SUBSTRUCTURE QUANTITY CALCULATION

SIMONGAN BRIDGE

SUBSTRUCTURE QUANTITY CALCULATION

SUMMARY SIMONGAN

			A1	P1	A2		TOTAL
STATION							
STRUCTURE EXCAVATION	0-2m	(m^3)	35.0	42.0	42.0		119.0
	2-4m	(m^3)	21.7	37.0	18.5		77.2
	>4m	(m^3)	0.0	0.0	0.0		0.0
	TOTAL	(m^3)	56.7	79.0	60.5		196.2
	WATER	(m^3)	1.6	31.3	10.7		43.6
	IN RIVER	(m^3)					0.0
BLINDING STONE		(m^3)	3.9	4.6	4.6		13.1
BACK FILE		(m^3)	17.2		31.4		48.5
PC PILE		(m)	24.0	40.0	32.0		96.0
STEEL-PILE		(m)					
CONCRETE	A-2-5						0.0
	B-1-2	(m^3)		0.0			0.0
	B-1-3	(m^3)					0.0
	B-1-4	(m^3)					0.0
	C-1	(m^3)	29.4	45.5	46.7		121.6
	E	(m^3)	1.9	2.3	2.3		6.5
FORM	TYPE-1	(m^2)	60.5	69.3	100.6		230.4
	TYPE-2	(m^2)					0.0
	TYPE-3	(m^2)					0.0
	TYPE-4	(m^2)					0.0
R-BAR		(kg)	1885	2862	2547		7294
REMARK							

PC PILE

			A1	P1	A2		TOTAL
STATION							
ELEVATION	FL	m					
	GH	m					
HEIGHT	HW	m					
	H1	m					
	H2-1	m					
	H2-2	m					
	H3	m					
	Hh	m					
	WT	m					
DIMENSION	A	m					
	B	m					
	D1	m	0.5	0.5	0.5		
	DL	m					
NUMBER OF PIER							
PILE	NUMBER		6	8	8		22
	LENGTH	m	4.0	5.0	4.0		96.0

EXCAVATION

			A1	P1	A2		TOTAL
STATION							
A*B		(m^2)					
GH-FL		(m)					
EXCAVATION	0-2m	(m^3)	35.00	42.00	42.00		119.00
	2-4m	(m^3)	21.70	37.00	18.50		77.20
	>4m	(m^3)	0.00	0.00	0.00		0.00
	TOTAL	(m^3)	56.70	79.00	60.50		196.20
	WATER	(m^3)	1.60	31.30	10.70		43.60
BLINDING STONE		(m^3)	3.89	4.60	4.61		13.10
STEEL-PILE		(m)					0

CONCRETE (m^3)

			A1	P1	A2		TOTAL
STATION							
LEVELING	a	(m^2)					
CONCRETE (E)	t	(m)					
	V	(m^3)	1.94	2.30	2.30		6.54
FOOTING (C-1)	a1	(m^2)					
	a2	(m^2)					
	h1	(m)	REFER TO ABUTMENT				
	h2	(m)					
	V	(m^3)	29.43	45.50	46.69		121.62
COLUMN (B-1-2)	a1	(m^2)					
	a2	(m^2)					
	h1	(m)					
	h2	(m)					
	V	(m^3)					0.00
C-PIER HEAD (B-1-2)							
RC PORTAL							
PC PORTAL							
REMARK							

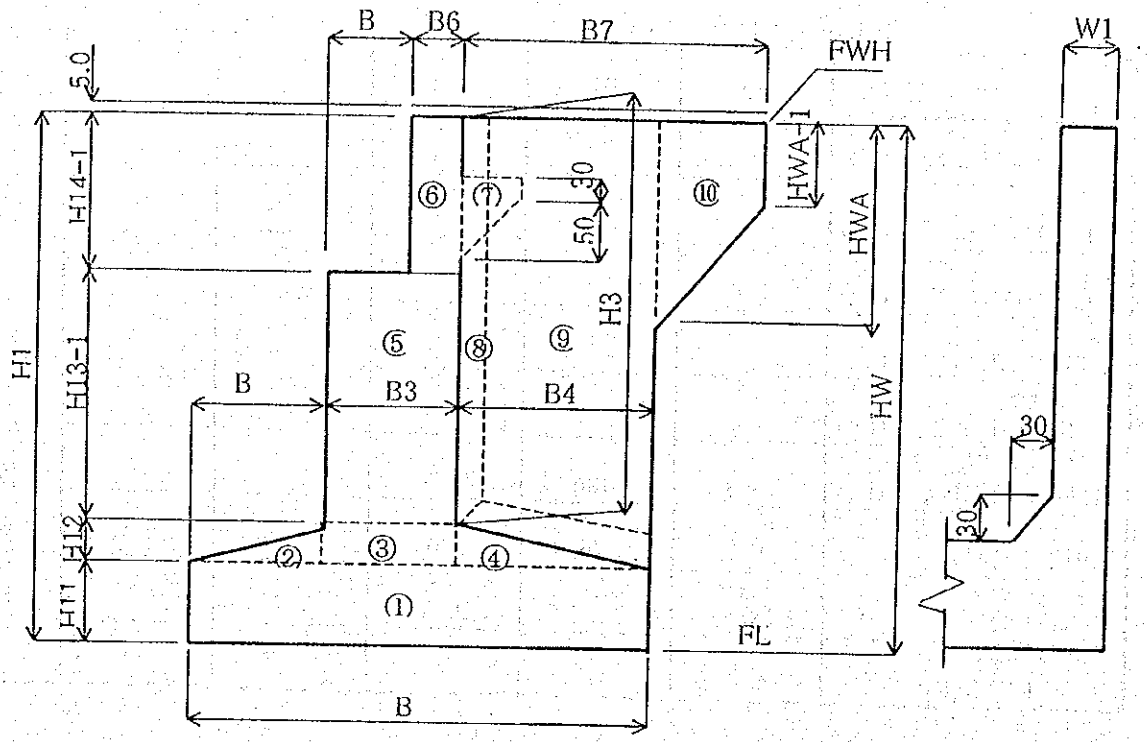
FORM AREA (m^2)

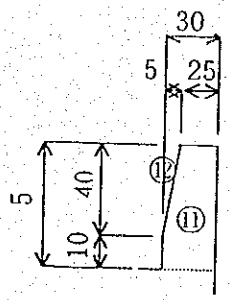
			A1	P1	A2		TOTAL
STATION							
	a1	(m^2)					
	a2	(m^2)					
	A	(m^2)					0
	D2	(m)					
	D3	(m)					
	h1	(m)					
	h2	(m)					
	a1	(m^2)					
	a2	(m^2)					
	A	(m^2)	60.47	69.30	100.60		230.37
C-PIER HEAD	TYPE-1						
	TYPE-4						
RC PORTAL	TYPE-6						
PC PORTAL	TYPE-6						
REMARK							

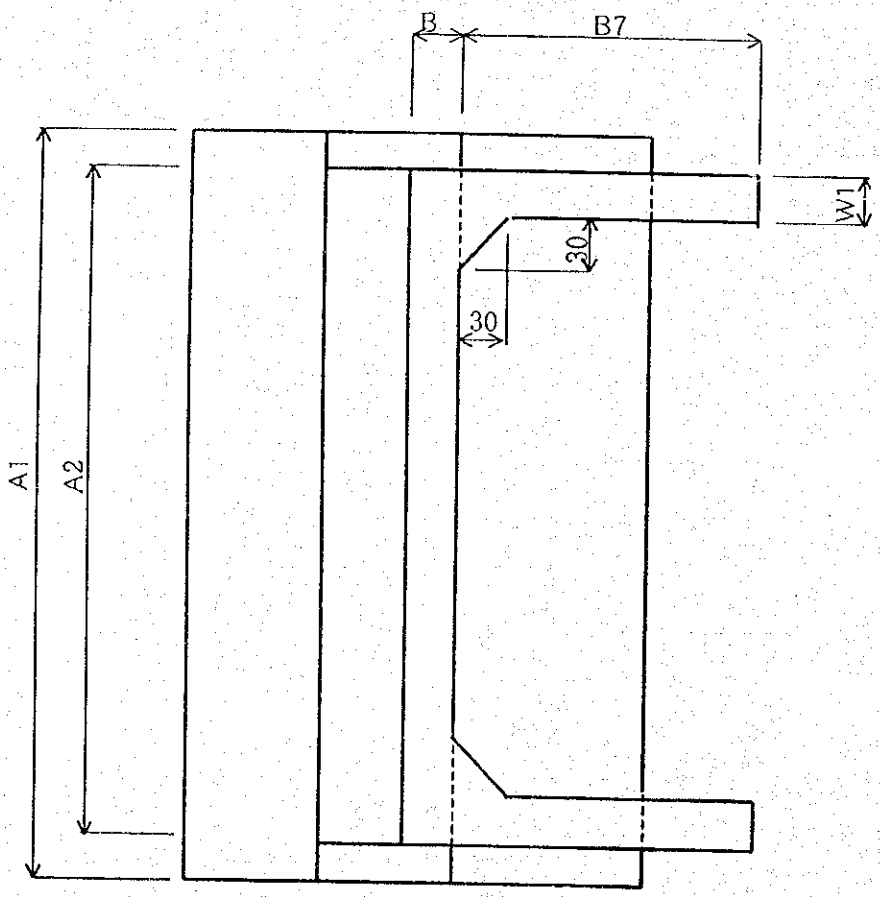
REINFORCING BAR

		A1	P1	A2			TOTAL
STATION							
FOOTING	(kg)						
COLUMN	(kg)						
C-PIER HEAD	(kg)						
OTHER	(kg)						
TOTAL of STRUCTURE	(kg)	1603	2486	2171			6260
PILE HEAD		282	376	376			1034
TOTAL		1885	2862	2547			7294
REMARK							

CONCRETE (C-1) ABUTMENT A1







ABUTMENT A-2

CONCRETE (C-1)

Vn	=	C	*	Bn	*	Hnn	*	An			=	VOLUME
				m		m		m				m3
1	=	1.0	*	2.50	*	1.00	*	7.00			=	17.50 m3
2	=	0.5	*		*		*	7.00			=	0.00 m3
3	=	1.0	*		*		*	7.00			=	0.00 m3
4	=	0.5	*		*		*	7.00			=	0.00 m3
5	=	1.0	*	1.15	*	1.02	*	7.00			=	8.21 m3
6	=	1.0	*	0.35	*	0.93	*	7.00			=	2.28 m3
7								7.00			=	m3
8	=	0.5	*	0.30	*	0.30	*	1.95	*	2	=	0.18 m3
9	=	1.0	*	0.70	*	1.95	*	0.35	*	2	=	0.96 m3
10	=		*		*		*				=	m3
11	=	1.0	*	0.30	*	0.50	*	1.05	*	2	=	0.32 m3
12	=	0.5	*	0.05	*	0.40	*	1.05	*	2	=	-0.02 m3
										V	=	29.43 m3

RUBBER SHEET

* * = 0.00 m^2

t = mm

FORM AREA

Vn	= C	* N	* Bn,An	* Hnn	= VOLUME
			m	m	m^2
1	= 1.0	* 2	* 2.50	* 1.00	= 5.00 m^2
	= 1.0	* 2	* 7.00	* 1.00	14.00 m^2
2	= 0.5	* 2	*	*	= 0.00 m^2
3	= 1.0	* 2	*	*	= 0.00 m^2
4	= 0.5	* 2	*	*	= 0.00 m^2
5	= 1.0	* 2	* 1.15	* 1.02	= 2.35 m^2
	= 1.0	* 2	* 7.00	* 1.02	= 14.28 m^2
6	= 1.0	* 2	* 0.35	* 0.93	= 0.65 m^2
	= 1.0	* 2	* 7.00	* 0.93	= 13.02 m^2
7					m^2
		0.3	* 1.414	= 0.42	
8		2	* 0.42	* 1.95	= 1.64 m^2
9		4	* 0.70	* 1.95	= 5.46 m^2
		2	* 0.35	* 1.95	= 1.37 m^2
10					m^2
11		4	* 1.05	* 0.50	= 2.10 m^2
12		4	* 0.30	* 0.50	= 0.60 m^2
					V = 60.47 m^2

LEVELING CONCRETE (CLASS E)

V = (B1 + 0.20)*(A1 + 0.20)* 0.10

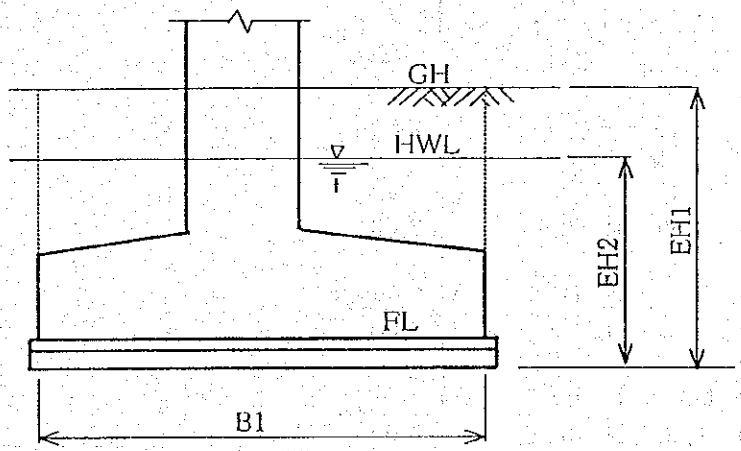
= (2.50 + 0.20)*(7.00 + 0.20)* 0.10 = 1.94 m3

BLINDING STONE

V = (B1 + 0.20)*(A1 + 0.20)* 0.20

= (2.50 + 0.20)*(7.00 + 0.20)* 0.20 = 3.89 m3

EXCAVATION



EH1=GH-FL+0.3

EH2=HWL-FL+0.3

GH = 9.000

HWL = 5.850

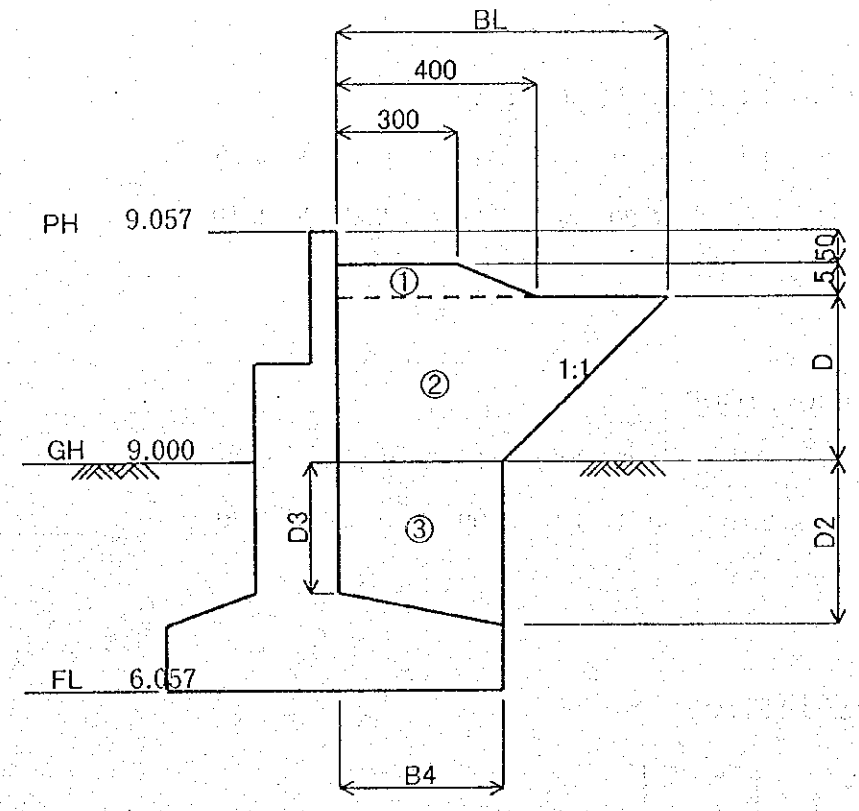
FL = 6.057

EH1 = 3.24

EH2 = 0.09

			B1		A1		Hn		V
1. EXC.<2m	:	V1 =	2.50	*	7.00	*	2.00	=	35.0 m^3
2. 2m<EXC.<4m	:	V2 =	2.50	*	7.00	*	1.24	=	21.7 m^3
3. EXC.>=4m	:	V3 =	2.50	*	7.00	*	0.00	=	0.0 m^3
4. INTO GROUND WATE	:	V4 =	2.50	*	7.00	*	0.09	=	1.6 m^3

GRANULAR BACKFILL



A1

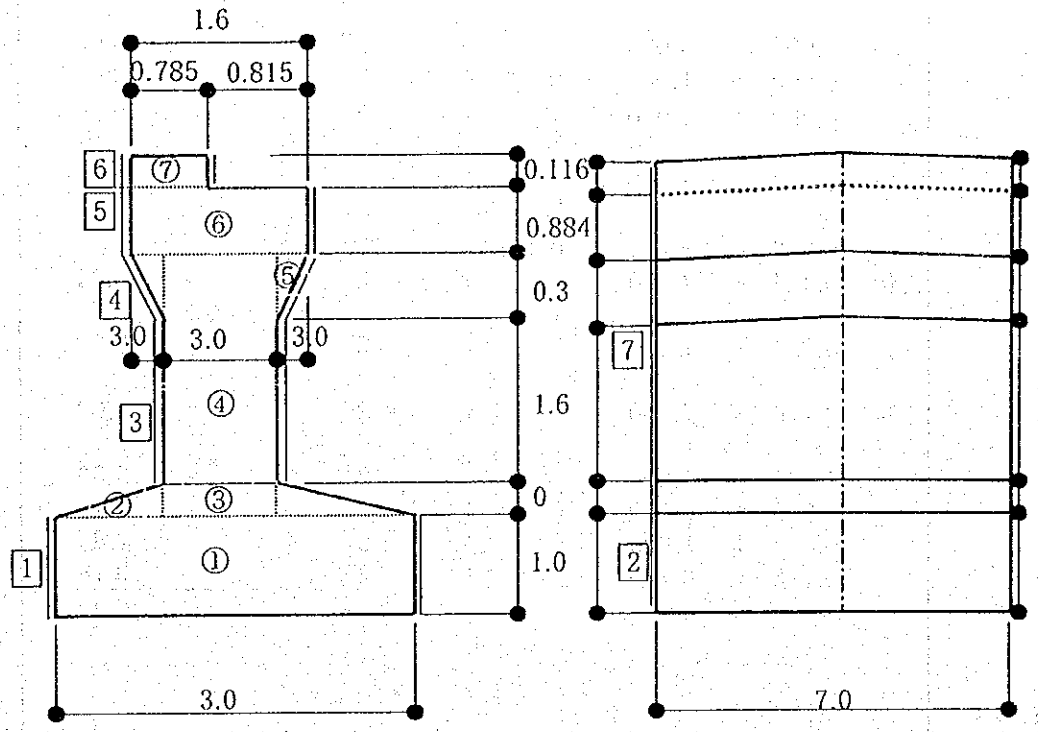
V1 = 0.5 *(3.00 + 4.00)* 0.50 * 7.00 = 12.25 m^3

V2 = 0.5 *(B4 + BL)* D1 * A1
= 0.5 *(+)* * 7.00 = 0 m^3

V3 = 0.5 *(D2 + D3)* B4 * A1
= 0.5 *(1.00 + 1.00)* 0.70 * 7.00 = 4.9 m^3

TOTAL = 17.15 m^3

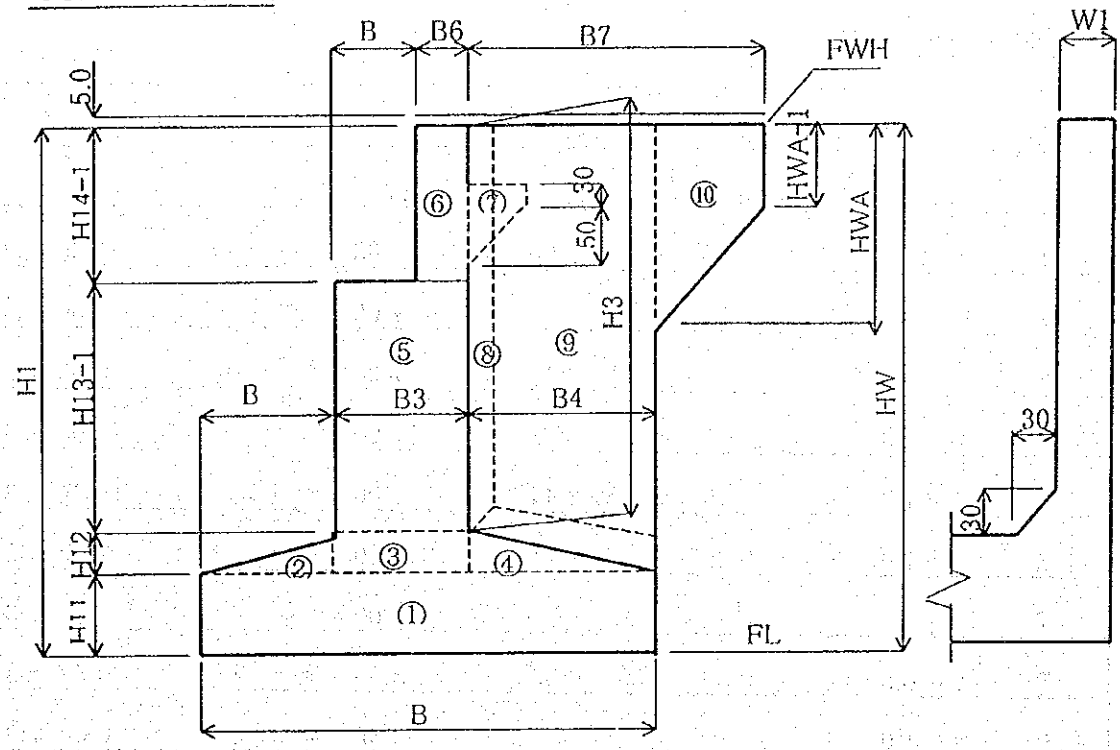
QUANTITY OF PIER



DESCRIPTION	CALCULATION		QUANTITY
1.CONCRETE	FOOTING (C-1)		
	V1= 3.000 * 1.000 * 7.000	= 21.00 m^3	
	V2= 1.000 * 0.000 * 0.5*2 * 7.000	= 0.00	
	V3= 1.000 * 0.000 * 7.000	= 0.00	
		Σ = 21.00 m^3	21.0 m^3
	COLUMN (B-1-2)		
	V4= 1.000 * 1.900 * 7.000	= 13.30 m^3	
	V5= 0.300 * 0.300 * 0.5*2 * 7.000	= 0.63	
	V6= 1.600 * 0.884 * 7.000	= 9.90	
	V7= 0.785 * 0.116 * 7.000	= 0.64	
		Σ = 24.47 m^3	24.5 m^3

DESCRIPTION	CALCULATION								QUANTITY
2. FORM	A1=	1.000	*	7.000		*	2	= 14.00 m^2	
	A2=	1.000	*	3.000		*	2	= 6.00	
		0.000	*	1.000	* 0.5*2	*	2	= 0.00	
		0.000	*	1.000		*	2	= 0.00	20.0 m^2
	A3=	1.600	*	7.000		*	2	= 22.40	
		0.300	*	1.414	= 0.424				
	A4=	0.424	*	7.000		*	2	= 5.94	
	A5=	0.884	*	7.000		*	2	= 12.38	
	A6=	0.116	*	7.000		*	2	= 1.62	
	A7=	1.900	*	1.000		*	2	= 3.80	
		0.300	*	0.300	* 0.5*2	*	2	= 0.18	
		0.884	*	1.600		*	2	= 2.83	
		0.116	*	0.785		*	2	= 0.18	49.3
								Σ = 69.33 m^2	69.3 m^2
3. LEVELING CONCRETE	(CLASS E)								
	V=	0.100	*	3.200		*	7.200	= 2.30 m^3	2.3 m^3
4. BLINDING STONE	V=	0.200	*	3.200		*	7.200	= 4.61 m^3	4.6 m^3
5.EXCAVATION	1. EXC. < 2m								
	V_1=	2.000	*	3.000		*	7.000	= 42.00 m^3	42.0 m^3
	2. 2 ≦ EXC. < 4m								
	V_2=	1.762	*	3.000		*	7.000	= 37.00 m^3	37.0 m^3
	3. 4 ≦ EXC.								
	V_3=	0.000	*	3.000		*	7.000	= 0.00 m^3	0.0 m^3
								Σ = 79.00 m^3	79.0 m^3
	4. ADD PRICES IF GRAUND WATER IS PRESENT								
	V_4=	1.492	*	3.000		*	7.000	= 31.33 m^3	31.3 m^3
	5. EXC. IN RIVER								
	V_5=	0.000	*	0.000		*	7.000	= 0.00 m^3	0.0 m^3

CONCRETE (C-1) ABUTMENT A2



ABUTMENT A-2

CONCRETE (C-1)

Vn	=	C	*	Bn	*	Hnn	*	An			=	VOLUME
				m		m		m				m3
1	=	1.0	*	3.00	*	1.00	*	7.00			=	21.00 m3
2	=	0.5	*		*		*	7.00			=	0.00 m3
3	=	1.0	*		*		*	7.00			=	0.00 m3
4	=	0.5	*		*		*	7.00			=	0.00 m3
5	=	1.0	*	1.15	*	2.44	*	7.00			=	19.64 m3
6	=	1.0	*	0.35	*	1.11	*	7.00			=	2.72 m3
7								7.00			=	m3
8	=	0.5	*	0.30	*	0.30	*	3.55	*	2	=	0.32 m3
9	=	1.0	*		*		*	0.35	*	2	=	0.00 m3
10	=	1.0	*	2.10	*	0.70	*	0.35	*	2	=	1.03 m3
		0.5	*	2.10	*	1.75	*	0.35	*	2	=	1.29 m3
11	=	1.0	*	0.30	*	0.50	*	2.45	*	2	=	0.74 m3
12	=	0.5	*	0.05	*	0.40	*	2.45	*	2	=	-0.05 m3
										V	=	46.69 m3

RUBBER SHEET

* * = m^2

t = mm

FORM AREA

Vn	=	C	*	N	*	Bn,An	*	Hnn	=	VOLUME
						m		m		m^2
1	=	1.0	*	2	*	3.00	*	1.00	=	6.00 m^2
	=	1.0	*	2	*	7.00	*	1.00		14.00 m^2
2	=	0.5	*	2	*		*		=	0.00 m^2
3	=	1.0	*	2	*		*		=	0.00 m^2
4	=	0.5	*	2	*		*		=	0.00 m^2
5	=	1.0	*	2	*	1.15	*	2.44	=	5.61 m^2
	=	1.0	*	2	*	7.00	*	2.44	=	34.16 m^2
6	=	1.0	*	2	*	0.35	*	1.11	=	0.78 m^2
	=	1.0	*	2	*	7.00	*	1.11	=	15.54 m^2
7										m^2
				0.3	*	1.414	=	0.42		
8				2	*	0.42	*	3.55	=	2.98 m^2
9					*		*		=	0.00 m^2
10	=	1.0	*	4	*	2.10	*	0.70	=	5.88 m^2
		0.5	*	4	*	2.10	*	1.75	=	7.35 m^2
		1.0	*	2	*	0.35	*	0.70	=	0.49 m^2
		1.0	*	2	*	0.35	*	2.73	=	1.91 m^2
11				4	*	2.45	*	0.50	=	4.90 m^2
12				4	*	0.50	*	0.50	=	1.00 m^2
									V =	100.60 m^2

LEVELING CONCRETE (CLASS E)

V = (B1 + 0.20)*(A1 + 0.20)* 0.10

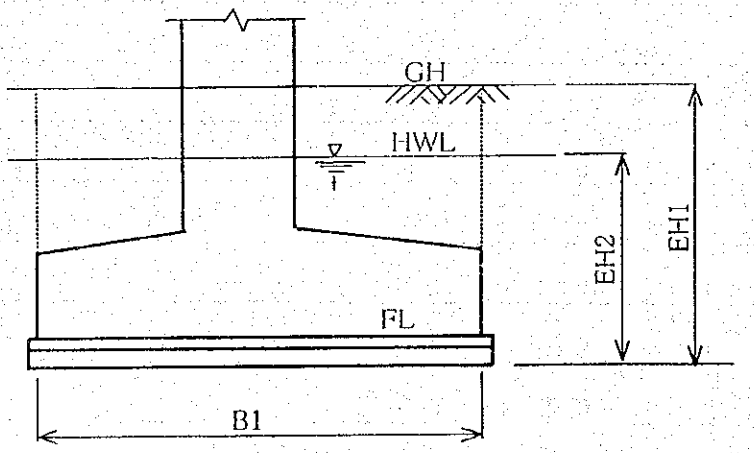
= (3.00 + 0.20)*(7.00 + 0.20)* 0.10 = 2.30 m3

BLINDING STONE

V = (B1 + 0.20)*(A1 + 0.20)* 0.20

= (3.00 + 0.20)*(7.00 + 0.20)* 0.20 = 4.61 m3

EXCAVATION



EH1=GH-FL+0.3

EH2=HWL-FL+0.3

GH = 8.220

HWL = 5.850

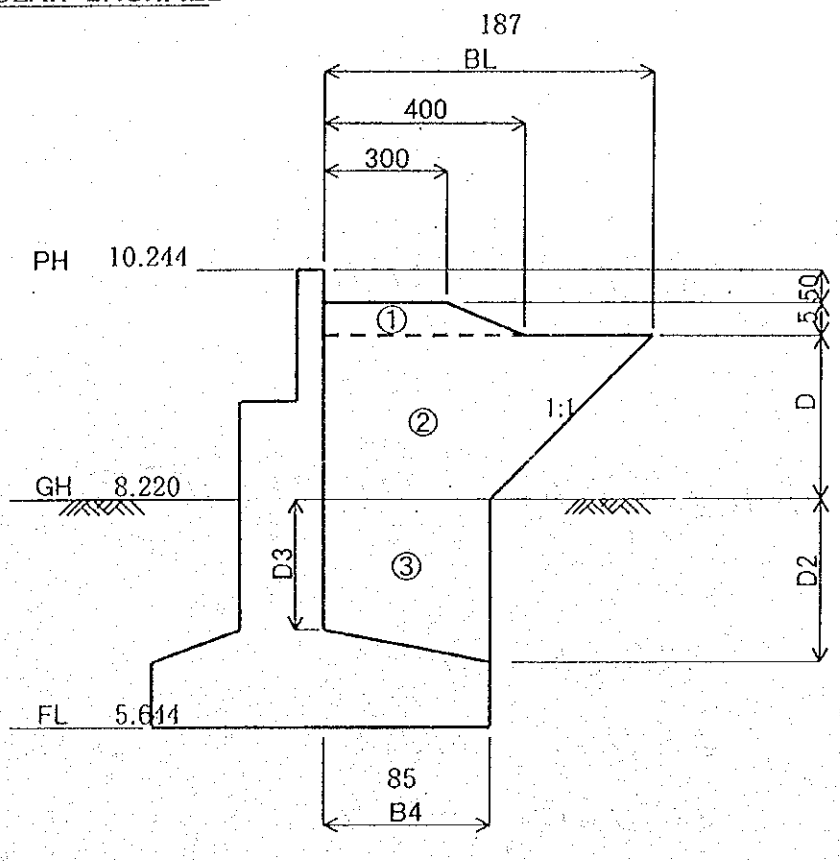
FL = 5.644

EH1 = 2.88

EH2 = 0.51

			B1		A1		Hn		V
1. EXC.<2m	: V1 =	3.00	*	7.00	*	2.00	=	42.0	m^3
2. 2m<EXC.<4m	: V2 =	3.00	*	7.00	*	0.88	=	18.5	m^3
3. EXC.>=4m	: V3 =	3.00	*	7.00	*	0.00	=	0.0	m^3
4. INTO GROUND WATE	: V4 =	3.00	*	7.00	*	0.51	=	10.7	m^3

GRANULAR BACKFILL



A1

V1 = 0.5 *(3.00 + 4.00)* 0.50 * 7.00 = 12.25 m^3

V2 = 0.5 *(B4 + BL)* D1 * A1
= 0.5 *(0.85 + 1.87)* 1.02 * 7.00 = 9.71 m^3

V3 = 0.5 *(D2 + D3)* B4 * A1
= 0.5 *(1.58 + 1.58)* 0.85 * 7.00 = 9.4 m^3

TOTAL = 31.36 m^3

Name of Structure		Category of calculation		Page	

DRAFT VOLUME

SIMONGAN PC BRIDGE.

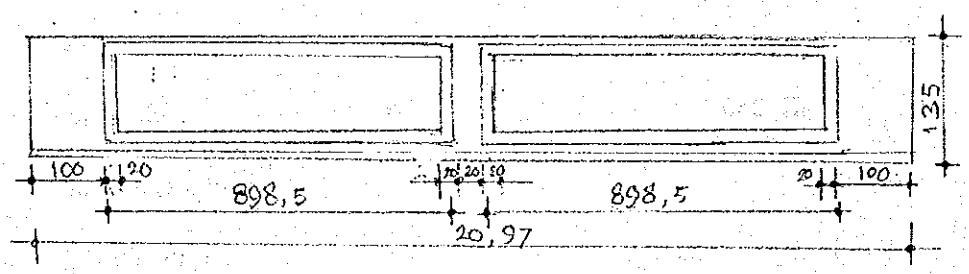
BRIDGE NO 2
BRIDGE NO 3
BRIDGE NO 4.

SIMONGAN WEIR PC (21.00 M) BRIDGE S
SUMMMARY QUANTITIES OF SUPERSTRUCTURE

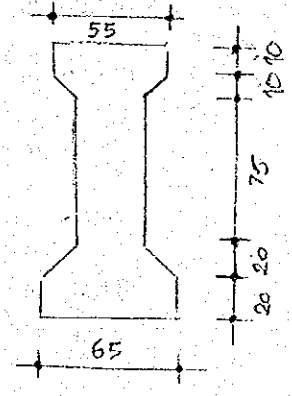
1	Structure Concrete K 400	=	131.34	m3
2	Structure Concrete K 250	=	132.75	m3
3	Reinforcing Stelel	=	40,686.00	m3
4	PC Cable K1 dia 12.7 7 strands	=	1,461.00	kg
	PC Cable K2 dia 12.7 12 strands	=	2,496.00	kg
	PC Cable K1 dia 12.7 7 strands	=	1,455.00	kg
	PC Cable mono strand cable	=	350.00	kg
		total =	5,762.00	kg
5	Bridge raillling	=	126.00	m
6	Exspansion Joint 6.4 m x 4	=	25.60	m
7	Bearing Shoe and rubber sheet	=	24.00	set
8	PVC Drainage Pipe dia 10 Cm	=	31.50	m
9	Asphal Pavement AC on top of slab	=	43.82	m3
10	Form work	=	1,736.40	m2

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	CONCRETE VOLUME	Page	2/6

I. MAIN GIRDER



* CENTRE BEAM



Wide

$A_1 = 0,65 \times 0,20 = 0,130\ m^2$

$A_2 = \frac{0,20 + 0,65}{2} \times 0,20 = 0,085\ m^2$

$A_3 = 0,20 \times 0,75 = 0,150\ m^2$

$A_4 = \frac{0,55 + 0,20}{2} \times 0,10 = 0,0375\ m^2$

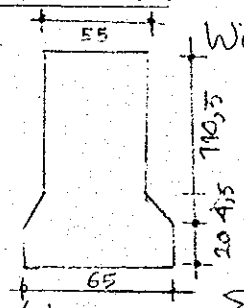
$A_5 = 0,55 \times 0,10 = 0,055\ m^2$

TOTAL $= 0,4575\ m^2$

Volume $= \Sigma A \times L$

$V_1 = 0,4575 \times 17,97 = 8,221\ m^3$

* END BEAM



Wide

$A_1 = 0,65 \times 0,20 = 0,130\ m^2$

$A_2 = \frac{0,55 + 0,65}{2} \times 0,045 = 0,027\ m^2$

$A_3 = 0,55 \times 11,105 = 0,608\ m^2$

TOTAL $= 0,765\ m^2$

Volume $= \Sigma A \times L$

$= 2 \times (0,765 \times 11,00) + (0,765 \times 0,20) + 4 \times \left(\frac{0,4575 + 0,765}{2} \times 0,20\right)$

$= 1,530 + 0,153 + 0,489$

$V_2 = 2,172\ m^3$

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	CONCRETE VOLUME	Page	3/6

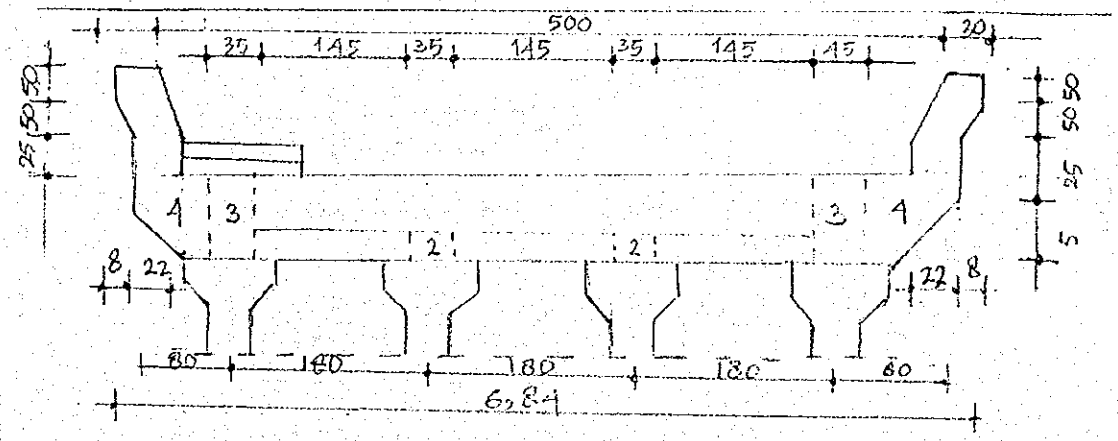
- Total volume in One Beam $= V_1 + V_2$

$$\Sigma_V = 8,221 + 2,172 = 10,393\ m^3$$

- Total volume all Beam in Bridge (V_6)

$$V_6 = 4 \times \Sigma_V = 4 \times 10,393 = 41,572\ m^3$$

II. SLAB, PANEL PLATE AND SIDE WALK



- PANEL PLATE

Volume One panel $= 1,45 \times 0,07 \times 1,0 = 0,1015\ m^3$

in one GIRDER :

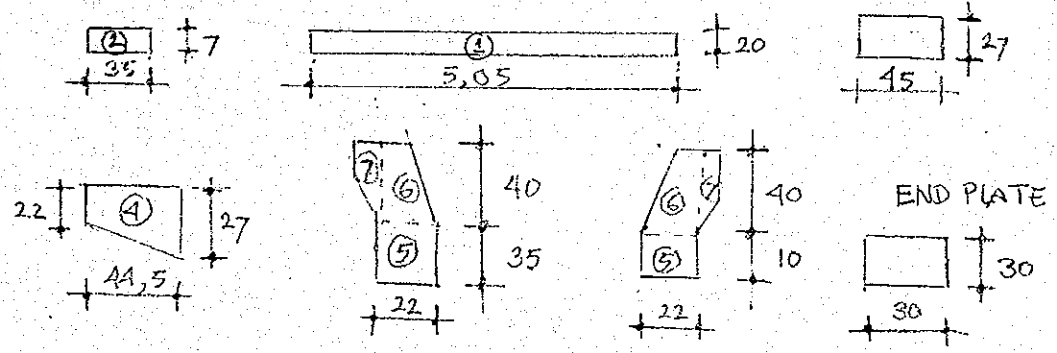
volume $= 0,1015 \times 20 + (1,45 \times 0,07 \times 0,37)$

$= 2,068\ m^3$

Total volume all panel in Bridge (V_P)

$$V_P = 3 \times V = 3 \times 2,068 = 6,203\ m^3$$

- BED PLATE



Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	CONCRETE VOLUME	Page	4/6

- WIDE

$A_1 = 5,05 \times 0,20 = 1,010\ m^2$

$A_2 = (0,35 \times 0,07) \times 2 = 0,049\ m^2$

$A_3 = 0,45 \times 0,27 \times 2 = 0,243\ m^2$

$A_4 = \frac{0,22 + 0,27}{2} \times 0,445 \times 2 = 0,218\ m^2$

$A_5 = (0,22 \times 0,35) + (0,22 \times 0,10) = 0,099\ m^2$

$A_6 = \frac{0,17 + 0,22}{2} \times 0,40 \times 2 = 0,156\ m^2$

$A_7 = 0,08 \times 0,20 \times 2 = 0,032\ m^2$

TOTAL $= 1,807\ m^2$

- Length of plate $= 20,97 - 60 = 20,37\ cm = 20,37\ m$

Volume (V_1) $= \sum A \times L$

$V_1 = 1,807 \times 20,37 = 36,809\ m^3$

- End plate

$V_2 = 0,30 \times 0,30 \times 6,84 \times 2 = 1,231\ m^3$

Total volume all bed plate in Bridge (V_B)

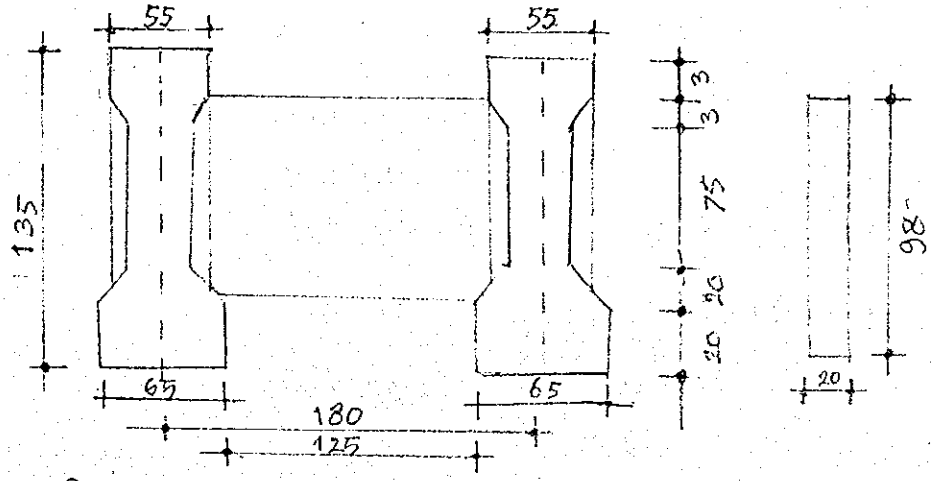
$V_B = V_1 + V_2$

$V_B = 36,809 + 1,231$

$= 38,040\ m^3$

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	CONCRETE VOLUME	Page	5/6

III. CROSS BEAM



- One Cross Beam

Volume = 0,20 × 0,98 × 1,25
= 0,245 m^3

- Total volume all cross beam in bridge (V_{CB})

V_{CB} = 3 × 3 × 0,245
= 2,205 m^3

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	CONCRETE VOLUME	Page	6/6

- MAIN GIRDER = 41,572 m^3
- SLAB = 38,040 m^3
- PANEL PLATE = 6,203 m^3
- CROSS BEAM = 2,205 m^3

TOTAL = 88,020 m^3

SO :

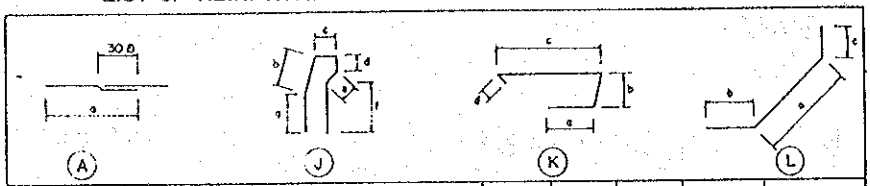
- Concrete Quality K-400 = 43,777 m^3
- Concrete Quality K-250 = 44,243 m^3

REINFORCING BAR CALCULATION VOLUME FOR 3 SPANS

- Main girder	5510 kg x 3	=	16,530.00	kg
- Slab	5169 kg x 3	=	15,507.00	kg
- Side walk and curb	1718 kg x 3	=	5,154.00	kg
- Panel Plate	938 kg x 3	=	2,814.00	kg
- Diaphragm	227 x 3	=	681.00	kg
Total		=	**40,686.00**	kg
- PC Cable				
K1 dia 12.7 mm 7 Strands		=	1,461.00	kg
K2 dia 12.7 mm 12 Strands		=	2,496.00	kg
K3 dia 12.7 mm 7 Strands		=	1,455.00	kg
PC Cable for Diaphragm di 12.5			350.00	kg
Total		=	**5,762.00**	kg
Anchore head type 7 Sc		=	36.00	set
Dead End anchore type H 5 - 7		=	36.00	set
Duct / Sheat Dia 66 mm		=	528.00	m
Duct / Sheat Dia 84 mm		=	264.00	m
Duct / Sheat Dia 29 mm		=	54.00	m

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	Reinforcing Volume	Page	3/4

LIST OF REINFORCING BAR OF SIDE WALK AND HAND RAIL



REINFORCING BAR NO.	Ø (mm)	TYPE	BENDING DIMENSION (cm) a	b	c	d	e	f	TOTAL LENGTH (m)	UNIT WEIGHT/m (kg/m)	NUMBER	WEIGHT (kg)	REMARKS
SIDE WALK													
T 1	13	J	45	35	20	15	10	55	1.93	1.56	105	321	
T 2	13	K	35	30	96	65			2.08	1.04	105	228	
T 3	13	L	12	40	15				0.67	1.56	105	112	
T 4	13	A	2116						21.29	1.56	14	471	
HAND RAIL													
T 1	13	J	20	35	20	15	10	30	1.43	1.56	105	236	
T 2													
T 3	13	L	12	40	15				0.67	1.56	105	112	
T 4	13	A	2116						21.29	1.56	7	236	
											TOTAL =	1718 kg	

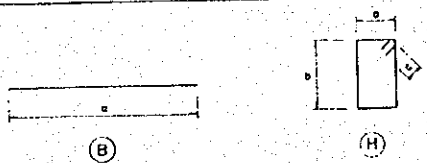
× 3 = 5154 kg

REINFORCING BAR NO.	Ø (mm)	TYPE	BENDING DIMENSION (cm) a	b	c	d	e	f	TOTAL LENGTH (m)	UNIT WEIGHT/m (kg/m)	NUMBER	WEIGHT (kg)	REMARKS
145 x 100 (60)													
P 1	13	B	90						0.926	1.04	360	347	
P 2	13	B	130						1.36	1.04	360	509	
P 3	9	I	20	10	12				0.438	0.50	240	53	
145 x 20 (3)													
P 1'	13	B	10						0.120	1.04	18	2,25	
P 2'	13	B	130						1.36	1.04	18	25,5	
P 3'	9	I	20	10	12				0.438	0.50	6	1,31	
											TOTAL =	938 kg	

× 3 = 2814 kg

LIST OF REINFORCING BAR OF PANEL PLATE

LIST OF REINFORCING BAR OF DIAPHRAGM

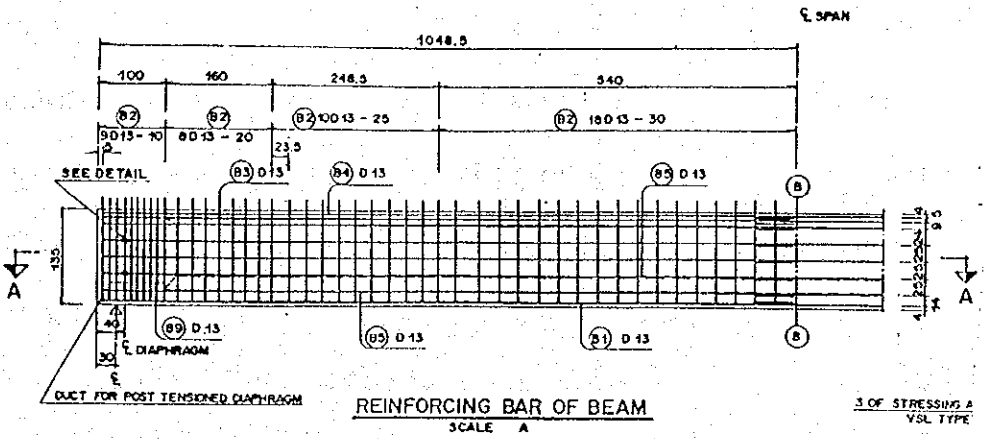


REINFORCING BAR NO.	Ø (mm)	TYPE	BENDING DIMENSION (cm) a	b	c	d	e	f	TOTAL LENGTH (m)	UNIT WEIGHT/m (kg/m)	NUMBER	WEIGHT (kg)	REMARKS
D 1	13	B	107						1.20	1.04	108	135	
D 2	9	H	12	97	4.5				2.27	0.50	81	92	
											TOTAL =	227 kg	
STRAND CABLE													
MONO STRAND CABLE Ø 12.5 mm													
	12.5	B	622.4						6.97	0.714	19	94	
											TOTAL =	94 kg	

× 3 = 681,00 kg

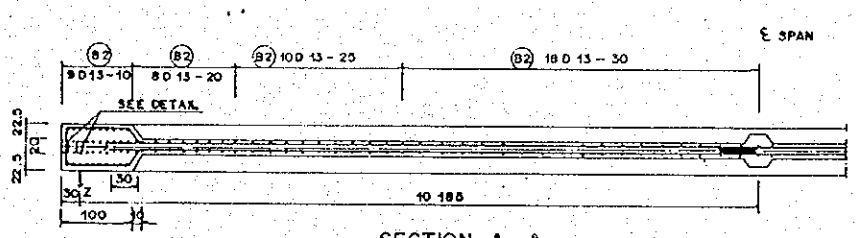
Name of Structure	Simunjan Weir Bridge	Category of calculation	Reinforcing Volume	Page	4/4

PC Cable :

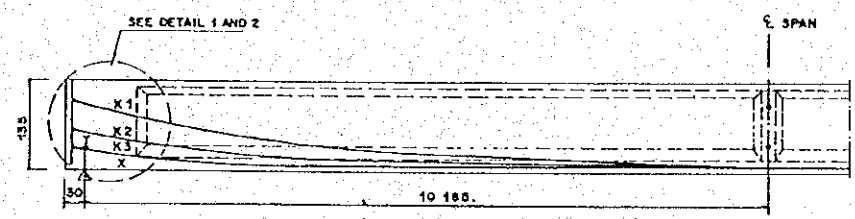


REINFORCING BAR OF BEAM
SCALE A

3 OF STRESSING A
VSL TYPE



SECTION A-A
SCALE A



CABLE ELEVATION
SCALE A

	X	0	100	200	300	400	500	600	700	800	900	100	1018.5
CABLE 3	Y	27	24.	21.4	190	16.9	15.1	13.5	12.2	11.3	10.6	10.1	10
(K3)	Z	0	2.1	4.	5.7	7.1	8.4	9.5	10.4	11.1	11.6	11.9	12
CABLE 2	Y	58.6	50.1	42.3	35.7	29.6	24.4	20	16.4	13.6	11.6	10.4	10
(K2)	Z	0	0	0	0	0	-3.2	-5.9	-8.1	-9.8	-11	-11.8	-12
CABLE 1	Y	90	76.1	63.6	52.3	42.4	33.8	26.5	20.6	17.7	13.4	10.9	10
(K1)	Z	0	0	0	0	0	0	0	0	0	0	0	0

LIST OF CABLE COORDINATE (Cm)

REINFORCING BAR NO.	ϕ (mm)	TYPE	BENDING DIMENSION (cm) a	b	c	d	e	f	TOTAL LENGTH (m)	UNIT WEIGHT/m (kg/m)	NUMBER	WEIGHT (kg)	REMARKS
K 3	12.7	7 STRANDS	15663						156.63	0.774	4	485	
K 2	12.7	7 STRANDS	26882						268.82	0.774	4	832	
K 1	12.7	7 STRANDS	15713						157.13	0.774	4	487	
											TOTAL = 1804	kg	

LIST OF PC CABLE OF MAIN GIRDER

1/7

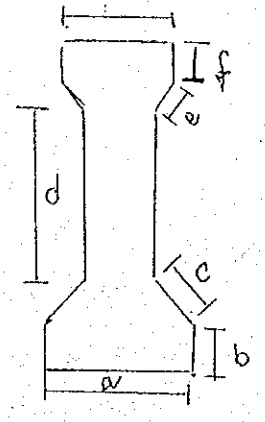
SUMMMARY OF BROAD FORM WORK for 3 SPANS

- Main girder	332.76 x 3	=	998.28	m2
- Slab	7.27 x 3	=	21.81	m2
- Side Walk	88.91 x 3	=	266.73	m2
- Panel Plat	119.8 x 3	=	359.39	m2
- Diaprhagm	30.078 x 3	=	90.23	m2
Total		=	**1,736.44**	m2

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	FORM VOLUME	Page	2/7

I. MAIN GIRDER

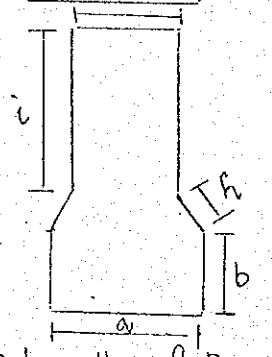
- CENTER BEAM



Thick of plate

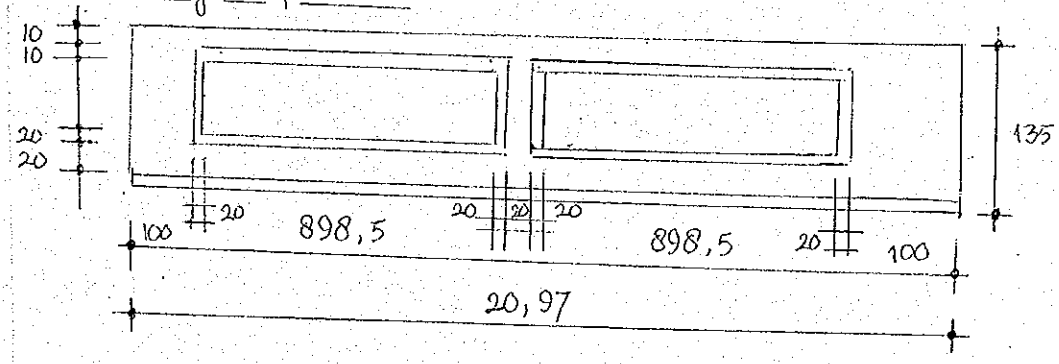
$a = 65 + 3/2 \times 2 = 68$ cm
$b = 20 + 3/2 \times 2 = 23$ cm
$c = 35 + 3/2 \times 2 = 38$ cm
$d = 75 + 3/2 \times 2 = 78$ cm
$e = 12 + 3/2 \times 2 = 15$ cm
$f = 10 + 3/2 = 11{,}5$ cm

- END BEAM



$a = 68$ cm
$b = 23$ cm
$h = 6{,}75 + 3/2 \times 2 = 9{,}75$ cm
$i = 110{,}5 + 3/2 = 112$ cm

- Length of Beam = 20,97 cm = 20,97 m



- WIDE

- Center $A_1 = (a + 2b + 2c + 2d + 2e + 2f) \times L$
$= (0{,}68 + 0{,}46 + 0{,}76 + 1{,}56 + 0{,}30 + 0{,}23) \times 17{,}97$
$A_1 = 3{,}99 \times 17{,}97 = 71{,}70\ m^2$

- End $A_2 = (a + 2b + 2h + 2i) \times L$
$= (0{,}68 + 0{,}46 + 0{,}195 + 2{,}24) \times 2{,}20$
$A_2 = 3{,}575 \times 2{,}20 = 7{,}865\ m^2$

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	FORM VOLUME	Page	3/7

$$A_3 = \left[\left(\frac{0,75 + 1,05}{2} \times 0,20 + 2 \times \frac{1}{2} \times 0,20 \times 20\right) \times 4\right] \times 2$$

$$A3 = (0,18 + 0,04) \times 4 \times 2$$

$$= 1,76 \ m^2$$

- END SIDE BEAM

$$A4 = \left[(0,68 \times 0,23) + \left(\frac{0,68 + 0,58}{2} \times 0,20\right) + (0,58 \times 1,12)\right] \times 2$$

$$= (0,1564 + 0,126 + 0,6496) \times 2$$

$$A4 = 0,932 \times 2$$

$$= 1,864 \ m^2$$

- Total Form in Bridge (F_G)

$$F_G = \Sigma_A \times 4$$

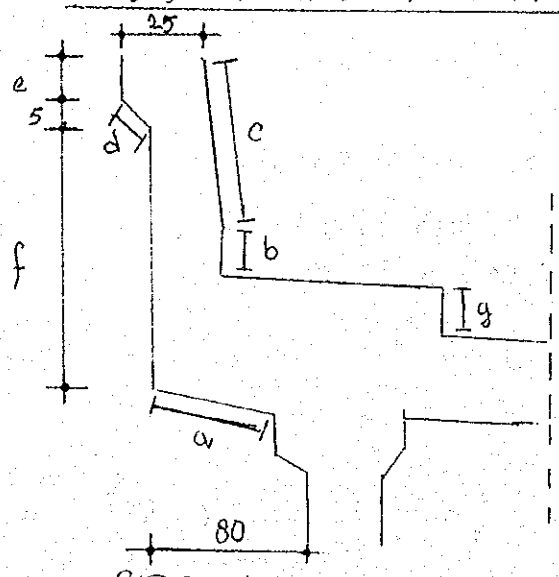
$$= (71,70 + 7,865 + 1,76 + 1,869) \times 4$$

$$F_G = 83,189 \times 4$$

$$= 332,756 \ m^2$$

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	FORM VOLUME	Page	1/7

II. SLAB, SIDE WALK AND HAND RAIL



Thick of plate = 3 cm

a = 44,78 + 3/2 = 46,28 cm
b = 10 + 3/2 = 11,5 cm
c = 40,31 + 3/2 = 41,81 cm
d = 9,43 + 3/2 x 2 = 12,43 cm
e = 20 + 3/2 = 21,5 cm
f = 72 + 3/2 x 2 = 75 cm
g = 25 cm

• SIDE WALK

Length of Beam = 20,97 cm = 20,97 m
Wide

$$A_1 = (a+b+c+d+e+f+g) \times L$$
$$= (46,28 + 11,5 + 41,81 + 12,43 + 12,5 + 75 + 25) \times 20,97$$
$$A_1 = 233,52 \times 20,97 = 489691,44 \text{ cm}^2$$
$$= 48,969 \text{ m}^2$$

• End

$$A_2 = (g \times 1,68) + (b \times 0,28) + \left(\frac{0,20+0,28}{2} \times 0,10\right) + \left(\frac{0,20+0,25}{2} \times 0,11\right) \times 2$$
$$= [(0,25 \times 1,68) + (0,115 \times 0,28) + 0,096 + 0,025)] \times 2$$
$$A_2 = 0,573 \text{ m}^2 \times 2$$
$$= 1,146 \text{ m}^2$$

Total Wide F_{SW_1} = 48,969 + 1,146
= 50,115 m²

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	FORM VOLUME	Page	5/7

- HAND RAIL

Length of Beam = 20,97 cm = 20,97 m

Wide

$$A_1 = (a+b+c+d+e+(f-g)) \times L$$
$$= (0,4628 + 0,115 + 0,4181 + 0,1243 + 0,215 + 0,50) \times 20,97$$
$$A_1 = 1,8352 \times 20,97$$
$$= 38,484 \ m^2$$

- END

$$A_2 = \left[(b \times 0,28) + \left(\frac{0,20+0,28}{2} \times 0,40\right) + \left(\frac{0,20+0,25}{2} \times 0,11\right)\right] \times 2$$
$$A_2 = 0,153 \times 2$$
$$= 0,306 \ m^2$$

Total wide $Fsw_2 = 38,484 + 0,306$
$= 38,790 \ m^2$

Total Form in Bridge $= \sum Fsw$

$Fsw = 50,115 \times 38,790$
$= 88,905 \ m^2$

- SLAB

End (Wide) $A = \left[(0,133 * 6,84) - 2\left(\frac{1}{2} \times 0,475 \times 0,05\right) + 3(0,30 \times 1,25) + 2(0,30 \times 0,4628)\right] \times 2$

$= (2,2572 - 0,02375 + 1,125 + 0,27768) \times 2$

$A = 3,63613 \times 2$
$= 7,272 \ m^2$

$Fs = 7,272 \ m^2$

Name of Structure	SIMONGAN WEIR BRIDGE	Category of calculation	FROM VOLUME	Page	6/7

PANEL PLATE

THICK OF PLATE = 3cm

THICK OF PANEL = 7cm

- ⊠ 145 x 100

WIDE : $A_1 = (1,40 \times 1,03) + 2(0,085 \times 1,48) + 2(0,085 \times 1,03)$

$= 1,5244 + 0,2516 + 0,751$

$A_1 = 1,951\ m^2$

- ⊠ 145 x 37

WIDE : $A_2 = (1,48 \times 0,40) + 2(0,085 \times 1,48) + 2(0,0085 \times 0,40)$

$= 0,192 + 0,2516 + 0,068$

$A_2 = 0,912\ m^2$

TOTAL WIDE = $(20 \times 1,951) + 0,912 = 39,932\ m^2$

TOTAL FROM IN BRIDGE $FP = 3 \times 39,932 = 119,796 m^2$

CROS BEAM

Wide : $A = 2(1,25 \times 0,98) + (1,25 \times 0,26) + 4(0,175 \times 0,81)$

$A = 2,45 + 0,325 + 0,569 = 5,342\ m^2$

TOTAL Wide = $3 \times 3,342 = 10,026\ m^2$

TOTAL Wide in Bridge $F_{CB} = 3 \times 10,026 = 30,078 m^2$

Name of Structure	SIMONGAN WEAR BRIDGE	Category of calculation	SUMMARY OF FROM VOLUME	Page	7/7

SUMMARY OF FROM VOLUME

- MAIN GIRDER = 332, 756 m^2
- SLAB = 7, 272 m^2
- SIDE WALK = 80, 905 m^2
- PANEL PLATE = 119, 796 m^2
- CROSS BEAM = 30, 078 m^2

TOTAL = 570, 807 m^2

Name of Structure	SIMONGAN WEAR BRIDGE	Category of calculation	PAVEMENT VOLUME	Page	1/1

- PAVEMENT (ASPHALT)

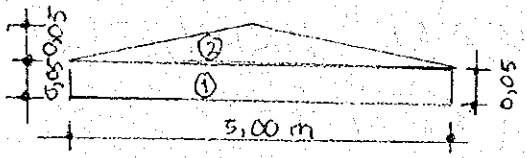
LENGTH = 2097 cm = 20,97 m'

WIDE = 5000 mm = 5,00 m'

THICK OF ASPHALT LEIGTH = 5 cm = 0,05 m'

CENTRE = 0,05 + 2 % x 2,5 = 0,10 m'

SIDE = 0,05 m'



WIDE :

A_1 = 5 x 0,05 = 0,25 m²

A_2 = (5 x 2,50 x 0,05) x 2 = 0,125 m²

TOTAL = 0,375 m²

VOLUME = Σ A x L

VAP = 0,375 x 20,97 = 7,86 m³

Name of Structure	SIMONGAN BRIDGE RC BRIDGE	Category of calculation	VOLUME OF CONCRETE.	Page	

DRAFT VOLUME

SIMONGAN BRIDGE NO. 1 & 5 (RC)

SPANS 8.30m.

1. CONCRETE VOLUME
2. REINFORCEMENT.
   - SLAB.
   - BEAM.

THE SUMMARY TABLE of SUPERSTRUCTURE

NAME and KIND			Concrete 400 m3	Concrete 200 m3	Reinforcement kg	PC cable 7T12.7 kg	PC cable 12T12.7 kg	PC cable 1T12.5 kg	Form m2	pavement m3	Expansion joint m	Road rail m	Drain pipe m	Bearing shoe size mm	Bearing shoe Number	Note
Spillway	1	Pc														
Gua kureo	1	Rc														
	2	Rc														
	3	Rc														
	4	Rc														
	total															
simon weir	1	Rc	—	24.093	5112	—	—	—	149	3.113	12,80	16.60	5,40	268×316	12	
	2	Pc														
	3	Pc														
	4	Pc														
	5	Rc	—	24.093	5112	—	—	—	149	3.113	12,80	16.60	5.40	268×316	12	
	6	Rc														
	7	Rc														
	total															
Asin	no1	Pc														
	no2	Pc														
	pump	Pc														
	total															
SYNTHETIC TOTAL																

Name of Structure	SIMONEAN RC BRIDGE 8.3. m.	Category of calculation	RESUME BOQ.	Page	

SUMMARY OF BRIDGE.

NO : 1.

I. CONCRETE :

1. SLab	:	: 13.678 m^3.
2. BEAM		: 9.50 m^3.
3. DIAPHRAGM		: 0.915 m^3.
		Σ = 24.093 m^3.

II. REINFORCEMENT :

1. Beam	: 3019 kg
2. Diaphragm	: 82 kg
3. Slab	: 1554 kg
4. Curb	: 458 kg
Σ =	5112

III. FORM WORK.

1. Beam	: 74.19 m^2
2. Diaphragm.	: 10.80 m^2
3. Slab.	: 44.504 m^2.
4. Curb	: 8.69 m^2 + 10.731.
Σ :	149 m^2.

Name of Structure	SIMONEAN .RC B.3.	Category of calculation	SUMMARY. BOQ.	Page	

IV. Pavement. : 3.113 m^3.

V. PVC Drain pipe : 5.40 m.

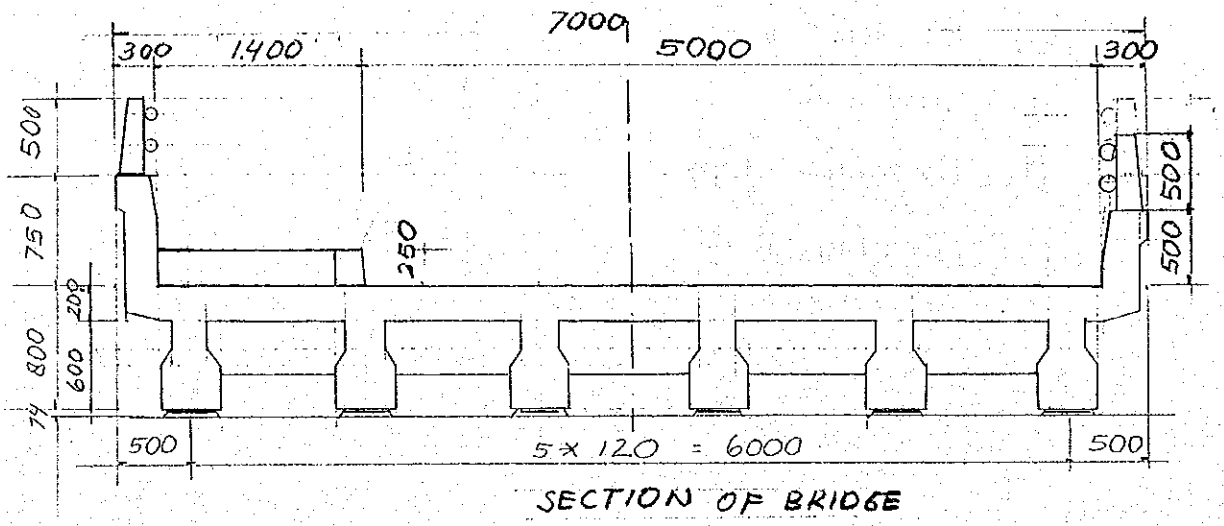
VI. Hand rail : 16.6 m.

VII. Expantion joint : 12.8 m.

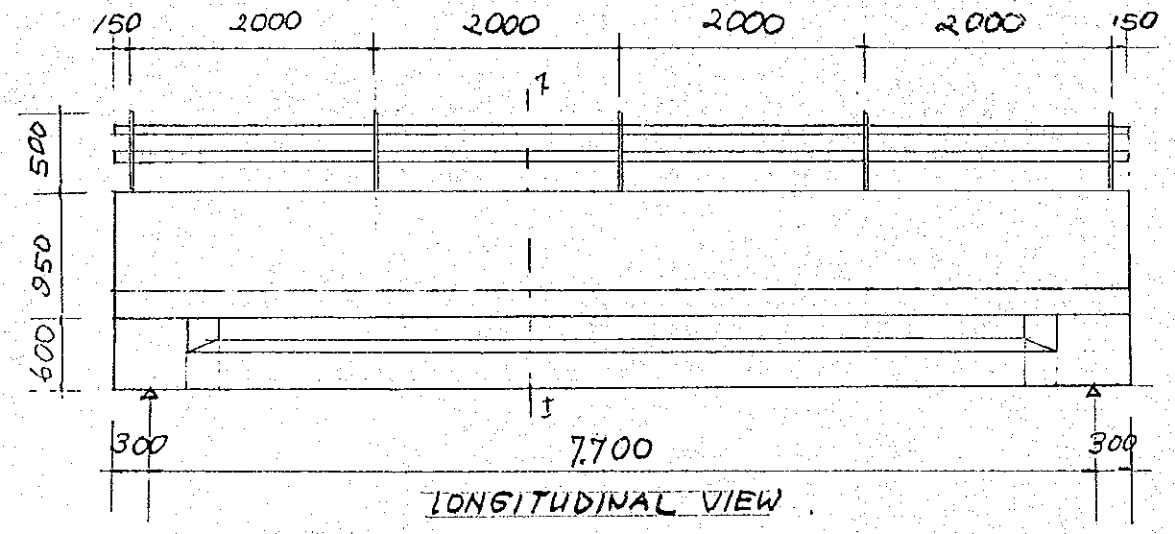
X. Bearing shoe : 12 nos.

Name of Structure	SIMONGAN BRIDGE	Category of calculation	Loading of Super Structure	Page	11

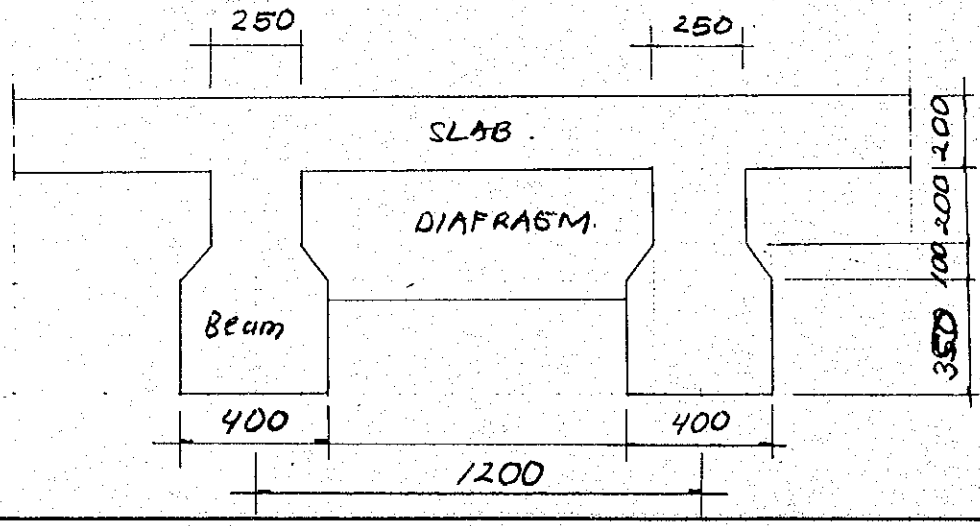
DESIGN CALCULATION
SIMOMGAN BRIDGE



SECTION OF BRIDGE



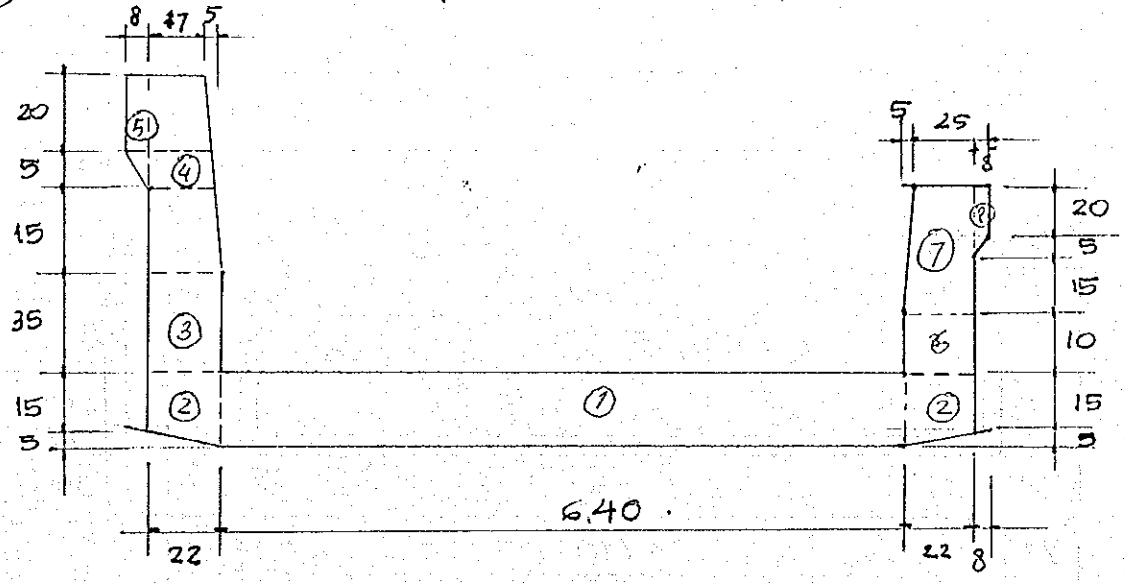
LONGITUDINAL VIEW



Name of Structure	SIMONGAN BRIDGE	Category of calculation	CONCRETE VOLUME .	Page	1.

I. CONCRETE VOLUME .

① SLAB AND CURB .



SLAB .

① 0.20 * 6,40 = 1.28 m² . = 1.280 m² . ✓

② (0.15 + 0.20)/2 * 0,22 = 0,0385 * 2 = 0,077 m² . ✓

total = 1.357 m² . ✓

CURB .

③ 0.22 * 0,35 = 0.077 m² . ✓

④ (0,17 + 0,22)/2 * 0.40 = 0.078 m² . ✓

⑤ (0,20 + 0,25)/2 * 0.08 = 0,018 m² . ✓

⑥ 0,10 * 0,22 = 0.022 m² . ✓

⑦ (0,17 + 0.22)/2 * 0,40 = 0,078 m² . ✓

⑧ (0,20 + 0,25)/2 * 0.08 = 0,018 m² . ✓

total : 0, 291 m² . ✓

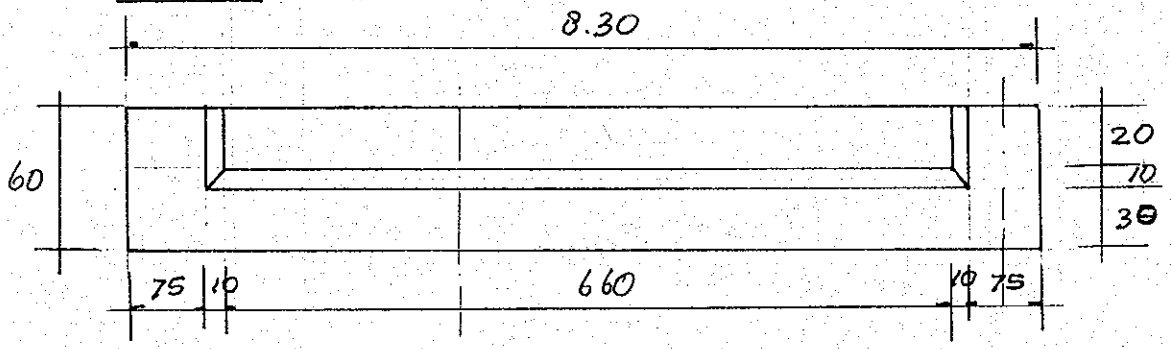
= 1,648 m² . ✓

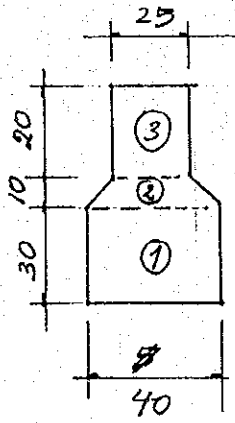
Name of Structure	SIMOMGAN BRIDGE	Category of calculation	CONCRETE VOLUME	Page	2.

- Length of spans. = 8.30 m.

Volume : 8.30 * 1.648 = 13.678 m^3.

② BEAM.





CENTRE OF BEAM.

① 0.40 x 0.30 = 0,12 m^2.

② (0.25 + 0,40)/2 * 0,10 = 0,035 m^2.

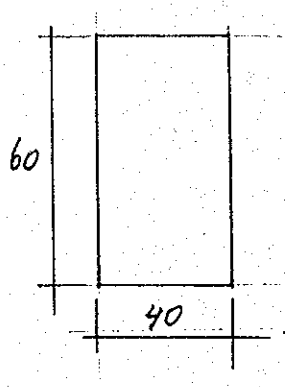
③ 0.25 * 0.20 = 0,050 m^2

A_1 = 0,205 m^2.

V_1 = 0,205 * 6.60 =

1,353 m^3

END OF BEAM.



A_2 = 0,40 * 0,60 = 0,24 m^2.

$V_2 = 0,24 * 0,75 + \frac{0,24 + 0,205}{2} * 0,10 \times 2$

= 0,2245 m^3.

Total Concrete Volume at Beam

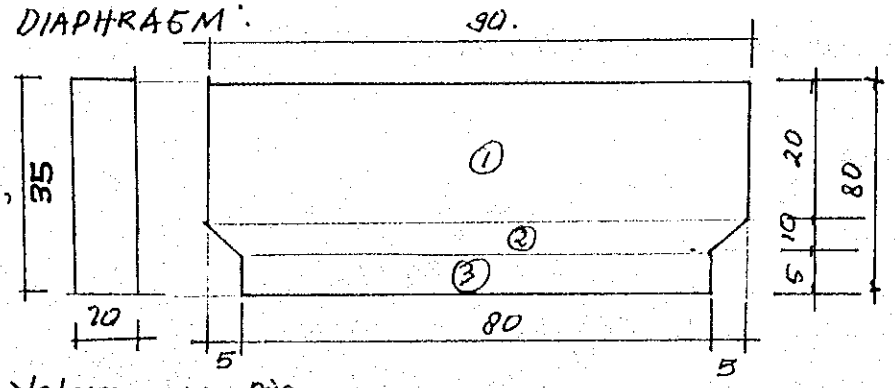
$\Sigma V = V_1 + V_2$.

= 1.353 + 0,2245 = 1.578 m^3.

total: 6 x 1.578 = 9.468 m^3

Name of Structure	SIMONDAN BRIDGE	Category of calculation	CONCRETE VOLUME.	Page	3.

3. DIAPHRAGM.



Volume of Dia.

① 0.20 * 0.90 * 0.20 = 0.036 m³. ✓

② 0.10 * $\frac{0.80 \times 0.90}{2}$ * 0.20 = 0.017 m³ ✓

3. 0.05 * 0.80 * 0.20 = 0.008 m³. ✓

ΣV = 0.061 m³. ✓

Number of Diaphragm : 15 nos.

Volume of diaphragm in bridge : 1 span.

15 * 0.061 m³. **0.915 m³** ✓

Total Volume of Concrete:

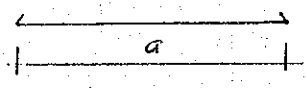
1. Slab and Curb = 13.678 m³ ✓
2. Beam = 9.468 m³ ✓
3. DIAPHRAGM = 0.915 m³ ✓

Σ = 24.061 m³ ✓

II. BRIDGE REINFORCEMENT.

(1). BEAM.

(B1)



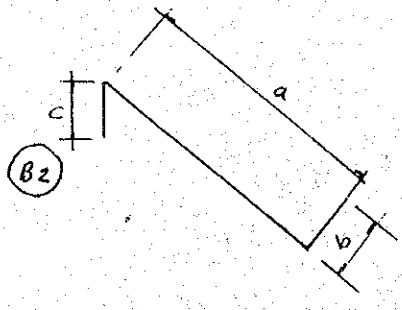
a = 824 cm.

(B1) Hook : 15 cm.

Total length a + Hook.

= 824 + 15 = 8.39 m. ✓

(B2)



a = 120 cm Hook : 15 cm

(B2) b = 25 cm

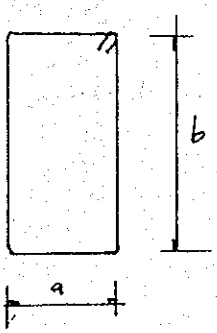
c = 37.5 cm.

Total length : a + b + c + hook.

= 120 + 25 + 37.5 = 182.5 cm.

↳ 1.825 m. ✓

(B3)



a = 34 cm.

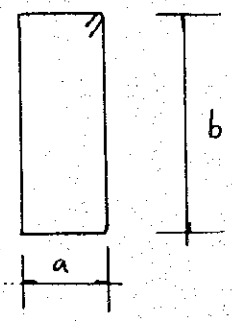
(B3) b = 74 cm. hook : 6 cm.

total length : a*2 + b*2 + hook.

= 34*2 + 74*2 + 6

= 222 cm ↳ 2.220 m ✓

(B3')



a = 19 cm.

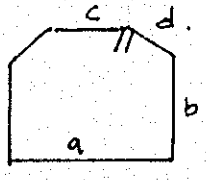
(B3') b = 74 cm. hook : 6 cm.

total length = 2a + 2b + hook.

= 2*19 + 2*74 + 6

= 192 cm ↳ 1.92 m. ✓

(B4)



a : 34 cm b = 24 cm c : 19 cm.

(B4) d : 14 cm hook : 6 cm.

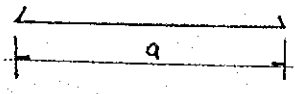
Total length : a + 2b + c + 2d + hook.

: 34 + 2*24 + 19 + 2*14 + 6

= 135 cm ↳ 1.35 m ✓

Name of Structure	SIMONGAN BRIDGE	Category of calculation	REINFORCEMENT VOLUME.	Page	7

(B5)



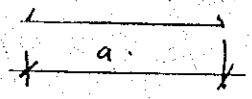
a = 34 cm. hook : 6 cm. ✓

Total length : a + hook

= 34 + 6 = 40 cm

↳ 0.4 m ✓

(B6)



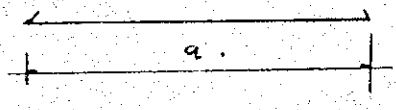
a = 72 cm.

hook . 6 cm.

total length : 72 + 6 = 78 cm.

↳ 0.78 m ✓

(B6')



a = 824 cm.

hook : 6 cm.

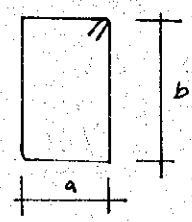
total length : a + hook

= 824 + 6 = 830 cm.

↳ 8.30 m ✓

② DIAPHRAGMA.

(D1)



a = 14 cm. hook : 7.8 cm.

b = 29 cm.

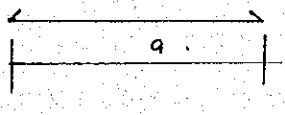
total length : 2a + 2b + 7.2

= 2 × 14 + 2 × 29 + 7.2

= 93.2 cm

↳ 0.932 m ✓

D2.



a = 7.20 / 720 cm.

Hook : 9.6 cm.

total length : 720 + 9.6 cm

= 729.6 cm

↳ 7.296 m ✓

Name of Structure		Category of calculation		Page	8

(3) CURB. left.

(S1)

length :

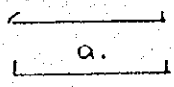
a = 220 cm hook : 7.2 cm.

total length : a + 7.2

= 2.272 cm

↳ 2,272 m ✓

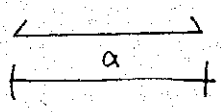
(S2)



a = 16 hook : 6 cm.

total length : 22 cm ↳ 0,22 m ✓

(S3)



a = 894 cm.

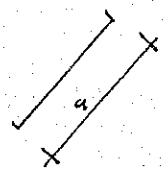
hook = 9.6 cm.

total length : 894 + 9.6

= 903.6 cm

↳ 9.036 m ✓

(S4)



a = 50 cm.

hook : 7.2 cm

total length : 50 + 7.2

= 572 ↳ 0.572 m ✓

(4) CURB Right.

S1' = a = 170 cm. hook 7.2 L = 177.2 cm

↳ 1.772 m /

S2' : a : 16 hook 6cm

total length : 22 cm = 0,22 m /

S3' = a = 894 hook : 9.6

total length . 894 + 9.6 = 903,6 cm

↳ 9.036 m /

S4' : a = 50 hook : 7.2

total length : 0.572 m /

Name of Structure	SIMONGAN RC BRIDGE	Category of calculation	REINFORCEMENT VOLUME.	Page	9

(3) SLAB.

Tua.

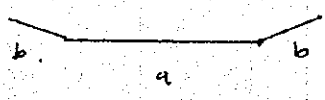
a = 678 cm hook : 7.2 cm

Length : a + hook

= 678 + 7.2 = 685,2 cm

= 6,852 m ✓

Tub



a = 640 cm . b = 24 cm hook : 7.2 cm

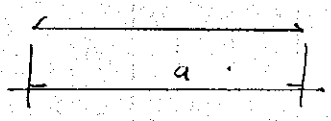
Length : a + 2b + hook :

= 640 + 2 * 24 + 7.2

= 695,2 cm

= 6.952 m ✓

Tp.



a = 824 cm Hook = 9.6 cm.

Length : a + hook.

= 824 + 9.6 = 833.6 cm.

= 8.336 m ✓

REINFORCEMENT BAR OF SIMONGAN RC BRIDGE L: 8.30 m.

REINF NO	DIA	TYPE	BENDING DIMENSION (cm) a	b	c	d	Hook	TOTAL LENGTH (m)	WEIGHT (kg/m)	NUMBER	NO OF BEAM	TOTAL WEIGHT (kg).	REMARK
	25	B_1	824	–	–	–	15	8.39	3.850	9	6	1744.28	
	25	B_2	120	25	37.5	–	15	1.975	3.850	8	6	364.98	
BEAM	10	B_3	34	74	–	–	6	2.220	0.616	20	6	164.102	
	10	B_3'	19	74	–	–	6	1.920	0.616	48	6	340.623	
	10	B_4	34	24	19	14	6	1.350	0.616	48	6	239.501	
	10	B_5	34	–	–	–	6	0.400	0.616	20	6	29.568	
	10	B_6	72	–	–	–	6	0.780	0.616	4	6	11.532	
	10	B_6'	824.	–	–	–	6	8.30	0.616	4	6	122.707	
													3017.242
	16	D_1	600	–	–	–	9.6	1,296	1.577	6	3	36.787	
DIA.	12	D_2	14	29	–	–	6.0	0.932	0.887	18	3	44.641	
													81.428
	12	S_1	220	–	–	–	7.2	2.272	0.887	43	1	86.656	
CURB	12	S_1'	170	–	–	–	7.2	1.772	0.887	43	1	67,586	
	10	S_2	16	–	–	–	6.0	0,232	0.616	129	1	18.436	
	10	S_2'	16	–	–	–	6.0	0.232	0.616	86	1	12,290	
	16	S_3	894	–	–	–	9.6	9.084	1.577	9	1	128.193	
	16	S_3'	894	–	–	–	9.6	9.084	1.577	7	1	100.28	
	12	S_4	50	–	–	–	7.2	0.572	0.887	43	2	43.633	
													457.817

Name of Structure: SIMONGAN BRIDGE

Category of calculation: CONCRETE REINFORCEMENT

Page: .

13-455

REINFORCEMENT BAR OF

REINF NO	DIA	TYPE	BENDING DIMENSION (cm) a	b	c	d	hook.	TOTAL LENGTH (m)	WEIGHT (kg/m)	NUMBER	NO OF BEAM	TOTAL WEIGHT (kg).	REMARK
	12	Tua	678	–	–	–	7.2	6.852	0,887	84	1	510.53	
SLAB.	12	Tub	640	24	–	–	7.2	6.852	0,887	84	1	517.98	
	12	Tp.	824	–	–	–	7.2	6.852	0,887	70	1	525,03	
													153.54
											N =	5.110,078	–

Name of Structure: SIMONGAN BRIDGE

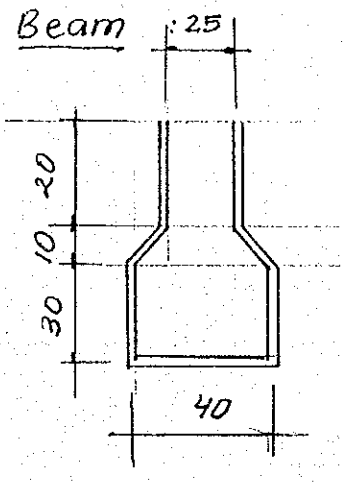
Category of calculation: CONCRETE REINFORCEMENT

Page:

Name of Structure	SIMONEAN RC BRIDGE	Category of calculation	FORM WORK .	Page	1.

III. FORM WORK :

Beam



CENTRE BEAM.

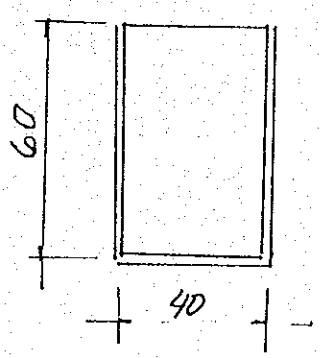
$L = 0{,}20 \times 2 + \sqrt{0.10^2 + 0{,}075^2} + 0{,}30 \times 2 + 0{,}40 = 1{,}525$ m

Length = 6.60 m.

$A_1 = 6.60 * 1.525 = 10{,}065\ m^2$.

END OF BEAM.

$L = 0.60 \times 2 + 0{,}40 = 1.00$ m.



Length = 1.15 m.

$A_2 = 1.00 * 1.15 * 2 = 2.3\ m^2$.

END SIDE BEAM.

$A_3\ 0.60 * 0.40 * 2 = 0.48\ m^2$.

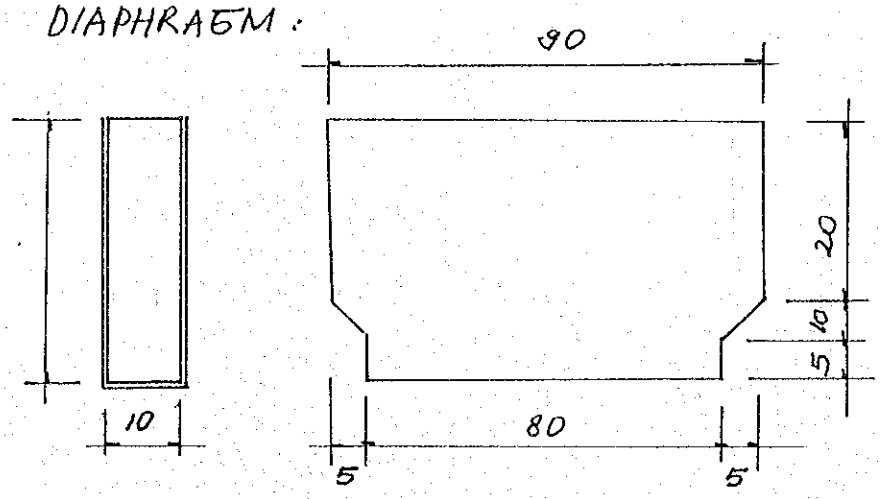
$\Sigma = 12.365\ m^2$.

Number of Beam : 6

Volume of Form : $6 * 12.365 = 74.190\ m^2$

Name of Structure	SIMONGAN RC BRIDGE 8.30m.	Category of calculation	FORM.	Page	

DIAPHRAGM.



L = 0,35 * 2 + 0,10 = 0,8 m

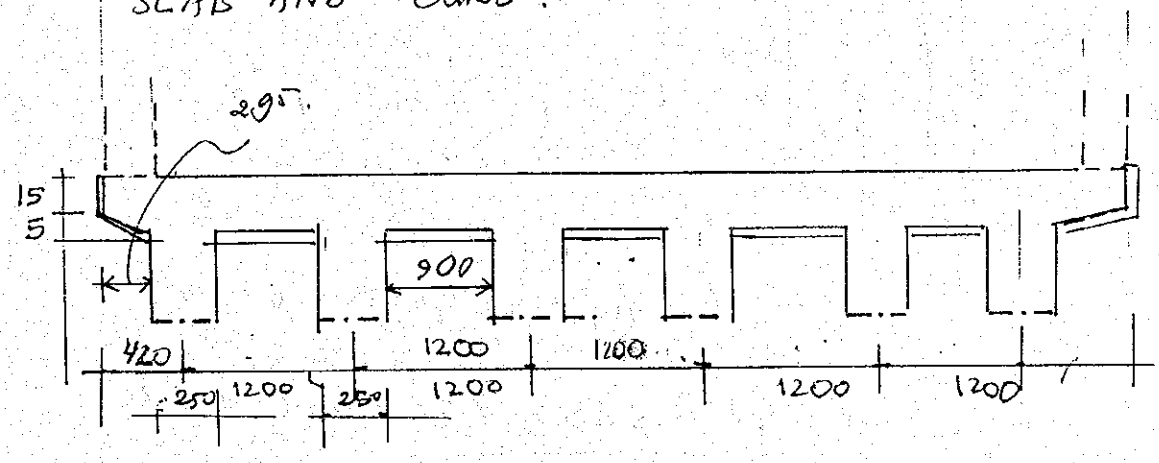
Length of BEAM = 0,90.

A = 0,80 * 0,90 m = 0.72. m^2.

Number of diaphragm : 15

Volume : 15 * 0,72 = 10,80 m^2 ✓

SLAB AND CURB.



L = 0,15 x 2 + $\sqrt{(0,05^2 + 0,295^2)}$ * 2 + 5 * 0,90

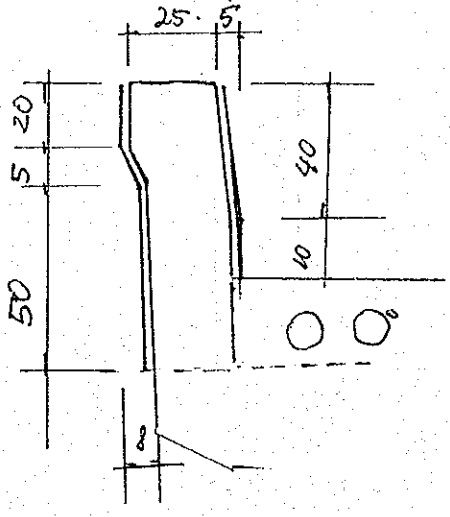
= 5.398 m.

Length of Bridge 8.30 -

Volume : 5,398 * 8.30 - 3 * 0,10 = 44,504 m^2. ✓

Name of Structure		Category of calculation		Page	

- LEFT Handrail .



$L_1 = 20 + \sqrt{5^2+8^2} + 50$

$= 0,794\ m$.

$L_2 = \sqrt{5^2+40^2} + 10$

$= 0,5031\ m$

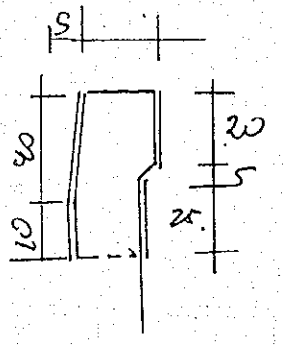
$L = 1,293\ m$.

Leng of span.

$A = 1.293 * 8.30$.

$= \boxed{10,733\ m^2}$. ✓

RIGHT Hand rail :



$L_1 = 20 + \sqrt{5^2+8^2} + 25$

$= 0,544\ m$. ✓

$L_2 = \sqrt{5^2+40^2} + 10$

$= 0.503\ m$. ✓

Length of span : $= 8.30\ m$.

$A = 0.583 * 8.30 + 0.544 * 8.30$

$= \boxed{8,69\ m^2}$. ✓

total Form :

Beam : $74.190\ m^2$

Dia : $10,80\ m^2$

slab : $44.504\ m^2$.

Cub : $8.69\ m^2 + 10,733$

$\boxed{\Sigma = 148.917\ m^2}$