163	143.75	4.519	3.68	165.86
San Silverio	142.241	207.23	7.823	5.50	180.92
San Lorenzo	135.641	195.03	7.460	5.50	166.72
Espiritu	71.403	152.69	3.927	3.85	126.30
Carrasco	172.34	242.69	9.479	7.28	211.83
A_2-Abut.					
Point A	61.050	118.432	3.358	3.30	90.53
Patuni	68.48	116.31	3.766	6.75	88.11
Challa	72.713	123.05	3.999	3.96	129.41
Alto Choro	83.853	141.95	4.612	3.85	108.64
Pto.Leon	125.805	201.072	6.919	5.28	274.74
Cajones	72.713	123.05	3.999	3.68	129.41
San Silverio	142.241	207.23	7.823	5.50	180.92
San Lorenzo	68.935	145.57	3.791	3.85	114.80
Espiritu	88.121	107.19	4.847	5.50	64.48
Carrasco	199.80	302.52	10.989	8.39	328.30

(2) Type 2



unit : m

	H	h_1	h_2	h_3	B	b_1	b_2	b_3	b_4	b_5	L
A_1-Abut.											
Chojna	3.80	1.45	1.35	1.00	2.50	0.30	0.90	0.80	0.50	0.30	12.12
Avaroa	3.50	1.70	1.30	0.50	2.50	0.30	1.00	0.70	0.50	0.40	13.65
A_2-Abut.											
Cascada	3.00	1.35	1.15	0.50	2.00	0.30	0.90	0.50	0.30	0.30	11.59
Chojna	4.00	1.45	1.55	1.00	2.50	0.30	0.90	0.80	0.50	0.30	12.12
Avaroa	3.50	1.70	1.30	0.50	2.50	0.30	1.00	0.70	0.50	0.40	12.29

1) Conctete (210Kg/cm²)

$V=(B \times h_3+b_2 \times h_2+b_5 \times h_1+1/2 \times b_3 \times h_2) \times L \quad (m^3)$

2) Form

$A_1=(2 \cdot h_1+h_2+h_3+\sqrt{b_3^2+h_2^2}) \times L$

$A_2=(B \times h_3+b_2 \times h_2+b_5 \times h_1+1/2 \times b_3 \times h_2) \times 2$

$\Sigma A=A_1+A_2 \quad (m^2)$

3) Reinforcement Bar (55Kg/m³)

$W=V \times 0.055 \quad (ton)$

4) Leveling Concrete

$Ve=B \times L \times 0.10 \quad (m^3)$

5) Staging (Spc. m³)

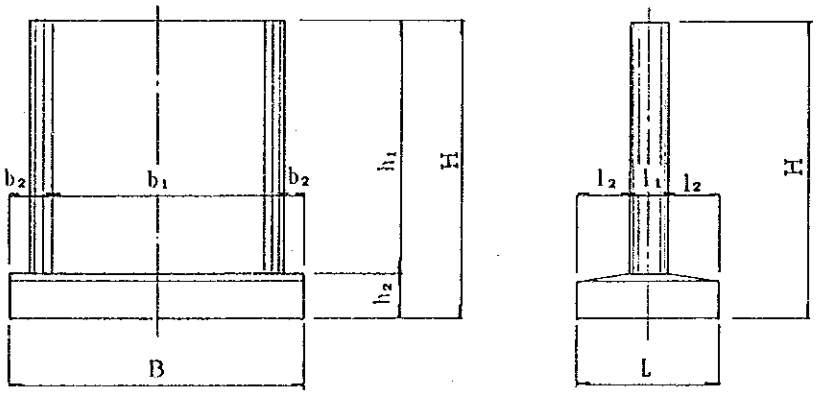
(See Type 1)

6) Quantity (Abutment:Type2)

A_1-Abut.					
	Concrete (m^3)	Form (m^2)	Reinforcement Bar (ton)	Leveling Concrete (m^3)	Staging (Spc.m^3)
Chojna	73.108	111.14	4.021	4.20	98.89
Avaroa	31.43	77.65	1.729	3.13	90.53
A_2-Abut.					
Cascada	31.43	77.65	1.729	4.01	70.87
Chojna	69.773	118.51	3.838	4.20	89.77
Avaroa	31.43	77.65	1.729	3.13	70.87

2-2 Pier

(1) Type 1



P1-Pier									
	B	b_1	b_2	L	l_1	l_2	H	h_1	h_2
Point A	9.50	5.50	2.00	10.70	2.00	4.35	21.00	15.00	6.00
Alto Choro	8.00	6.80	0.50	4.00	1.00	1.50	8.00	6.80	1.20
San Silverio	8.00	6.80	0.50	5.00	1.00	2.00	15.00	10.30	1.20
San Lorenzo	8.00	7.00	0.50	6.00	1.20	2.40	18.00	16.50	1.50
Espiritu	8.00	7.00	0.50	7.00	1.30	2.85	20.00	18.50	1.50
P2-Pier									
Point A	9.50	5.50	2.00	10.70	2.00	4.35	26.00	18.00	8.00

1) Concrete (210kg/cm²)

$V = (b_1-l_1)\times h_1 \times l_1 + 1/4 \times \pi \times l_1^2 \times h_1 + B \times L \times h_2 (m^3)$

2) Form

$A = (b_1-l_1)\times h_1 + 2\times \pi \times l_1 \times h_1 + 2\cdot(B+L)\times h_2 \ (m^2)$

3) Reinforcement Bar (70kg/m³)

$W = V \times 0.070$ (ton)

4) Leveling Concrete

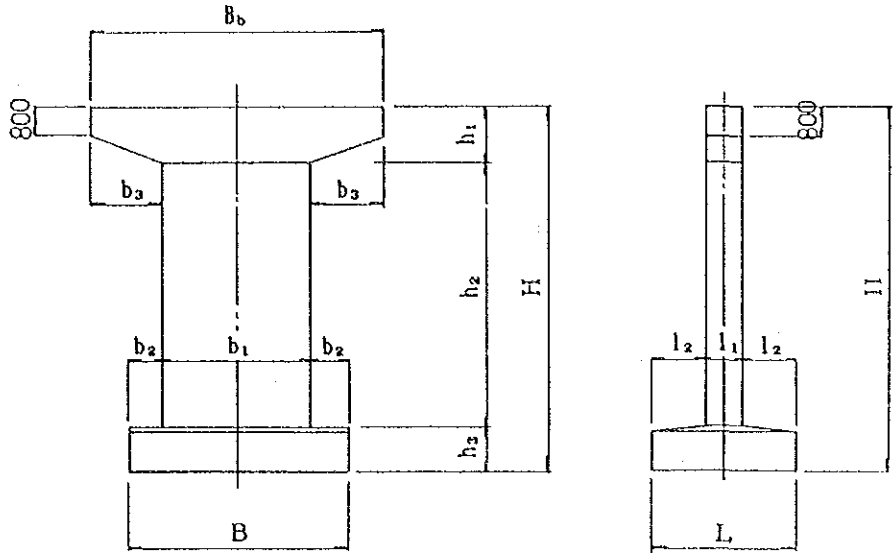
$V_c = B \times L \times 0.10 \ (m^3)$

5) Staging (Spc.m³)

6) Quantity (Pier : Type 1)

P_1 - Pier					
	Concrete (m³)	Form (m³)	Reinforcement Bar (ton)	Leveling Control (m³)	Staging (Spc·m³)
Point A	483.50	338.90	33.85	13.50	562.5
Alto Choro	83.18	129.03	5.81	3.20	136.0
San Sliverio	115.83	183.02	8.11	4.00	206.0
San Lorenzo	205.50	295.57	14.39	4.80	336.0
Espiritu	243.24	327.72	17.03	5.60	381.10
P_2 - Pier					
Point A	633.60	403.70	44.35	15.12	724.5

(2) Type 2



	B	b_1	b_2	b_3	L	l_1	l_2	H	h_1	h_2	h_3	B_b
Patuni	6.00	5.00	0.50	2.75	5.00	1.20	1.90	14.00	1.50	10.91	1.20	10.50
Pto.Leon	6.00	4.00	1.00	2.00	5.00	1.20	1.90	10.00	1.50	7.30	1.20	8.00

1) Concrete (210kg/m³)

$V = \frac{1}{2}(0.80 + h_1) \times b_3 \times h_1 + b_1 \times (h_1 + h_2) \times b_3 + B \times L \times h_3 \quad (m^3)$

2) Form

$A_1 = 2 \times (0.80 + h_1) + b_1 \times (h_1 + h_2) \times 2 + 0.80 \times \ell_1 \times 2 + \sqrt{(h_1 - 0.8)^2 + b_3^2} \times \ell_1 \times 2$

$+ b_2 \times h_2 \times 2 + 2 \times (B + L) \times h_3 \quad (m^2)$

3) Reinforcement Bar (70kg/m³)

$W = V \times 0.070$ (ton)

4) Leveling Concrete

$V = B \times L \times 0.10$

5) Staging (Spc·m³)

See : Type-1

6) Quantity (Pire : Type 2)

		Concrete (m^3)	Form (m^2)	Reinforcement Bar (ton)	Leveling Concrete (m^3)	Staging (Spc·m^3)
Patuni		89.98	139.58	6.299	3.00	147.12
Pto:Leon	P_1	81.104	96.02	5.677	3.00	200.64
	P_2	81.104	96.02	5.677	3.00	200.64

付録6-2　　主要資機材の価格

LABOUR COST

US$

Item	Unit	L.C.		F.C.	Total	Remark
		Duties	Other			
Foreman	PRS	1.91	1.75		19.06	
Mechanic of Heavy Equipmemt	PRS	2.73	24.53		27.26	
Operator of Heavy Equipment	PRS	1.88	16.91		18.79	
Operator of Light Equipment	PRS	1.63	14.67		16.30	
Operator Assistant	PRS	1.63	14.67		16.30	
Operator of Crusher Plant Operator of Asphalt Plant	PRS	1.88	16.91		18.79	
Measurer	PRS	1.63	14.67		16.30	
Driver	PRS	1.44	12.94		14.38	
Technician of Explosive	PRS	1.70	15.30		17.00	
Perfortor	PRS	1.63	14.67		16.30	
Carpenter Formworker	PRS	1.64	14.75		16.39	
Reinforcement Worker	PRS	1.37	12.31		13.68	
Masonry Worker	PRS	1.37	12.31		13.68	
Plasterer	PRS	1.38	12.45		13.83	
Electrician, Welder	PRS	1.37	12.31		13.68	
Surveyor	PRS	1.32	11.90		13.22	
Skilled Worker	PRS	1.88	16.91		18.79	
Administrator	PRS	1.32	11.90		13.22	
Normal Worker	PRS	0.92	8.32		9.24	
Cook	PRS	1.22	10.94		12.16	
Cook Assistant	PRS	1.08	9.76		10.84	
Guard Man	PRS	1.25	11.27		12.52	

MATERIAL COST

US$

Item	Size & Type	Unit	L.C.		F.C.	Total	Remark
			Duties	Other			
Cement	Portland	50Kg	0.48	5.70	-	6.18	
Reinforcement	Determed	Kg	0.21	0.04	0.65	0.90	
Reinforcement	Mild	Kg	0.21	0.04	0.62	0.87	
Timber	For Bridge	m^3	31.39	269.10	-	300.49	
Timber	For Bridge	m^2	0.38	3.02	-	3.40	
Timber	Normal	m^3	8.97	103.15	-	112.12	
Timber	Normal	m^2	0.29	2.34	-	2.65	
Steel Plate	t=2mm	m^2	20.42	0.58	61.32	81.32	
Steel Plate		Kg	0.43	0.04	1.30	1.77	
Separating Agent		ℓ	0.25	0.04	-	0.29	
Vinyl Chloride Pipe	PVC φ4"	m	0.59	4.70	-	5.29	
Nail		Kg	0.31	0.04	0.94	1.29	
Binding Wire		Kg	0.30	0.04	0.90	1.24	
Wire Mesh	1.3Kg/m^2	m^2	0.39	0.05	1.17	1.61	
Admixture		Kg	0.61	-	1.83	2.44	
Anchor Bolt	φ16 ℓ=400mm	Pcs	0.13	0.03	0.39	0.55	
Extra Anchor Bort	φ9 ℓ=200mm	Pcs	0.02	0.01	0.06	0.09	
Detonator		No	0.09	0.01	0.30	0.40	
Dynamite		Kg	0.40	0.04	1.20	1.64	
Bit+Rod		No	22.37	1.47	40.92	64.76	
Seed		Kg	0.70	6.30	-	7.00	
Soil Improving Grass		m^3	9.40	84.60		94.00	
Filler		ton	0.73	0.96	2.73	3.00	
Prestressing Bar		Kg	0.63	0.06	1.91	2.60	

MATERIAL COST

US$

Item	Size & Type	Unit	L.C.		F.C.	Total	Remark
			Duties	Other			
Gasoline		ℓ	0.03	0.28	-	0.31	
Disel	10w40	ℓ	0.03	0.23	-	0.26	
Engine Oil	SEA 30	ℓ	0.09	0.79	-	0.88	
		ℓ	0.08	0.73	-	0.81	
Hydraulic Oil	φ60cm	ℓ	0.12	1.05	-	1.17	
Conrete Pipe Culver		m	6.00	54.00	-	60.00	
Cut-back Asphalt		ton	84.94	31.13	255.06	371.13	
Seal Carpet		ton	74.94	31.13	225.06	331.13	
Guard Rail	20.1Kg/m	m	.95	0.75	14.87	20.57	
Traffic Marking	w=10cm	m	0.02	0.18	-	0.20	
Bolt, Nut		Kg	0.19	0.15	0.66	1.00	
Propan Gas		Kg	0.02	0.19		0.21	
Concrete Pipe	φ=0.6m	m	6.00	54.00		60.00	
Concrete Pipe	φ1.0m	m	11.65	104.86		116.50	

OPERATION COST

US$

Item	Size & Type	Unit	L.C.		F.C.	Total	Remark
			Duties	Other			
Bulldozer	D6		12.61	13.35	42.52	68.48	A -13
Bulldozer	D7		15.26	11.89	52.00	79.15	-15
Bulldozer (Attach Ripper)	D8		28.84	14.28	102.64	145.76	-14
Track Crane	10~11Ton		9.28	5.99	32.72	47.99	-16
Track Crane	4Ton		3.74	4.49	12.25	120.48	-17
Excavator (Back hoe)	0.6m³		9.87	7.77	34.19	51.83	-18
Macadam Roller	10~12Ton		6.15	9.83	19.14	35.12	-21
Tire Roller	20Ton		7.93	9.69	25.93	43.55	-22
Vibrator Roller	10Ton		10.74	10.79	36.13	57.66	-23
Road Sprinkler	6,000 ℓ		3.81	4.41	12.60	20.82	-24
Crusher Plant	60m³/h		35.27	10.56	129.76	175.59	-25
Asphalt Finisher	W=3.6m		13.75	5.19	50.13	69.07	-26
Asphalt Plant	60Ton/h		14.97	10.61	53.04	78.62	-27
Motor Grader	W=3.7m		8.62	8.37	29.16	46.15	-28
Tire Roller	10Ton		6.25	9.32	19.72	35.29	-29
Tractor Shovel	1.6m³		2.37	3.33	0.76	6.46	-11
Dump Track	6m³		4.83	3.57	16.81	25.21	-12
Small Track	3.5Ton		1.61	3.40	4.59	9.60	-19
Distributer	4,000 ℓ		5.21	5.09	17.64	27.94	-20

Construction Equipment			Unit	Bulldozer	Bulldozer	Bulldozer	Motor Scraper	Motor Grader	Motor Grader	Vibrator Roller
Type				D6	D8	D-7	10.7m³	3.7m	4.0m	9.7ton
Engine Power			PS	141	319	250	330	125	180	127
Weight			Ton	15.0	32.0	18.5	30.2	11.5	15.1	11
Life Time			Years	6	6	6	6	6	6	6
Working Time per Year			Hours	1100	1200	1200	1200	1100	1000	750
Working Day per Year			Days	170	180	170	170	155	150	150
Depreciation Rate per Hour			10^{-6}	352	352	325	268	324	353	471
CIF of La Paz			$	120800	291600	160000	190000	90000	122000	62600
Customs Duties			$	31770	76690	42080	49970	23670	32086	16464
Transportation (Construction Site) and Other Cost			$	767	1548	895	825	431	635	532
Purchase Price			$	153337	369838	202975	240795	114101	154721	79596
F.C. Depreciation			$/hr	42.52	102.64	52.00	50.92	29.16	43.07	33.30
L.C.	Duties	Income Tax	$/hr	11.18	26.99	13.68	13.39	7.67	11.33	8.76
		Fuel	$/hr	0.46	1.03	0.81	1.05	0.25	0.36	0.42
		Lube. Cost	$/hr	0.09	0.21	0.16	0.21	0.05	0.07	0.08
		Sub Total	$/hr	11.73	28.23	14.65	14.65	7.97	11.76	9.26
	Others	Transportation	$/hr	0.27	0.54	0.29	0.22	0.14	0.22	0.28
		Fuel	$/hr	3.65	8.27	6.48	8.40	2.01	2.89	3.32
		Lube. Cost	$/hr	0.73	1.65	1.30	1.68	0.40	0.58	0.66
		Sub Total	$/hr	4.65	10.46	8.07	10.30	2.55	3.69	4.26
Total (per hour)			$/hr	58.90	141.33	74.72	75.87	39.68	58.52	46.82

NOTE: F.C. = Foreign Currency, L.C. = Local Currency

Construction Equipment			Unit	Vibrator Roller	Tire Roller	Macadam Roller	Tractor Shovel	Tractor Shovel	Tractor Shovel	Tractor Shovel
Type				11t	10ton	20ton	10 ～12ton	0.6m³	0.8m³	1.6m³
Engine Power			PS	118	145	165	158	46	65	100
Weight			Ton	11.0	8.5	11	10	3.9	7.0ton	9.5ton
Life Time			Yers	6	7	7	7	6	6	6
Working Time per Year			Hours	800	900	900	900	800	900	1000
Working Day per Year			Days	160	150	150	150	120	135	150
Depreciation Rate per Hour			10^{-6}	446	348	348	348	370	411	370
CIF of La Paz			$	81000	56670	74500	55000	52800	57000	41000
Customs Duties			$	21303	14904	19594	14465	13886	14991	10783
Transportation (Construction Site) and Other Cost			$	532	411	532	484	189	339	459
Purchase Price			$	102835	71985	94626	49949	66875	72330	52242
F.C. Depreciation			$/hr	36.13	19.72	25.93	19.14	19.54	23.43	15.17
L.C.	Duties	Income Tax	$/hr	9.50	5.19	6.82	5.03	5.14	6.16	3.99
		Fuel	$/hr	0.39	0.24	0.28	0.29	0.11	0.23	0.24
		Lube. Cost	$/hr	0.08	0.05	0.06	0.06	0.02	0.05	0.05
		Sub Total	$/hr	9.97	5.48	7.16	5.38	5.27	6.44	4.28
	Others	Transportation	$/hr	0.24	0.14	0.19	0.17	0.07	0.14	0.17
		Fuel	$/hr	3.09	1.95	2.22	2.35	0.88	1.86	1.92
		Lube. Cost	$/hr	0.62	0.39	0.44	0.47	0.18	0.37	0.38
		Sub Total	$/hr	3.95	2.48	2.85	2.99	1.13	2.37	2.47
Total (per hour)			$/hr	50.05	27.68	35.94	27.51	25.94	32.24	21.92

NOTE: F.C. = Foreign Currency, L.C. = Local Currency

Construction Equipment			Unit	Wheel Loader	Tractor Shovel	Excavator	Excavator	Small Truck	Truck	Large Truck
Type				1.4m³	2.1m³	0.6m³	1.0m³	3.5t	6.0m³	8.0m³
Engine Power			PS	107	125	105	175	140	160	244
Weight			Ton	12.7	12.2	18.0	30	1.9	5.2	7.1
Life Time			Years	6	6	5	5	5	5	5
Working Time per Year			Hours	1100	1200	1300	1300	1700	1500	1600
Working Day per Year			Days	165	170	185	195	220	200	215
Depreciation Rate per Hour			10^{-6}	359	325	304	308	255	367	328
CIF of La Paz			$	95800	195000	111000	206000	17660	45800	53550
Customs Duties			$	25195	51285	29193	54178	4734	12045	14084
Transportation (Construction Site) and Other Cost			$	614	908	870	1451	42	156	163
Purchase Price			$	121609	247193	104436	261629	22776	58096	67977
F.C. Depreciation			$/hr	34.39	63.38	34.19	63.45	4.59	16.81	17.56
L.C.	Duties	Income Tax	$/hr	9.05	16.67	8.99	16.69	1.21	4.42	4.62
		Fuel	$/hr	0.38	0.30	0.35	0.58	0.15	0.16	0.16
		Lube. Cost	$/hr	0.08	0.06	0.07	0.12	0.03	0.03	0.03
		Sub Total	$/hr	9.51	17.03	9.41	17.39	1.39	4.61	4.81
	Others	Transportation	$/hr	0.22	0.30	0.26	0.45	0.01	0.06	0.05
		Fuel	$/hr	3.06	2.40	2.80	4.66	1.21	1.31	1.31
		Lube. Cost	$/hr	0.61	0.48	0.56	0.93	0.24	0.26	0.26
		Sub Total	$/hr	3.89	3.18	3.62	6.04	1.46	1.63	1.62
Total (per hour)			$/hr	47.79	83.59	47.22	86.88	7.44	23.05	23.99

Construction Equipmet			Unit	Road Sprinkler	Dump Truck	Truck Crane	Truck Crane	Truck Crane	Truck Crane	Truck Crane
Type				6000 l	11t(8.0m³)	Cap.carga 4t grua 2.9t	10 - 11t	15 - 16t	25t	35t
Engine Power			PS	160	281	140	225	236	255	302
Weight			Ton	11.0	9.2	6.1	13.5	18	29.0	39.0
Life Time			Years	5	5	5	6	6	5	6
Working Time per Year			Hours	1100	1700	1300	1100	1100	1100	1100
Working Day per Year			Days	180	225	175	160	160	160	160
Depreciation Rate per Hour			$\times 10^{-6}$	336	509	308	271	271	271	271
CIF of La Paz			$	37500	62000	39000	115000	145000	212000	244400
Customs Duties			$	9863	16306	10257	30245	38135	55756	64277
Transportation (Construction Site) and Other Cost			$	121	156	114	453	540	818	965
Purchase Price			$	47484	78462	49257	145698	183135	268574	309642
F.C. Depreciation			$/hr	12.60	19.56	12.01	31.16	39.30	57.45	66.23
L.C.	Duties	Income Tax	$/hr	3.31	5.04	3.16	8.20	10.33	15.11	17.42
		Fuel	$/hr	0.17	0.16	0.15	0.20	0.21	0.23	0.37
		Lube. Cost	$/hr	0.03	0.03	0.03	0.04	0.04	0.05	0.07
		Sub Total	$/hr	3.51	5.23	3.34	8.44	10.58	15.39	17.86
	Others	Transportation	$/hr	0.04	0.05	0.04	0.12	0.15	0.22	0.26
		Fuel	$/hr	1.38	1.31	1.21	1.62	1.70	1.84	3.67
		Lube. Costs	$/hr	0.28	0.26	0.24	0.32	0.34	0.37	0.73
		Sub Total	$/hr	1.70	1.62	1.49	2.06	2.19	2.43	4.66
Total (per hour)			$/hr	17.81	26.41	16.84	41.66	52.07	75.27	88.75

NOTE: F.C. = Foreign Currency, L.C. = Local Currency, (**) = Gasoline, (*) = Per day

Construction Equipmet			Unit	Selection Plant	Concrete Pump	Concrete Pump	Concrete Cutter	Concrete Mixer Car	Asphalt Plant
Type				50t/hr	18m³/hr	45m³/h	tcc- 3	3.5m³	60 t/h
Engine Power			PS	60	25	145	8	195	227
Weight			Ton	3.0	3.0	7.3	0.13	7.5	79
LifeT Time			Years	6	4	4	3	5	6
Working Time per Year			Hours	2000	900	1300	—	1000	900
Working Day per Year			Days		110	190	100	165	170
Depreciation Rate per Hour			$\times 10^{-6}$	255	531	419	1333	360	365
CIF of La Paz			$	60000	28500	96580	2570	55440	145325
Customs Duties			$	15780	7496	25400	676	14581	38220
Transportation Construction Site) and Other Cost			$	145	145	353	6	161	3820
Purchase Price			$	75925	36141	122333	3252	70384	187365
F.C. Depreciation			$/hr	15.30	15.13	40.47	3.43	19.96	53.04
L.C.	Duties	Income Tax	$/hr	4.02	3.98	10.64	0.90	5.25	13.95
		Fuel	$/hr	0.14	0.05	0.30	0.23 (**)	0.23	—
		Lube. Cost	$/hr	0.03	0.01	0.06	0.05	0.05	—
		Sub Total	$/hr	4.19	4.04	11.00	1.18	5.35	13.95
	Others	Transportation	$/hr	0.04	0.08	0.15	0.01	0.06	1.39
		Fuel	$/hr	1.15	0.43	2.47	1.86 (**)	1.83	—
		Lube. Cost	$/hr	0.23	0.09	0.49	0.37	0.37	—
		Sub Total	$/hr	1.42	0.60	3.11	2.24	2.26	1.39
Total (per hour)			$/hr	20.91	19.77	54.58	6.85	27.57	68.38

NOTE: F.C. = Foreign Currency, L.C. = Local Currency, (*)= Per day

Construction Equipmet			Unit	Crusher Plant	Asphalt Finisher	Engine Sprayer	Pile Driver	Concrete Mixer	Compaction Roller(*)	Drill Jambo
Type				60m³/hr	3.6	200 l	3.5t	600Lts	60 - 100kg	7t
Engine Power			PS	172	34	3.5	106	30	4	49
Weight			Ton	46.5	8.0	0.17	49	2.6	0.078	7.0
Life Time			Years	6	7	3	5	4	3	6
Working Time per Year			Hours	4500	600	600	1200			550
Working Day per Year			Days	500	100	150	170	120	140	140
Depreciation Rate per Hour			10^{-6}	2333	474	525	354	3750	4167	258
CIF of La Paz			$	556200	105760	1840	807000	11000	2200	120800
Customs Duties			$	146281	27815	484	212241	2893	579	31770
Transportation (Construction Site) and Oather Cost			$	2249	387	8	2370	126	4	767
Purchase Parice			$	704730	133962	2332	1021611	14019	2783	153337
F.C. Depreciation			$/hr	129.76	50.13	0.97	285.68	41.25	9.17	42.52
L.C.	Duties	Income Tax	$/hr	34.08	13.18	0.25	75.13	10.85	2.41	11.18
		Fuel	$/hr	0.54	0.08	0.009	0.14	0.22	0.14 **	0.46
		Lube. Cost	$/hr	0.11	0.02	0.002	0.03	0.04	0.03	0.09
		Sub Total	$/hr	34.73	13.28	0.26	75.30	11.11	2.58	11.73
	Others	Transportation	$/hr	0.52	0.18	0.01	0.84	0.47	0.02	0.27
		Fuel	$/hr	4.29	0.68	0.07	1.09	1.80	1.11 **	3.65
		Lube. Cost	$/hr	0.86	0.14	0.01	0.22	0.36	0.22	0.73
		Sub Total	$/hr	5.67	1.00	0.09	2.15	2.63	1.35	4.65
Total (per hour)			$/hr	170.16	64.41	1.32	363.13	54.99	13.10	58.90

NOTE: F.C. = Foreign Currency, L.C. = Local Currency

Construction Equipment			Unit	Tamper	Stressing (*) Equipment	(*) Compressor	(*) Compressor	Electri (*) Ventilator	(*) Generator	(*) Generator
Type				60 - 100kg	Freyssinett	20m³/min	10m³/min	40m³/min	75kw	110KW
Engine Power			PS	4	—	252	140	60	100	120
Weight			Ton	0.078	0.15	5.5	2.7	0.46	2.3	2.6
Life Time			Year	3	8	6	6	6	6	6
Working Time per Year			Hours		—	-	-	-	—	-
Working Day per Year			Days	140	—	140	140	200	140	140
Depreciation Rate per Hour			$\times 10^{-6}$	4167	2500	2500	2500	1500	1893	1905
CIF of La Paz			$	2200	31000	64500	50500	4400	15000	25000
Customs Duties			$	579	8153	16964	13282	1157	3945	6575
Transportation (Construction Site) and Other Cost			$	4	7	266	131	22	111	126
Purchase Price			$	2783	39160	81730	63913	5579	19056	31701
F.C. Depreciation			$/hr	9.17	77.50	161.25	126.25	6.60	28.39	47.63
L.C.	Duties	Income Tax	$/hr	2.41	20.38	42.41	33.21	1.74	7.47	12.53
		Fuel	$/hr	0.14 **	—	0.91	0.50	0.18	0.35	0.42
		Lube. Cost	$/hr	0.03	—	0.18	0.10	0.04	0.07	0.08
		Sub Total	$/hr	2.58	20.38	43.5	33.81	1.96	7.89	13.03
	Others	Transportation	$/hr	0.02	0.02	0.67	0.33	0.03	0.21	0.24
		Fuel	$/hr	1.11 **	—	7.26	4.03	1.47	2.81	3.37
		Lube. Cost	$/hr	0.22	—	1.45	0.81	0.29	0.56	0.67
		Sub Total	$/hr	1.35	0.02	9.38	5.17	1.79	3.58	4.28
Total (per hour)			$/hr	13.10	97.90	214.13	165.23	10.35	39.86	64.94

Construction Equipment			Unit	Generator	Earth (*) Drill	Small (*) Breaker	Drop (*) Hammer	Drill	Water (*) Pump	Welder (*)
Type				256KW	-	40Kg	600 ~800Kg	-	φ8	-
Engine Power			PS	350	5.5KW	-	-	-	35	-
Weight			Ton	4.8	0.54	0.039	0.78	0.008	0.92	0.23
Life Time			Years	7	6	2	2	2	5	7
Working Time per Year			Hours	-	-	-	-	-		-
Working Day per Year			Days	140	140	150	150	150	135	200
Depreciation Rate per Hour			10^{-6}	1905	2464	4500	4500	4500	3630	1378
CIF of La Paz			$	39587	83000	3900	3520	1370	9142	5860
Customs Duties			$	10411	21829	1026	926	360	2404	1541
Transportation (Construction Site) and Other Cost			$	232	26	2	38	1	44	11
Purchase Price			$	50230	104855	4928	4484	1731	11590	7412
F.C. Depreciation			$/hr	75.41	204.51	17.55	15.84	6.17	33.19	8.08
F.C.	Duties	Income Tax	$/hr	19.83	53.79	2.53	4.17	1.62	8.73	2.12
		Fuel	$/hr	1.23	-	-	-	-	1.41	-
		Lube. Cost	$/hr	0.25	-	-	-	-	0.28	-
		Sub Total	$/hr	21.31	53.79	2.53	4.17	1.62	10.42	2.12
	Others	Transportation	$/hr	0.44	0.06	0.06	0.17	0.01	0.16	0.02
		Fuel	$/hr	9.83	-	-	-	-	11.29	-
		Lube. Cost	$/hr	1.97	-	-	-	-	2.26	-
		Sub Total	$/hr	12.24	0.06	0.06	0.17	0.01	13.71	0.02
Total (per hour)			$/hr	108.96	258.36	20.14	20.18	7.80	57.32	10.22

Construction Equipment			Unit	Water (*) Pump	(*) Vibrator	Weighing Machine	Oil (*) Jacky	Hydraulic (*) Pump	(*) Winch	Belt (*) Conveyer	Leg (*) Hammer
Type				φ = 4"	1.2"	Cap. 1000kg	Freyssinett	Freyssinett	1 t	7 m	600 - 800Kg
Engine Power			PS	3.7	4.5		—	-	7.5km	3.0	-
Weight			Ton	0.10	0.045		0.10	0.15	0.50	0.23	0.78
Life Time			Years	3	4	0.20	8	8	7	3	2
Working Time per Year			Hours	—	—		—	-	—	—	—
Working Day per Year			Days	180	130		—	-	140	130	150
Depreciation Rate per Hour			$\times 10^{-6}$	1850	3462	2153	1929	2500	2990	4487	4500
CIF of La Paz			$	1600	1320	3260	31000	31000	28900	2300	31000
Customs Duties			$	421	347	857	8153	8153	7601	605	8153
Transportation (Construction Site) and Other Cost			$	5	2	8	5	7	24	11	38
Purchase Price			$	2026	1669	4125	39158	39160	36525	2916	39191
F.C. Depreciation			$/hr	2.96	4.57	7.02	59.80	77.50	86.41	10.32	139.5
L.C.	Duties	Income Tax	$/hr	0.78	1.20	1.85	15.73	20.38	22.73	2.71	36.69
		Fuel	$/hr	0.15	0.26	—	—	-	—	0.02	-
		Lube. Cost	$/hr	0.03	0.05	—	—	-	—	0.00	-
		Sub Total	$/hr	0.96	1.51	1.85	15.73	20.38	22.73	2.74	36.69
	Others	Transportation	$/hr	0.01	0.01	0.02	0.01	0.02	0.07	0.05	0.17
		Fuel	$/hr	1.19	2.11	—	—	-	—	0.14	-
		Lube. Cost	$/hr	0.23	0.42	—	—	-	—	0.03	-
		Sub Total	$/hr	1.43	2.54	0.92	0.01	0.02	0.07	0.22	0.17
Total (per Hour)			$/hr	5.35	8.62	8.89	75.54	97.90	109.21	13.28	176.36

付録6-3　　工事費単価表

UNIT COST FOR CONSTRUCTION

US$

Item	Cost			Unit	L.C.		F.C.	Total	Remarks
					Duties	Others			
Earth Work	Clearing and Grubbing			ha	2,789	2,599	9,460	14,845	A-31
	Excavation A			m^3	1.40	1.30	2.07	4.50	38
	Excavation B			m^3	1.42	1.38	4.72	7.52	39
	Finished Rolling of Subgrade			m^2	0.01	0.02	0.04	0.07	37
	Slope	Seed Spraying		m^2	0.13	1.13		1.23	73
		Concrete Spraying		m^2	3.29	11.97	7.59	22.85	65
		Cribworks		m^2	6.95	4.58	15.71	47.24	111
		Concrete Pitching		m^2	5.15	13.68	13.12	31.95	112
	Retaining Wall		Gravity(4m)	m	35.12	224.54	50.02	309.77	69
			Stone Masonry	m^2	4.12	27.66	4.69	36.47	63
			Grid Type	m^2	17.07	67.07	30.87	115.01	61
	Culvert	Box 3.0X3.0		m	202	488	523	1,213	71
		Box 4.0X4.0		m	282	696	730	1,708	72
		Pipe Φ1.0m		m	17.58	131.21	12.43	161.22	70
	Disaster		Catch Netting	m^2	2.00	1.59	5.95	9.54	113
			Gabion	m	11.56	25.22	29.94	66.72	114
			Catch Fence	m	20.48	39.02	53.30	112.80	115
			Gabion Dam	m^3	12.78	28.54	35.45	76.77	116
			Shed	m	1,565.36	2,904.05	4,444.72	8,914.13	117
			French Drain	m	3.54	7.63	10.44	21.61	118
	Drainage			Km	4,530	29,637	5,826	39,993	74
Pavement	Subbase Course			m^2	0.36	0.30	1.28	1.94	87
	Base Course			m^2	0.74	1.17	2.40	4.31	88
	Binder Course			m^2	1.08	0.93	3.67	5.68	82
	Surface Course			m^2	1.28	0.88	4.04	6.20	83
Bridge	$\ell \geq 50^m$			Set					
	$\ell < 50^m$			Set					
Tunnel	Lining			m	1,022	3,180	2,713	6,915	92
	Unsupported			m	751	2,076	2,038	4,865	91
	Portal			Pcs	2,827	9,317	7,176	19,320	93
Others	Traffic Sign and Guard Rail			Km	5,910	1,740	14,050	21,700	104
	Marking			Km	47.50	427.50		475	105
Pavement	Macadam Asphalt			m^2	0.70	0.97	1.97	3.64	89

CONSTRUCTION COST

US$

Item	Size & Type	Unit	L.C.		F.C.	Total	Remark
			Duties	Other			
Concrete Class.B	210Kg/cm²	m³	13.49	49.85	34.71	98.05	A -41
Concrete Class.C	160Kg/cm²	m³	5.51	37.33	8.10	50.94	-42
Concrete Class.D	-	m³	5.27	34.35	8.14	47.76	-43
Concrete Mixing		m³	0.84	5.71	0.78	7.33	-48
Concrete Placing (A)	by Man Power	m³	0.43	3.91	-	4.34	-49
Concrete Placing (B)	by Piping	m³	0.75	3.15	1.51	5.41	-49
Concrete Placing (C)	by Crane	m³	1.48	1.65	4.58	7.71	-49
Form Work		m²	0.67	6.23	0.04	6.94	-51
Reinforcement Work		Ton	228.62	105.46	689.13	1,023.21	-52
Scaffolding Work		m³	0.61	4.50	0.45	5.56	-54
Loading Cost		m³	0.24	0.33	0.76	1.33	-11
Transportation Cost		m³	0.09	0.07	0.33	0.49	-12
Transportation Cost		Ton	0.04	0.03	0.13	0.20	-12
Sand	From Swapi	m³	8.04	6.75	29.07	43.86	-45
Sand	From Site	m³	1.20	1.43	3.99	6.62	-45
Gravel	From Alt. Ben:	m³	7.28	6.53	26.02	39.83	-45
Gravel	From Site	m³	1.79	2.26	5.89	9.94	-45
Drainage	Type 1	m	1.36	8.41	1.95	11.72	-75
Drainage	Type 2	m	1.82	12.82	19.19	16.55	-76
Excavation for Tunnel		m³	5.36	12.41	15.63	33.40	-94
Mortar Spray for Tunnel	t=15cm	m²	3.36	15.92	7.93	27.48	-97
Anchor Works for Tunnel		Pcs	14.06	54.88	43.04	111.98	-98
Lining Concrete for Tunnel	t=45cm	m	240.30	929.69	550.49	1,720.48	-101

Unit Cost for Bridge Constructiion							
Name of Work	Size and Type	Unit	L.C.		F.C.	Total	Remarks
			Duties	Others			
Excavation	For Structure	m^3	1.65	6.98	3.31	11.94	B-32
Concrete	Type -P	m^3	16.22	67.28	38.51	122.01	B-29
Concrete	Type -A	m^3	15.08	58.71	37.00	110.79	B-30
Concrete	Type -D	m^3	5.27	34.35	8.14	47.76	A-43
Concrete Mixing		m^3	0.84	5.71	0.78	7.33	A-48
Concrete Placing		m^3	0.75	3.15	1.51	5.41	A-49
Form(hard)		m^2	0.98	7.87	0.24	9.09	B-12
Form(simple)		m^2	0.67	6.23	0.04	6.94	A-51
Reinforcement Bar		Ton	233.81	127.98	694.18	1055.97	B-26
PC-Assembiling		Kg	1.41	0.42	4.61	6.44	B-3
Slab		m^3	69.02	145.12	176.22	390.36	B-4
Cross Beam		m^3	48.71	122.24	120.49	291.44	B-5
Shoe	neopren	Pce	42.66	15.36	126.77	184.79	B-6
Shoe(Box)	neopren	Pce	79.91	15.72	240.26	335.89	B-6
Expansion Joint		m	9.12	3.60	25.00	37.72	B-8
Drenage		Pce	0.58	5.02	-	5.60	B-9
Handrail		m	16.66	35.43	42.38	94.47	B-10
Newel Post		Br.	107.17	63.08	788.83	959.08	B-11
I-Girder		m^3	142.55	177.84	416.83	737.22	B-1
Main Girder (Box)		m^3	109.73	137.75	319.08	566.56	B-2
Staging		Sec·m^3	0.61	4.50	0.45	5.56	B-31
Erection	Girder	ton	4.40	1.26	18.04	23.70	
Erection		m^3	19.7	2.09	55.3	77.09	C-

付録6-4　　橋工事費集計表

1.　　Unit : $

Name of Bridges		L. C.		F. C.	Total
		Duties	Others		
Point A Br.	Spr.S (B)	174074	195257	516789	886120
	Sub.S (A)	4125	12273	10146	26544
(ℓ =132.5m)	(P)	37114	89325	97655	224094
	Subtotal	215313	296855	624590	1136758
Putini Br.	Spr.S (B)	21502	34974	62124	118600
	Sub.S (A)	4612	18446	14121	37179
(ℓ = 40.0m)	(P)	3368	9156	8478	21002
	Subtotal	29482	62576	84723	176781
Challa Br.	Spr.S (I)	10839	17006	31660	59505
	Sub.S (A)	5287	15470	13714	34471
(ℓ = 20.0m)	Subtotal	16126	32476	45374	93976
Cascada Br.	Spr.S (I)	8877	14953	25813	49643
	Sub.S (A)	3973	12531	9459	25963
(ℓ = 18.0m)	Subtotal	12850	27484	35272	75606
Alto Choro	Spr.S (B)	41236	53891	128976	224103
Br.	Sub.S (A)	5930	17769	14547	38246
(ℓ = 50.0m)	(P)	2989	7949	7587	18525
	Subtotal	50155	79609	151110	280874
Pto Leon Br.	Spr.S (B)	40733	65842	117659	224234
	Sub.S (A)	8169	24891	19871	52931
(ℓ = 75.0m)	(P)	6030	16404	15170	37604
	Subtotal	54932	107137	152700	314769
Cajones Br.	Spr.S (I)	13612	21701	39678	74991
	Sub.S (A)	4725	14555	12383	31663
(ℓ = 25.0m)	Subtotal	18337	36256	52061	106654
Chojna Br.	Spr.S (I)	9528	15165	27768	52461
	Sub.S (A)	4492	12598	11341	28431
(ℓ = 22.0m)	Subtotal	14020	27763	39109	80892
San Silverio	Spr.S (B)	41236	53891	128976	224103
Br.	Sub.S (A)	9740	28516	24135	62391
(ℓ = 50.0m)	(P)	4258	11507	10742	26507
	Subtotal	55234	93914	163853	313001
San Lorenzo	Spr.S (B)	43347	56709	135550	235606
Br.	Sub.S (A)	7669	23526	18614	49809
(ℓ = 52.0m)	(P)	7602	18473	19305	45380
	Subtotal	58618	98708	173469	330795

2.

Unit : $

Name of Bridges		L. C.		F. C.	Total
		Duties	Others		
Espiritu Br.	Spr.S (B)	43347	56709	135550	235606
	Sub.S (A)	6245	19416	15069	40730
(ℓ = 52.0m)	(P)	8639	22555	22069	53263
	Subtotal	58231	98680	172688	329599
Carrasco Br.	Spr.S (I)	21917	34423	64125	120465
	Sub.S (A)	14358	43862	34718	92938
(ℓ = 30.0m)	Subtotal	36275	78285	98843	213403
Avaroa Br.	Spr.S (I)	20878	27006	65476	113360
	Sub.S (A)	2354	7572	5583	15509
(ℓ = 25.0m)	Subtotal	23232	34578	71059	128869

note Spr.S : Superstructure
Sub.S : Substructure
I : PCI-compsite Girder
B : Box Girder
A : Abutment
P : Pier

I. Superstructure

Point A

Name of Work	Size and Type	Unit	Volume	Unit Cost			Costos			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Concrete	Type P	m³	1207.40	16.22	67.28	38.51	19584.03	81233.87	46496.97	
Rainforcement	Grade 60	Ton	205.26	233.81	127.98	694.18	47991.84	26269.17	142487.39	
PC-Cable	270G	Kg	48296	1.41	0.42	4.61	68097.36	20284.32	222644.56	
Form		m²	4193.06	0.98	7.87	0.24	4109.20	32999.38	1006.33	
Shoe		Set	4	15.72	240.26	719.19	62.88	961.04	2876.76	
Handrail		m	265.0	16.66	35.43	42.38	4414.9	9388.95	11230.70	
Expansion		m	22.0	9.12	3.60	25.00	200.64	79.2	550	
Drainage		set	28	0.58	5.02	-	16.24	140.56	-	
Newel Post		set	1.0	107.17	63.08	788.83	106.17	63.08	788.83	
Erection(Center)		m³	531.43	19.7	2.09	55.3	10469.17	1110.69	29388.08	
Erection(Side)		m³	675.97	4.40	1.26	18.04	2974.27	4231.57	12194.50	
Caring		m²	1305.7	0.17	0.57	0.11	221.97	744.25	143.63	
Miscellaneous	10%	set	1.0				15824.87	17750.61	46980.98	
Total							174073.5	195256.7	516788.5	

Patuni Bridge (ℓ=40.0m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
I-Girder	Type-P	m^3	70.8	142.55	177.84	416.83	10092.54	12591.07	29511.56	
Cross Beam	Type-A	m^3	22.324	48.71	122.24	120.49	1087.40	2728.89	2689.82	
Slab	Type-A	m^3	88.974	70.61	153.98	178.50	6282.45	13700.22	15881.86	
Erection		Ton	177	10.99	15.66	45.11	1945.23	2771.82	7984.47	
Shoe		Set	10	42.66	15.36	126.77	426.6	153.6	1267.7	
Handrail		m	79.76	16.66	35.43	42.38	1328.80	2825.90	3380.23	
Expansion Joint		m	24.8	9.12	3.60	25.00	226.18	89.28	620.0	
Drainage		Set	10	0.58	5.02	-	5.8	50.2	-	
Newel Post		Set	1.0	107.17	63.08	788.83	107.17	63.08	788.83	
Total							21502.0	34974.0	62124.0	

Challa Bridge (ℓ=20.0m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
I- Girder	Type-P	m^3	35.4	142.55	177.84	416.83	5046.27	6295.54	14755.78	
Cross Beam	Type-A	m^3	11.162	48.71	122.24	120.49	543.70	1364.44	1344.91	
Slab	Type-A	m^3	40.339	70.61	153.98	178.50	2848.34	6211.40	7200.51	
Shoe		Set	10	42.66	15.36	126.77	426.6	153.6	1267.7	
Handrail		m	39.88	16.66	35.43	42.38	664.40	1412.95	1690.11	
Expansion Joint		m	24.8	9.12	3.60	25.00	226.18	89.28	620.0	
Drainage		Set	6	0.58	5.02	-	3.48	30.12	-	
Newel Post		Set	1	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	88.5	10.99	15.66	45.11	972.62	1385.91	3992.24	
Total							10839.0	17006.0	31660.0	

Cascada Bridge (ℓ=18.5m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
I-Girder	Type-P	m^3	26.912	142.55	177.84	416.83	3836.30	4786.03	11217.73	
Cross Beam	Type-A	m^3	9.761	48.71	122.24	120.49	475.46	1193.18	1176.10	
Slab	Type-A	m^3	36.234	70.61	153.98	178.50	2558.48	5579.31	6467.77	
Shoe		Set	8	42.66	15.36	126.77	341.28	122.88	1014.16	
Handrail		m	36.88	16.66	35.43	42.38	614.42	1306.66	1562.97	
Expansion Joint		m	22.0	9.12	3.60	25.00	200.64	79.20	550.0	
Drainage		Set	6	0.58	5.02	-	3.48	30.12	-	
Neswel		Set	1.0	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	67.28	10.99	15.66	45.11	739.41	1793.01	3035.0	
Total							8877.0	14953.0	25813.0	

Alto Choro Bridge (ℓ=50m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Main Girder	Type-P	m^3	280.218	109.73	137.75	319.08	30748.32	38600.03	89411.96	
Pavement		m^2	9.13	15.38	61.57	37.73	140.42	562.13	344.47	
Shoe		set	9	79.91	15.72	240.26	719.19	141.48	2162.34	
Handrail		m	96.076	16.66	35.43	42.38	1600.63	3403.97	4071.70	
Exponsion Joint		m	23.0	9.12	3.60	25.00	209.76	82.8	575.0	
Drainage		set	12	0.58	5.02	-	6.96	60.24	-	
Newel Post		set	1.0	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	701	10.99	15.06	45.11	7703.99	10977.66	31622.11	
Total							41236.0	53891.0	128976.0	

Pto Leon Bridge (ℓ=75.0m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
I-Girder	Type-P	m^3	138.0	142.55	177.84	416.83	19671.90	24541.92	57522.54	
Cross Beam	Type-A	m^3	40.569	48.71	122.24	120.49	1976.12	4959.15	4888.16	
Slab	Type-A	m^3	162.732	70.61	153.98	178.50	11490.51	25057.47	29047.66	
Shoe		Set	24	42.66	15.36	126.77	1023.84	368.64	3042.48	
Handrail		m	149.64	16.66	35.43	42.38	2993.00	5301.75	6341.74	
Expansion Joint		m	18.60	9.12	3.60	25.00	169.63	66.96	465.0	
Drainage		Set	16	0.58	5.02	-	9.28	80.32	-	
Neswel		Set	1.0	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	345	10.99	15.66	45.11	3791.55	5402.70	15562.95	
Total							40733.0	65842.0	117659.0	

Cajones Bridge (ℓ=25.0m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
I-Girder	Type-P	m^3	46.0	142.55	177.84	416.83	6557.30	8180.64	19174.18	
Cross Beam	Type-A	m^3	16.30	48.71	122.24	120.49	793.973	1992.51	1963.99	
Slab	Type-A	m^3	49.775	70.61	153.98	178.50	3514.61	7664.35	8884.84	
Shoe		Set	8	42.66	15.36	126.77	341.28	122.88	1014.16	
Handrail		m	49.88	16.66	35.43	42.38	831.00	1767.25	2113.91	
Expansion Joint		m	22.0	9.12	3.60	25.00	200.64	79.2	550.0	
Drainage		Set	6	0.58	5.02	-	3.48	30.12	-	
Neswel		Set	1.0	106.17	63.08	788.83	106.17	63.08	788.83	
Erection		Ton	115	10.99	15.66	45.11	1263.85	1800.9	5187.65	
Total							13612.0	21701.0	39678.0	

Chojña Bridge (ℓ=22.0m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
1-Girder	Type-P	m^3	30.028	142.55	177.84	416.83	4280.49	5340.18	12516.57	
Cross Beam	Type-A	m^3	10.785	48.71	122.24	120.49	525.34	1318.36	1299.48	
Slab	Type-A	m^3	35.593	70.61	153.98	178.50	2513.22	5480.61	6353.35	
Shoe		Set	8	42.06	15.36	126.77	341.28	122.88	1014.16	
Handrail		m	43.88	16.66	35.43	42.38	731.04	1554.67	1859.63	
Expansion Joint		m	22.0	9.12	3.60	25.00	200.64	79.20	550.0	
Drainage		Set	6	0.58	5.02	-	3.48	30.12	-	
Neswel		Set	1.0	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	75.07	10.99	15.66	45.11	825.02	1175.60	3386.41	
Total							9528.0	15165.0	27768.0	

San Silverio Bridge (ℓ=50m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Main Girder	Type-P	m^3	280.218	109.73	137.75	319.08	30748.32	38600.03	89411.96	
Pavement		m^2	9.13	15.38	61.57	37.73	140.42	562.13	344.47	
Shoe		set	9	79.91	15.72	240.26	719.19	141.48	2162.34	
Handrail		m	96.076	16.66	35.43	42.38	1600.63	3403.97	4071.70	
Exponsion Joint		m	23.0	9.12	3.60	25.00	209.76	82.8	575.0	
Drainage		set	12	0.58	5.02	-	6.96	60.24	-	
Newel Post		set	1.0	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	701	10.99	15.06	45.11	7703.99	10977.66	31622.11	
Total							41236.0	53891.0	128976.0	

San Lorenzo Bridge (ℓ=50m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Main Girder	Type-P	m^3	294.94	109.73	137.75	319.08	32363.77	40627.99	94109.46	
Pavement		m^2	9.65	15.38	61.57	37.73	148.42	594.15	364.09	
Shoe		set	9.00	79.91	15.72	240.26	719.19	141.48	2162.34	
Handrail		m	101.556	16.66	35.43	42.38	1691.92	3598.13	4303.94	
Exponsion Joint		m	23.0	9.12	3.60	25.0	209.76	82.8	575	
Drainage		set	12	0.58	5.02	-	6.96	60.24	-	
Newel Post		set	1.0	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	737	10.99	15.66	45.11	8099.63	11541.42	33246.07	
Total							43347.0	56709.0	135550.0	

Espiritu Bridge (ℓ=50m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Main Girder	Type-P	m^3	294.94	109.73	137.75	319.08	32363.77	40627.99	94109.46	
Pavement		m^2	9.65	15.38	61.57	37.73	148.42	594.15	364.09	
Shoe		set	9.00	79.91	15.72	240.26	719.19	141.48	2162.34	
Handrail		m	101.556	16.66	35.43	42.38	1691.92	3598.13	4303.94	
Exponsion Joint		m	23.0	9.12	3.60	25.0	209.76	82.8	575	
Drainage		set	12	0.58	5.02	-	6.96	60.24	-	
Newel Post		set	1.0	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	737	10.99	15.66	45.11	8099.63	11541.42	33246.07	
Total							43347.0	56709.0	135550.0	

Carrasco Bridge (ℓ=30.0m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
T-Girder	Type-P	m^3	80.385	142.55	177.84	416.83	11458.88	14295.67	33506.88	
Cross Beam	Type-A	m^3	25.585	48.71	122.24	120.49	1246.25	3127.51	3082.74	
Slab	Type-A	m^3	73.952	70.61	153.98	178.50	5221.75	11387.13	13200.43	
Shoe		Set	10	42.06	15.36	126.77	426.6	153.6	1267.7	
Handrail		m	59.88	16.66	35.43	42.38	997.60	2121.55	2537.71	
Expansion Joint		m	27.0	9.12	3.60	25.00	246.24	97.2	675.0	
Drainage		Set	6	0.58	5.02	-	3.48	30.12	-	
Newel Post		Set	1.0	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	200.96	10.99	15.66	45.11	2208.55	3147.03	9065.31	
Total							21917.0	34423.0	64125.0	

Avaroa Bridge (ℓ=25m)

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Main Girder	Type-P	m^3	140.109	109.73	137.75	319.08	15374.16	19300.01	44705.98	
Pavement		m^2	4.50	15.38	61.57	37.73	69.21	277.07	169.79	
Shoe		set	6	79.91	15.72	240.06	479.46	94.32	1441.56	
Handrail		m	47.338	16.66	35.43	42.38	788.65	1677.19	2006.18	
Exponsion Joint		m	23.0	9.12	3.60	25.00	209.76	82.8	575.0	
Drainage		set	6	0.58	5.02	-	3.48	30.12	-	
Newel Post		set	1	107.17	63.08	788.83	107.17	63.08	788.83	
Erection		Ton	350	10.99	15.66	45.11	3846.5	5481.0	15788.50	
Total							20878.0	27006.0	65476.0	

II. Substructure

Point A Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	247.4	1.65	6.98	3.31	408.21	1726.85	818.89	
Concrete	Type-A	m^3	122.10	13.49	49.85	34.71	1647.13	6086.69	4238.09	
Leveling Concrete	Type-D	m^3	6.60	5.27	34.35	8.14	34.78	226.71	53.72	
Concrete Mixing		m^3	122.10	0.84	5.71	0.78	102.56	697.19	95.24	
Concrete Placing		m^3	122.10	0.75	3.15	1.51	91.58	384.62	184.37	
Reinforcement Bar		Ton	6.72	233.81	127.98	694.18	1571.20	860.03	4664.89	
Form		m^2	236.86	0.67	6.23	0.04	158.70	1475.64	9.47	
Staging		Spc·m^3	181.06	0.61	4.50	0.45	110.45	814.77	81.48	
Total							4125.0	12273.0	10146.0	

Point A Pier

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	334.00	1.65	6.98	3.31	551.10	2331.32	1105.54	
Concrete	Type-A	m^3	1117.10	13.49	49.85	34.71	15069.68	55687.44	38774.54	
Leveling Concrete	Type-D	m^3	28.62	5.27	34.35	8.14	150.83	983.10	232.97	
Concrete Mixing		m^3	1117.10	0.84	5.71	0.78	938.36	6378.64	871.34	
Concrete Placing		m^3	1117.10	0.75	3.15	1.51	837.83	3518.87	1686.82	
Reinforcement Bar		Ton	78.20	233.81	127.98	694.18	18283.34	10008.04	54284.88	
Form		m^2	742.60	0.67	6.23	0.04	497.54	4626.40	29.70	
Staging		Spc·m^3	1287.00	0.61	4.50	0.45	785.07	5791.50	579.15	
Total							37114.0	89325.0	97655.0	

Patuni Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	851.00	1.65	6.98	3.31	1404.15	5939.98	2816.81	
Concrete	Type-A	m^3	147.71	13.49	49.85	34.71	1992.61	7363.34	5127.01	
Leveling Concrete	Type-D	m^3	12.83	5.27	34.35	8.14	67.61	440.71	104.40	
Concrete Mixing		m^3	147.71	0.84	5.71	0.78	124.08	843.42	115.21	
Concrete Placing		m^3	147.71	0.75	3.15	1.51	110.78	465.29	223.04	
Reinforcement Bar		Ton	8.12	233.81	127.98	694.18	1898.54	1039.20	5636.74	
Form		m^2	236.76	0.67	6.23	0.04	158.63	1475.01	9.47	
Staging		Spc·m^3	195.28	0.61	4.50	0.45	119.12	878.76	87.88	
Total							4612.0	18446.0	14121.0	

Patuni Pier

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	205.20	1.65	6.98	3.31	338.58	1432.30	679.21	
Concrete	Type-A	m^3	89.98	13.49	49.85	34.71	1213.83	4485.50	3123.21	
Leveling Concrete	Type-D	m^3	3.00	5.27	34.35	8.14	15.81	103.05	24.42	
Concrete Mixing		m^3	89.98	0.84	5.71	0.78	75.58	513.79	70.18	
Concrete Placing		m^3	89.98	0.75	3.15	1.51	67.49	283.44	135.87	
Reinforcement Bar		Ton	6.30	233.81	127.98	694.18	1473.00	806.27	4373.33	
Form		m^2	139.58	0.67	6.23	0.04	93.52	869.58	5.58	
Staging		Spc·m^3	147.12	0.61	4.50	0.45	89.74	662.04	66.20	
Total							3368.0	9156.0	8478.0	

Challa Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	279.70	1.65	6.98	3.31	461.51	1952.31	925.81	
Concrete	Type-A	m^3	159.14	13.49	49.85	34.71	2146.80	7933.13	5523.75	
Leveling Concrete	Type-D	m^3	8.07	5.27	34.35	8.14	42.53	227.20	65.69	
Concrete Mixing		m^3	159.14	0.84	5.71	0.78	133.68	908.69	124.13	
Concrete Placing		m^3	159.14	0.75	3.15	1.51	119.36	501.29	240.30	
Reinforcement Bar		Ton	8.75	233.81	127.98	694.18	2045.84	1119.83	6074.08	
Form		m^2	262.07	0.67	6.23	0.04	175.59	1632.70	10.48	
Staging		Spc·m^3	265.52	0.61	4.50	0.45	161.97	1194.84	119.48	
Total							5287.0	15470.0	13714.0	

Cascada Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	506.70	1.65	6.98	3.31	836.06	3536.77	1617.18	
Concrete	Type-A	m^3	102.36	13.49	49.85	34.71	1380.84	5102.65	3552.92	
Leveling Concrete	Type-D	m^3	8.06	5.27	34.35	8.14	42.48	276.86	65.61	
Concrete Mixing		m^3	102.36	0.84	5.71	0.78	85.98	584.48	79.84	
Concrete Placing		m^3	120.36	0.75	3.15	1.51	76.77	322.43	154.56	
Reinforcement Bar		Ton	5.63	233.81	127.98	694.18	1316.35	720.53	3908.23	
Form		m^2	202.38	0.67	6.23	0.04	135.59	1260.83	8.10	
Staging		Spc·m^3	161.40	0.61	4.50	0.45	98.45	726.30	72.63	
Total							3973.0	12531.0	9459.0	

Alto Choro Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	534.70	1.65	6.98	3.31	882.26	3732.21	1769.86	
Concrete	Type-A	m^3	167.71	13.49	49.85	34.71	2262.41	8360.34	5821.21	
Leveling Concrete	Type-D	m^3	7.70	5.27	34.35	8.14	40.58	264.50	62.68	
Concrete Mixing		m^3	167.71	0.84	5.71	0.78	140.88	957.62	130.81	
Concrete Placing		m^3	167.71	0.75	3.15	1.51	125.78	528.29	253.24	
Reinforcement Bar		Ton	9.22	233.81	127.98	694.18	2155.73	1179.98	6400.34	
Form		m^2	283.90	0.67	6.23	0.04	190.21	1768.70	11.36	
Staging		Spc·m^3	217.28	0.61	4.50	0.45	132.54	977.76	97.78	
Total							5930.0	17769.0	14547.0	

Alto Choro Pier

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	113.90	1.65	6.98	3.31	187.94	795.02	377.01	
Concrete	Type-A	m^3	83.18	13.49	49.85	34.71	1122.10	4146.52	2887.18	
Leveling Concrete	Type-D	m^3	3.20	5.27	34.35	8.14	16.86	109.92	26.05	
Concrete Mixing		m^3	83.18	0.84	5.71	0.78	69.87	474.96	64.88	
Concrete Placing		m^3	83.18	0.75	3.15	1.51	62.39	262.02	125.60	
Reinforcement Bar		Ton	5.82	233.81	127.98	694.18	1360.77	744.84	4040.13	
Form		m^2	129.03	0.67	6.23	0.04	86.45	803.86	5.16	
Staging		Spc·m^3	136.00	0.61	4.50	0.45	82.96	612.00	61.20	
Total							2989.0	7949.0	7587.0	

Pto Leon Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	712.40	1.65	6.98	3.31	1175.46	4972.55	2358.04	
Concrete	Type-A	m^3	228.73	13.49	49.85	34.71	3085.57	11402.19	7939.22	
Leveling Concrete	Type-D	m^3	9.68	5.27	34.35	8.14	51.01	332.51	78.80	
Concrete Mixing		m^3	228.73	0.84	5.71	0.78	192.13	1306.05	178.41	
Concrete Placing		m^3	228.73	0.75	3.15	1.51	171.55	720.50	345.38	
Reinforcement Bar		Ton	12.58	233.81	127.98	694.18	2941.33	1609.99	8732.78	
Form		m^2	370.54	0.67	6.23	0.04	248.26	2308.46	14.82	
Staging		Spc·m^3	497.56	0.61	4.50	0.45	303.51	2239.02	223.90	
Total							8169.0	24891.0	19871.0	

Pto Leon Pier

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	318.00	1.65	6.98	3.31	524.70	2219.64	1052.58	
Concrete	Type-A	m^3	162.21	13.49	49.85	34.71	2188.21	8086.17	5630.31	
Leveling Concrete	Type-D	m^3	6.00	5.27	34.35	8.14	31.62	206.10	48.87	
Concrete Mixing		m^3	162.21	0.84	5.71	0.78	136.26	926.22	126.52	
Concrete Placing		m^3	162.21	0.75	3.15	1.51	121.66	510.96	244.94	
Reinforcement Bar		Ton	11.35	233.81	127.98	694.18	2653.74	1452.57	7878.94	
Form		m^2	192.04	0.67	6.23	0.04	128.67	1196.41	7.68	
Staging		Spc·m^3	401.28	0.61	4.50	0.45	244.78	1805.76	180.58	
Total							6030.0	16404.0	15170.0	

Cajoñes Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m³	161.60	1.65	6.98	3.31	266.64	1127.97	543.90	
Concrete	Type-A	m³	154.88	13.49	49.85	34.71	2089.33	7720.77	5375.88	
Leveling Concrete	Type-D	m³	7.36	5.27	34.35	8.14	38.79	252.82	59.91	
Concrete Mixing		m³	154.88	0.84	5.71	0.78	130.10	884.36	120.81	
Concrete Placing		m³	154.88	0.75	3.15	1.51	116.16	487.87	233.87	
Reinforcement Bar		Ton	8.52	233.81	127.98	694.18	1992.06	1091.39	5914.41	
Form		m²	266.80	0.67	6.23	0.04	178.76	1662.16	10.67	
Staging		Spc·m³	295.27	0.61	4.50	0.45	180.11	1328.72	132.87	
Total							4992.0	14555.0	12383.0	

Chojña Abutment — Por pilote

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m³	142.60	1.65	6.98	3.31	235.29	995.35	472.01	
Concrete	Type-A	m³	142.88	13.49	49.85	34.71	1927.45	7122.57	4959.36	
Leveling Concrete	Type-D	m³	8.40	5.27	34.35	8.14	44.27	288.54	68.38	
Concrete Mixing		m³	142.88	0.84	5.71	0.78	120.02	815.84	111.45	
Concrete Placing		m³	142.88	0.75	3.15	1.51	107.16	450.07	215.75	
Reinforcement Bar		Ton	7.86	233.81	127.98	694.18	1837.75	1005.92	5456.25	
Form		m²	229.65	0.67	6.23	0.04	153.86	1430.72	9.19	
Staging		Spc·m³	108.66	0.61	4.50	0.45	66.28	488.97	48.90	
Total							4492.0	12598.0	11341.0	

San Silverio Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	748.30	1.65	6.98	3.31	1234.70	5223.13	2476.87	
Concrete	Type-A	m^3	284.48	13.49	49.85	34.71	3837.64	14181.33	9874.30	
Leveling Concrete	Tpye-D	m^3	11.00	5.27	34.35	8.14	57.97	377.85	89.54	
Concrete Mixing		m^3	284.48	0.84	5.71	0.78	238.96	1624.38	221.89	
Concrete Placing		m^3	284.48	0.75	3.15	1.51	213.36	896.11	429.56	
Reinforcement Bar		Ton	15.65	233.81	127.98	694.18	3659.13	2002.89	10863.92	
Form		m^2	414.46	0.67	6.23	0.04	277.69	2582.09	16.58	
Staging		Spc·m^3	361.84	0.61	4.50	0.45	220.72	628.28	162.83	
Total							9740.0	28516.0	24135.0	

San Silverio Pier

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	209.70	1.65	6.98	3.31	346.01	1463.71	694.11	
Concrete	Type-A	m^3	115.83	13.49	49.85	34.71	1562.55	5774.13	4020.46	
Leveling Concrete	Type-D	m^3	4.00	5.27	34.35	8.14	21.08	137.40	32.56	
Concrete Mixing		m^3	115.83	0.84	5.71	0.78	97.30	661.39	90.35	
Concrete Placing		m^3	115.83	0.75	3.15	1.51	86.87	364.86	174.90	
Reinforcement Bar		Ton	8.11	233.81	127.98	694.18	1896.20	1037.92	5629.80	
Form		m^2	183.02	0.67	6.23	0.04	122.62	1140.21	7.32	
Staging		Spc·m^3	206.00	0.61	4.50	0.45	125.66	927.00	92.70	
Total							4258.0	11507.0	10742.0	

San Lorenzo Abutment										
Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	912.10	1.65	6.98	3.31	1504.80	6365.76	3018.72	
Concrete	Type-A	m^3	204.58	13.49	49.85	34.71	2759.78	10198.31	7100.97	
Leveling Concrete	Type-D	m^3	9.35	5.27	34.35	8.14	49.27	321.17	76.11	
Concrete Mixing		m^3	204.58	0.84	5.71	0.78	171.85	1168.15	159.57	
Concrete Placing		m^3	204.58	0.75	3.15	1.51	153.44	644.43	308.92	
Reinforcement Bar		Ton	11.25	233.81	127.98	694.18	2630.36	1439.78	7809.53	
Form		m^2	340.60	0.67	6.23	0.04	228.20	2121.94	13.62	
Staging		Spc·m^3	281.52	0.61	4.50	0.45	171.73	1266.84	126.68	
Total							7669.0	23526.0	18614.0	

San Lorenzo Pier										
Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	370.40	1.65	6.98	3.31	611.16	2585.39	1226.02	
Concrete	Type-A	m^3	205.50	13.49	49.85	34.71	2772.20	10244.18	7132.91	
Leveling Concrete	Type-D	m^3	4.80	5.27	34.35	8.14	25.30	164.88	39.07	
Concrete Mixing		m^3	205.50	0.84	5.71	0.78	172.62	1173.41	160.29	
Concrete Placing		m^3	205.50	0.75	3.15	1.51	154.13	647.33	310.31	
Reinforcement Bar		Ton	14.39	233.81	127.98	694.18	3364.53	1841.63	9989.25	
Form		m^2	295.57	0.67	6.23	0.04	296.24	301.80	295.61	
Staging		Spc·m^3	336.60	0.61	4.50	0.45	205.33	1514.70	151.47	
Total							7602.0	18473.0	19305.0	

Espiritu Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	878.20	1.65	6.98	3.31	1449.03	6129.84	2906.84	
Concrete	Type-A	m^3	159.52	13.49	49.85	34.71	2151.92	7952.07	5536.94	
Leveling Concrete	Type-D	m^3	9.35	5.27	34.35	8.14	49.27	321.17	76.11	
Concrete Mixing		m^3	159.52	0.84	5.71	0.78	134.00	910.86	124.43	
Concrete Placing		m^3	159.52	0.75	3.15	1.51	119.64	502.49	240.88	
Reinforcement Bar		Ton	8.77	233.81	127.98	694.18	2050.51	1122.38	6087.96	
Form		m^2	259.88	0.67	6.23	0.04	174.12	1619.05	10.40	
Staging		Spc·m^3	190.78	0.61	4.50	0.45	116.38	858.51	85.85	
Total							6245.0	19416.0	15069.0	

Espiritu Pier

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	307.40	1.65	6.98	3.31	507.21	2145.65	1017.49	
Concrete	Type-A	m^3	243.24	13.49	49.85	34.71	3281.31	12125.51	8442.86	
Leveling Concrete	Type-D	m^3	5.60	5.27	34.35	8.14	29.51	192.36	45.58	
Concrete Mixing		m^3	243.24	0.84	5.71	0.78	204.32	1388.90	189.73	
Concrete Placing		m^3	243.24	0.75	3.15	1.51	182.43	766.21	367.29	
Reinforcement Bar		Ton	17.03	233.81	127.98	694.18	3981.78	2179.50	11821.89	
Form		m^2	327.72	0.67	6.23	0.04	219.57	2041.70	13.11	
Staging		Spc·m^3	381.10	0.61	4.50	0.45	232.47	1714.95	171.50	
Total							8639.0	22555.0	22069.0	

Carasco Abutment

Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	1962.70	1.65	6.98	3.31	3238.46	13699.65	6496.54	
Concrete	Type-A_m	m^3	370.14	13.49	49.85	34.71	4993.19	18451.48	12847.56	
Leveling Concrete	Type-D	m^3	15.67	5.27	34.35	8.14	82.58	538.26	127.55	
Concrete Mixing		m^3	370.14	0.84	5.71	0.78	310.92	2113.50	288.71	
Concrete Placing		m^3	370.14	0.75	3.15	1.51	277.61	1165.94	558.91	
Reinforcement Bar		Ton	20.36	233.81	127.98	694.18	4760.37	2605.67	14133.50	
Form		m^2	545.21	0.67	6.23	0.04	365.29	3396.66	21.81	
Staging		Spc·m^3	540.13	0.61	4.50	0.45	329.48	2430.59	243.06	
Total							14358.0	43862.0	34718.0	

Avaroa Abutment

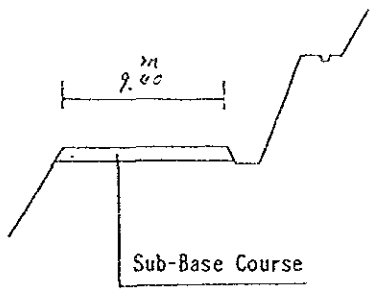
Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Duties	Others		
Excavation		m^3	219.20	1.65	6.98	3.31	361.68	1530.02	725.55	
Concrete	Type-A	m^3	62.86	13.49	49.85	34.71	847.98	3133.57	2181.87	
Leveling Concrete	Type-D	m^3	6.26	5.27	34.35	8.14	32.99	215.03	50.96	
Concrete Mixing		m^3	62.86	0.84	5.71	0.78	52.80	358.93	49.03	
Concrete Placing		m^3	62.86	0.75	3.15	1.51	47.15	198.01	94.92	
Reinforcement Bar		Ton	3.46	233.81	127.98	694.18	808.98	442.81	2401.86	
Form		m^2	155.30	0.67	6.23	0.04	104.05	967.52	6.21	
Staging		Spc·m^3	161.40	0.61	4.50	0.45	98.45	726.30	72.63	
Total							2354.0	7572.0	5583.0	

付録6-5　　維持費

B-201

Gravel Road Maintenance

Name of Work	Size and Type	Unit	Volume	Unit Cost L.C. Duties	Unit Cost L.C. Others	Unit Cost F.C.	Cost L.C. Ditoes	Cost L.C. Others	Cost F.C.	Remarks
Clearing of Surface		Km	107	299	1,187	635	31,993	127,009	67,945	B-203
Clearing of Structure		Total	1.00	1,070	5,423	1,763	1,070	5,423	1,763	-204
Rehabilitation of Shoulder		Km	107	19	46	54	2,033	4,922	5,778	-05
Patrol		Total	1.00	3,098	10,292	7,298	3,098	10,292	7,298	-206
Sub Total							38,194	147,646	82,784	
Contingeucy		%	5.00				1,910	7,382	4,139	
Rehabilitaion of Surface	2 Times/ Year	Km	107×2 214	406	430	1,375	86,884	92,020	294,250	473,154 207
Total							126,988	247,048	381,173	755,209
Per Km	108.63Km						1,169	2,274	3,509	(6,952)

Condition	Calculation	Remarks
		

B-202

Asphalt Road Maintenance

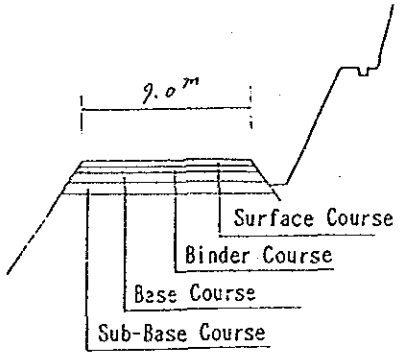
Name of Work	Size and Type	Unit	Volume	Unit Cost			Cost			Remarks
				L.C.		F.C.	L.C.		F.C.	
				Duties	Others		Ditoes	Others		
Clearing of Surface		Km	107	299	1,187	635	31,993	127,009	67,945	B-203
Clearing of Structure		Total	1.00	1,070	5,423	1,763	1,070	5,423	1,763	-204
Rehabilitation of Shoulder		Km	107	19	46	54	2,033	4,922	5,778	-05
Patrol		Total	1.00	3,098	10,292	7,298	3,098	10,292	7,298	-206
Sub Total							38,194	147,646	82,784	
Contingeucy		%	5.00				1,910	7,382	4,139	
Rehabilitaion of Surface		Km	107	118.75	123	364.5	12,706	13,161	39,001	209
Total							52,810	168,189	125,924	346,923
Per Km	108.63Km						486	1,548	1,159	(3,193)

Condition	Calculation	Remarks

A-213

Asphalt Macadam Road Maintenance

Name of Work	Size and Type	Unit	Volume	Unit Cost L.C. Duties	Unit Cost L.C. Others	Unit Cost F.C.	Cost L.C. Ditoes	Cost L.C. Others	Cost F.C.	Remarks
Clearing of Surface		Km	107	299	1,187	635	31,993	127,009	67,945	A-203
Clearing of Structure		Total	1.00	1,070	5,423	1,763	1,070	5,423	1,763	-204
Rehabilitation of Shoulder		Km	107	19	46	54	2,033	4,922	5,778	-205
Patrol		Total	1.00	3,098	10,292	7,298	3,098	10,292	7,298	-206
Sub Total							38,194	147,646	82,784	
Contingeucy		%	5.00				1,910	7,382	4,139	
Rehabilitaion of Surface		Km	107	621	932	1,797	66,447	99,724	192,279	-212
Total							106,551	254,752	279,202	640,505
Per Km	108.63Km						981	2,345	2,570	(5,896)

Condition	Calculation	Remarks
		

付録6-6　補償費

(Local Currency, Dthers)

Unit : US$

	Unit	Unit Costo	Section 1		Section 2		Section 3	
			Volumen	Costo	Volumen	Costo	Volumen	Costo
Houses	hou.	1,500	36	54,000	23	34,500	13	19,500
Farm & Orchard	ha	477	3.0	1,431	3.9	1,860	4.6	2,194
Total				55,431		36,360		21,694

	Unit	Unit Costo	Section 4		Section 5		Section 6		Total
			Volumen	Costo	Volumen	Costo	Volumen	Costo	
Houses	hou.	1,500	15	22,500	1	1,500	3	45,000	136,500
Farm & Orchard	ha	477	6.3	3,005	1.1	525	0.3	143	9,158
Total				25,505		2,025		4,643	145,658