

REPUBLIC OF THE PHILIPPINES
MINISTRY OF PUBLIC WORKS & HIGHWAYS

THE FEASIBILITY STUDY
OF
PHILIPPINE ROAD DISASTER PREVENTION PROJECT

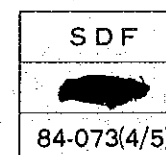
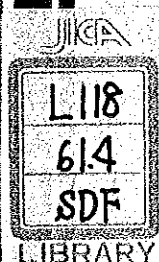
FINAL REPORT

DRAWINGS

(VOLUME IV)

JUNE, 1984

JAPAN INTERNATIONAL COOPERATION AGENCY



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**THE FEASIBILITY STUDY
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PHILIPPINE ROAD DISASTER PREVENTION PROJECT**

FINAL REPORT

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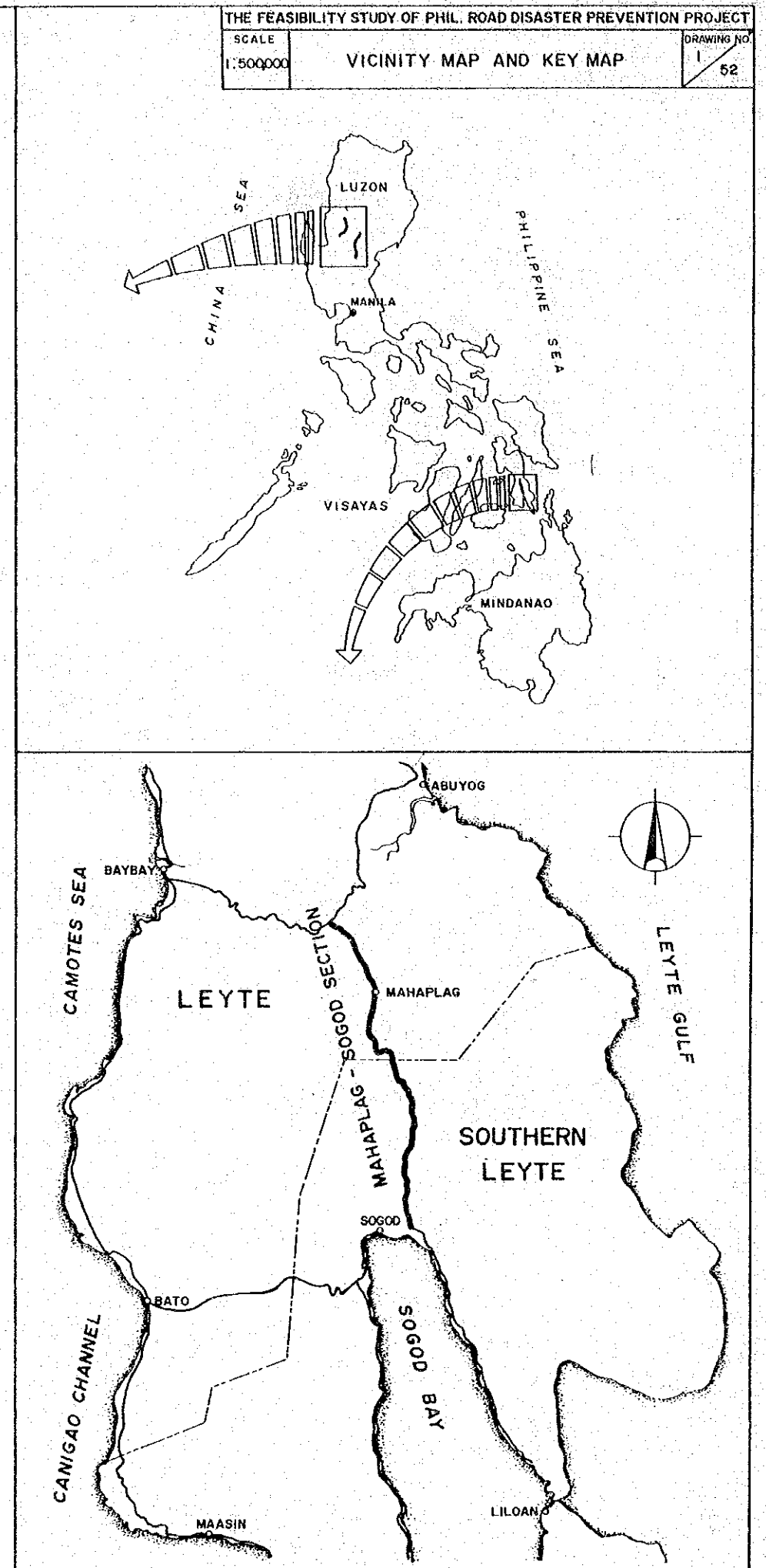
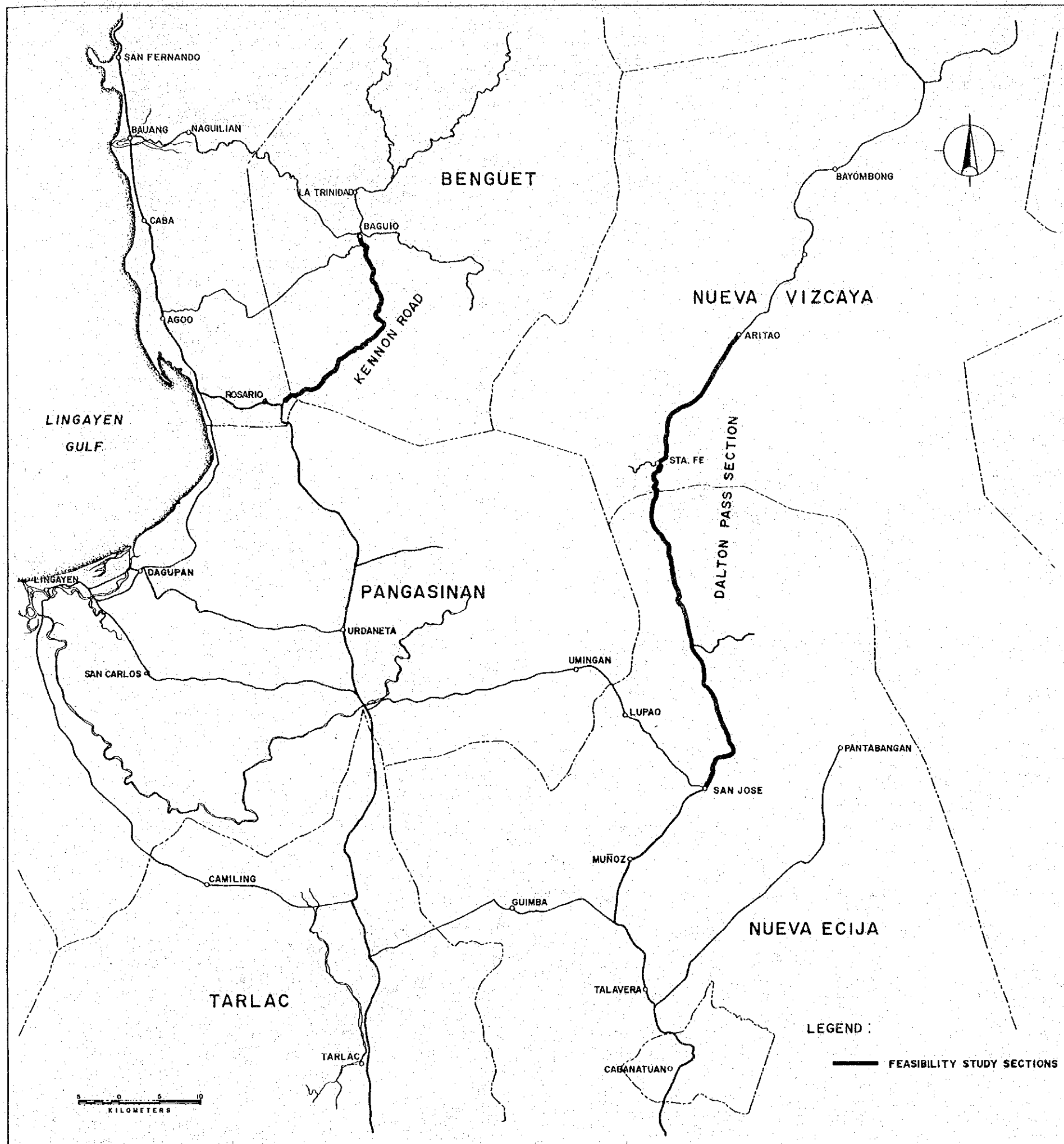
JUNE, 1984

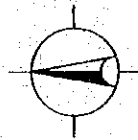
JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団	
受入 月日 '85. 6. 10	L118
登録No. 11534	614
	SDF

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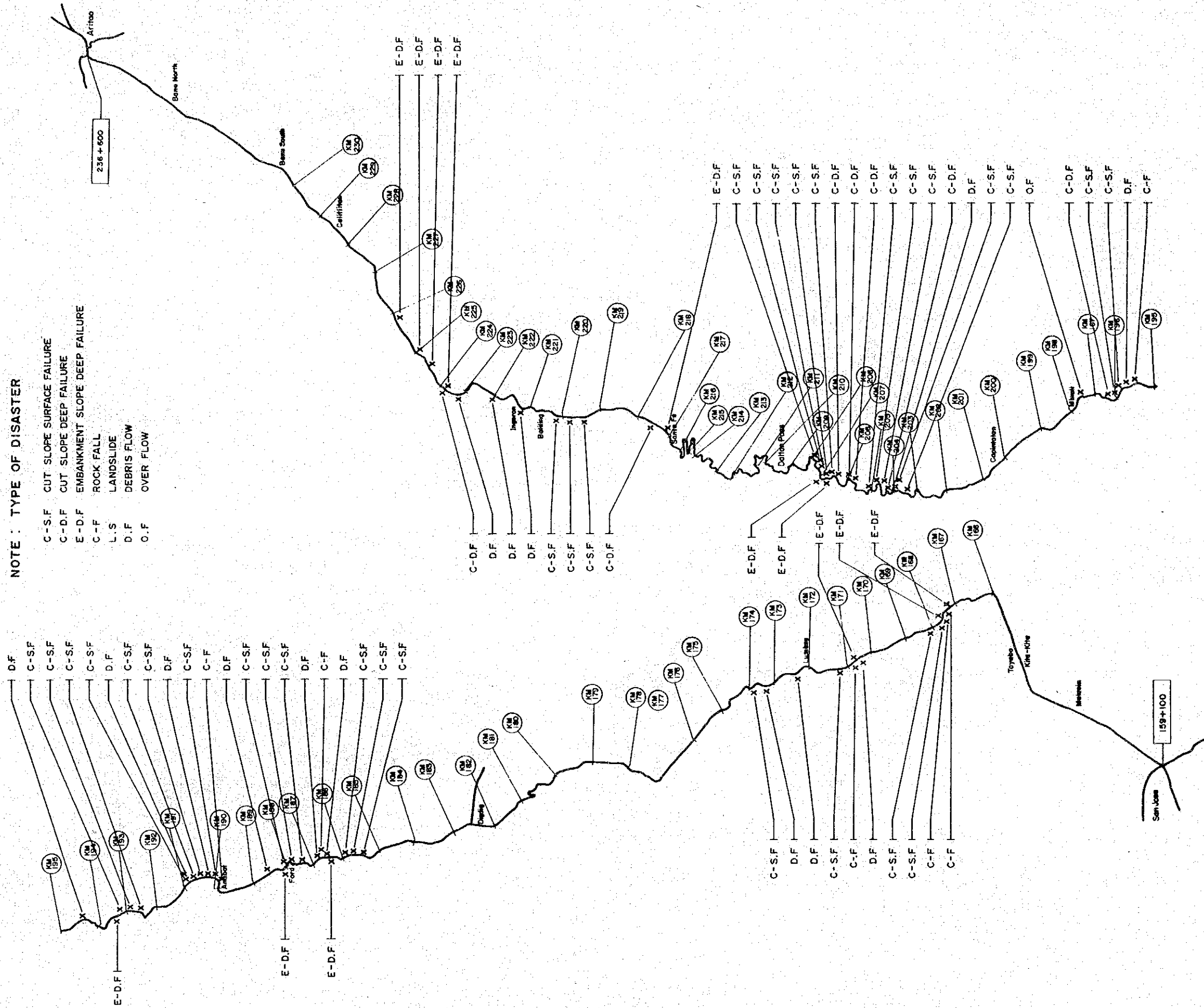
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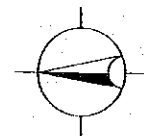




NOTE : TYPE OF DISASTER

C-S.F CUT SLOPE SURFACE FAILURE
C-D.F CUT SLOPE DEEP FAILURE
E-D.F EMBANKMENT SLOPE DEEP FAILURE
C-F ROCK FALL
L.S LANDSLIDE
D.F DEBRIS FLOW
O.F OVER FLOW





NOTE: TYPE OF DISASTER

- C-S.F CUT SLOPE SURFACE FAILURE
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- O.F OVER FLOW

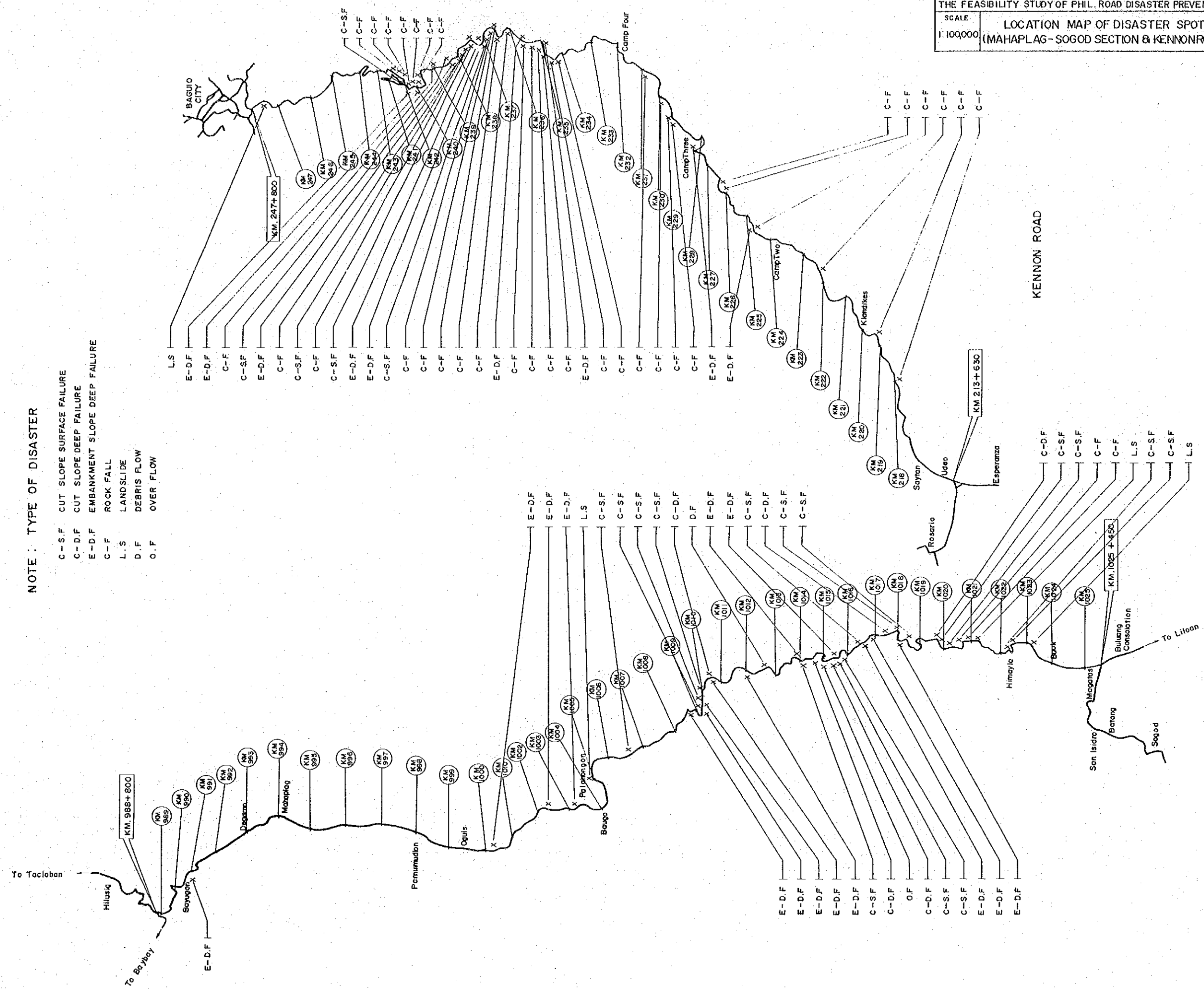


TABLE OF COUNTERMEASURES APPLIED TO EACH DISASTER SPOT (1)

[illegible]

* t = thickness

TABLE OF COUNTERMEASURES APPLIED TO EACH DISASTER SPOT (2)

[illegible]

* t = thickness

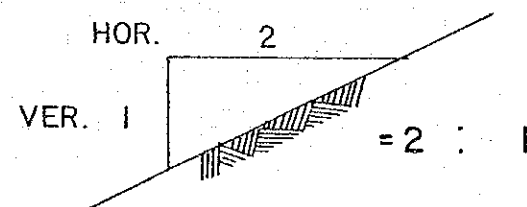
TYPICAL COUNTERMEASURES

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ANCHORING (WITH CONCRETE CRIB)	17/52
CONCRETE SABO-DAM	18/52
CONCRETE PIPE CULVERT/CONCRETE BOX CULVERT	19/52

NOTES:

(1) ALL DIMENSIONS ARE IN
MILLIMETER UNLESS
OTHERWISE SPECIFIED

(2.) SLOPE GRADIENT



(3) ABBREVIATIONS

HW.L : HIGH WATER LEVEL

J.I.S : JAPANESE INDUSTRIAL STANDARD

R.C.P : REINFORCED CONCRETE PIPE

RDWY. : ROADWAY

TYP. : TYPICAL

℄ : CENTER LINE

H or h : HEIGHT

L or ℓ : LENGTH

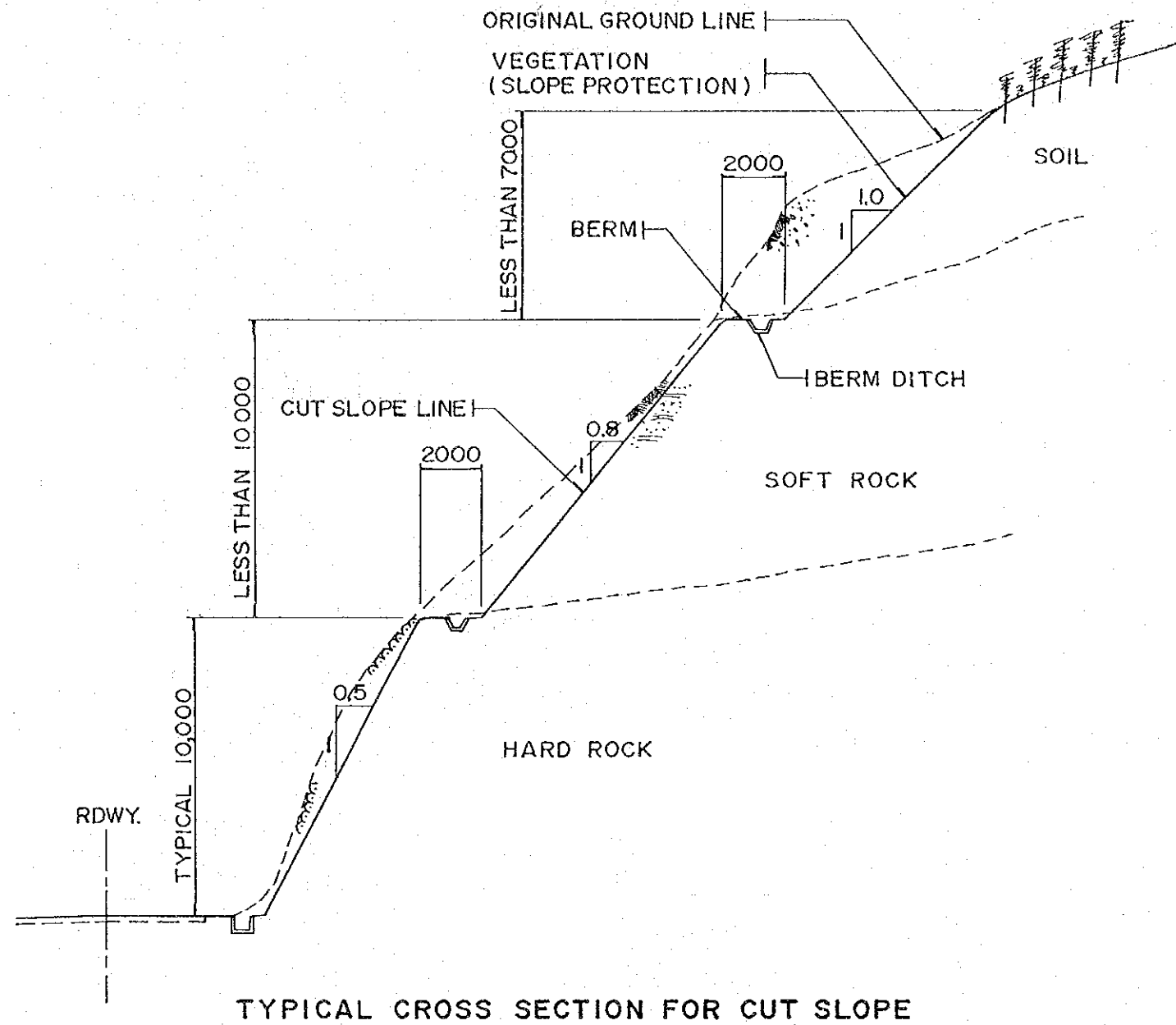
∅ : DIAMETER

t : THICKNESS

m. : METER

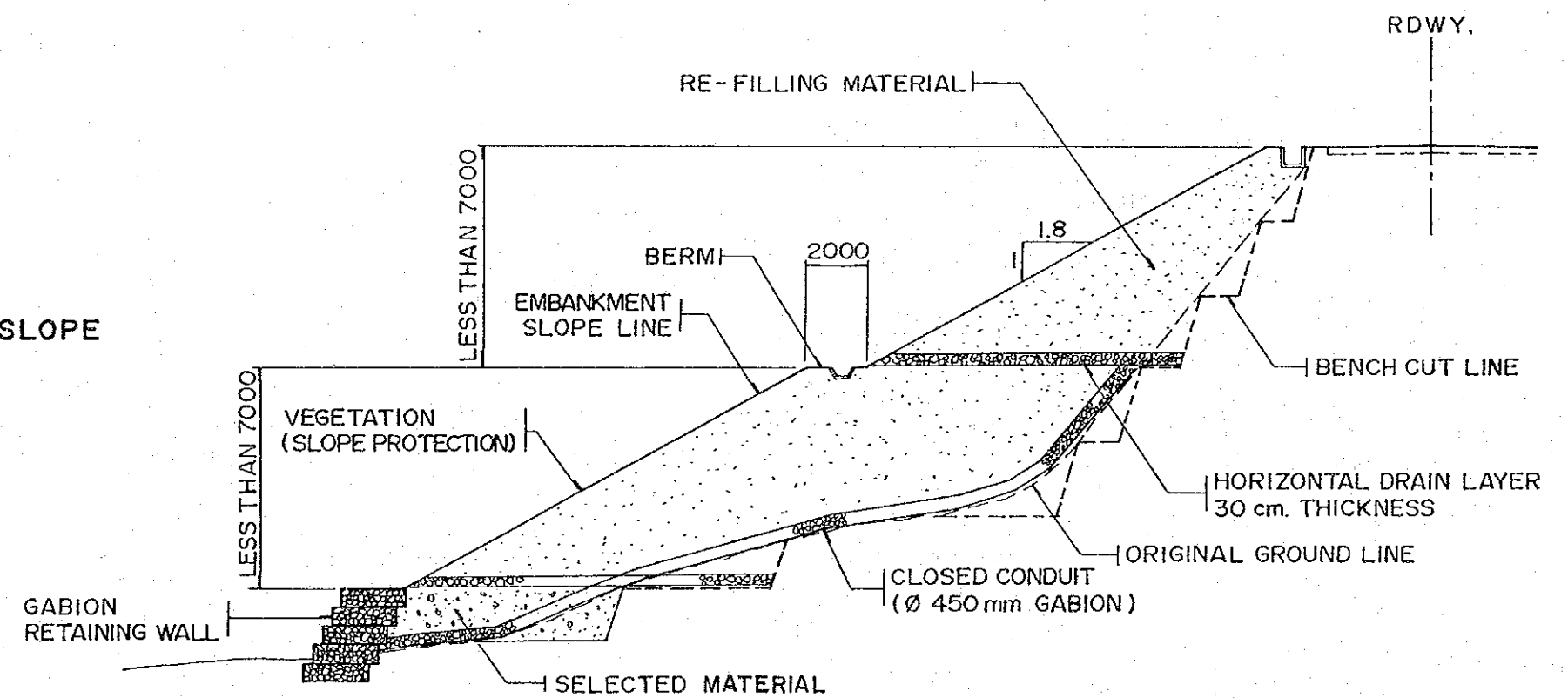
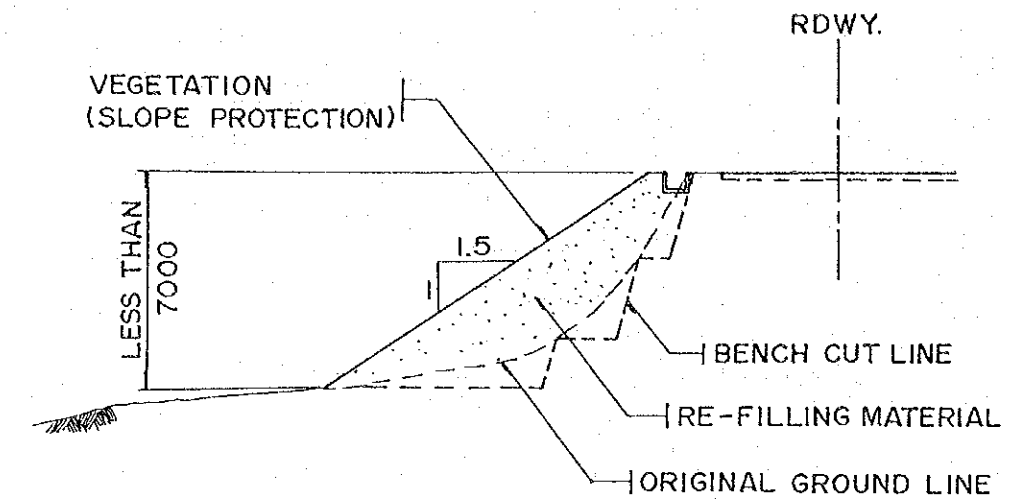
cm. : CENTIMETER

mm. : MILLIMETER

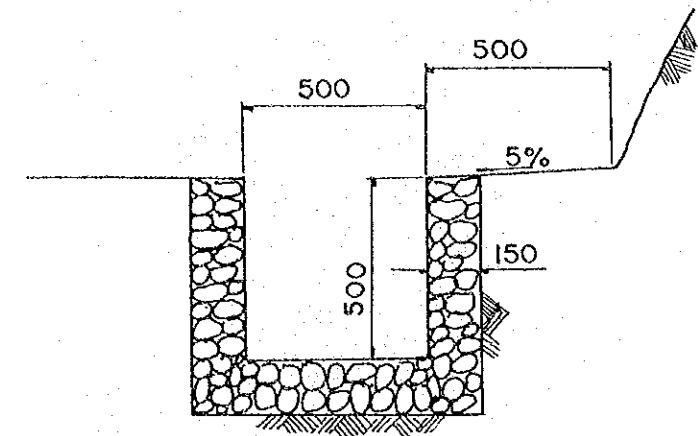


TYPICAL CROSS SECTION FOR CUT SLOPE

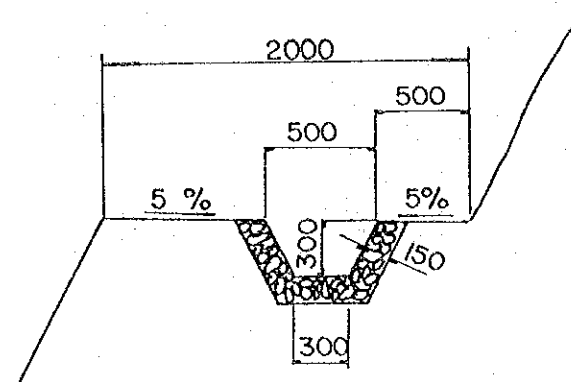
ITEM	KINDS OF ROCKS		
	SOIL	SOFT ROCK	HARD ROCK
GRADIENT	1.0 : 1	0.8 : 1	0.5 : 1
LOCATION OF BERM	EVERY 7.0 M	EVERY 10.0 M	—
WIDTH OF BERM	2.0 M	2.0 M	—



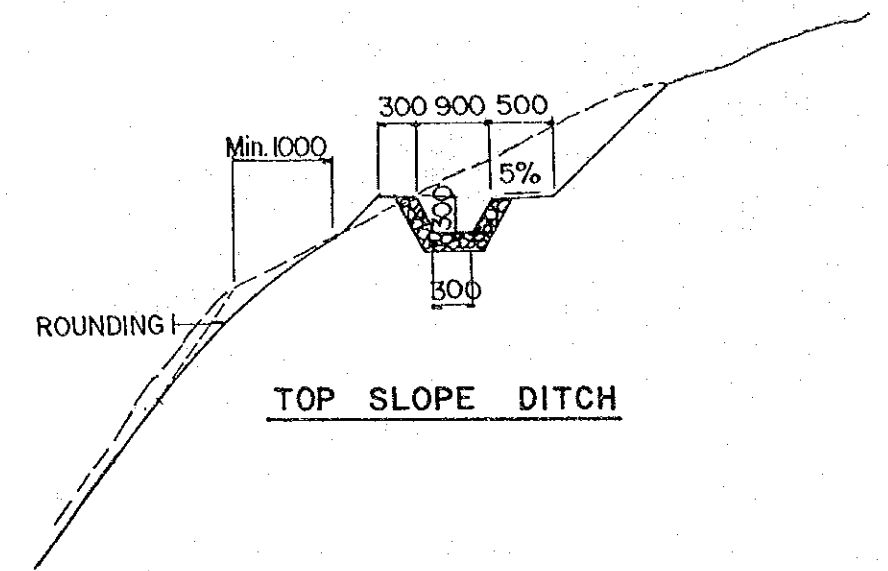
TYPICAL CROSS SECTION FOR EMBANKMENT SLOPE



SIDE DITCH
(FOR MOUNTAINOUS AREA)

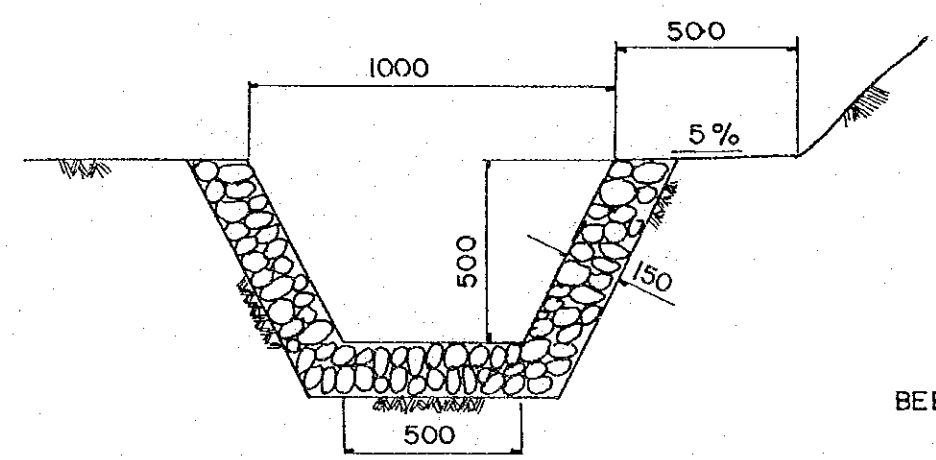


BERM DITCH

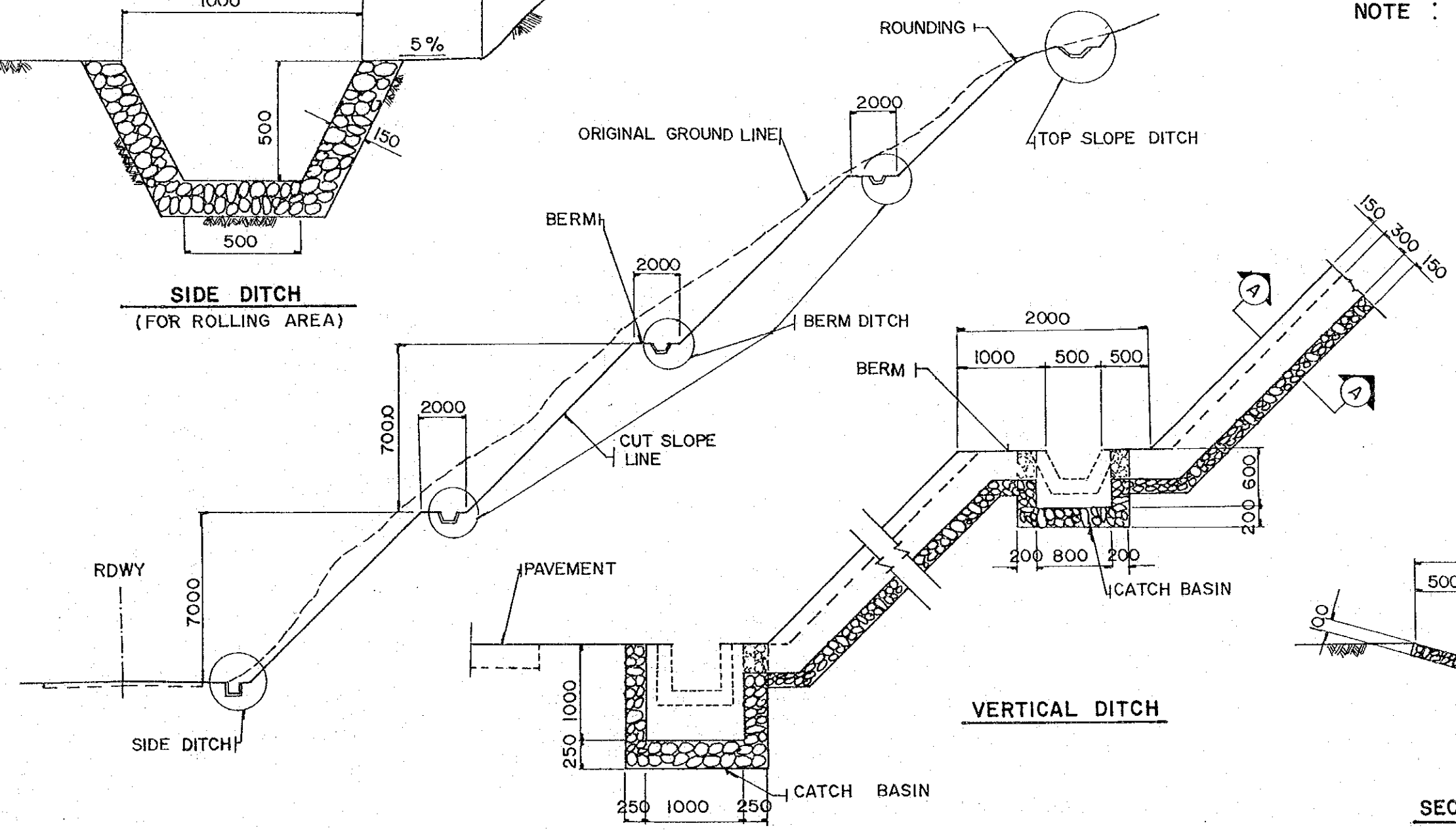


TOP SLOPE DITCH

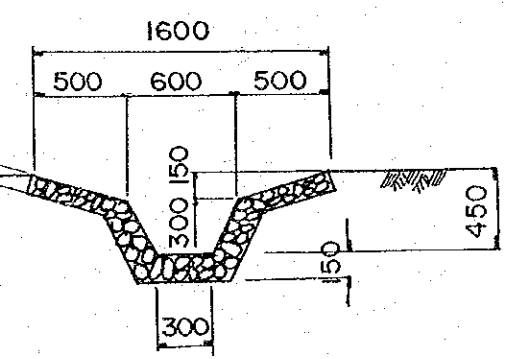
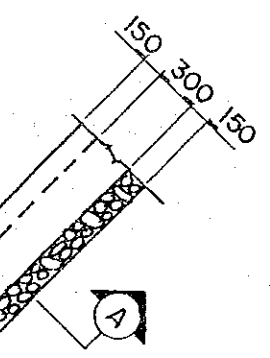
NOTE : DIMENSION OF CROSS SECTION OF DITCH SHALL BE DETERMINED BASED ON THE HYDROLOGICAL ANALYSIS.



SIDE DITCH
(FOR ROLLING AREA)

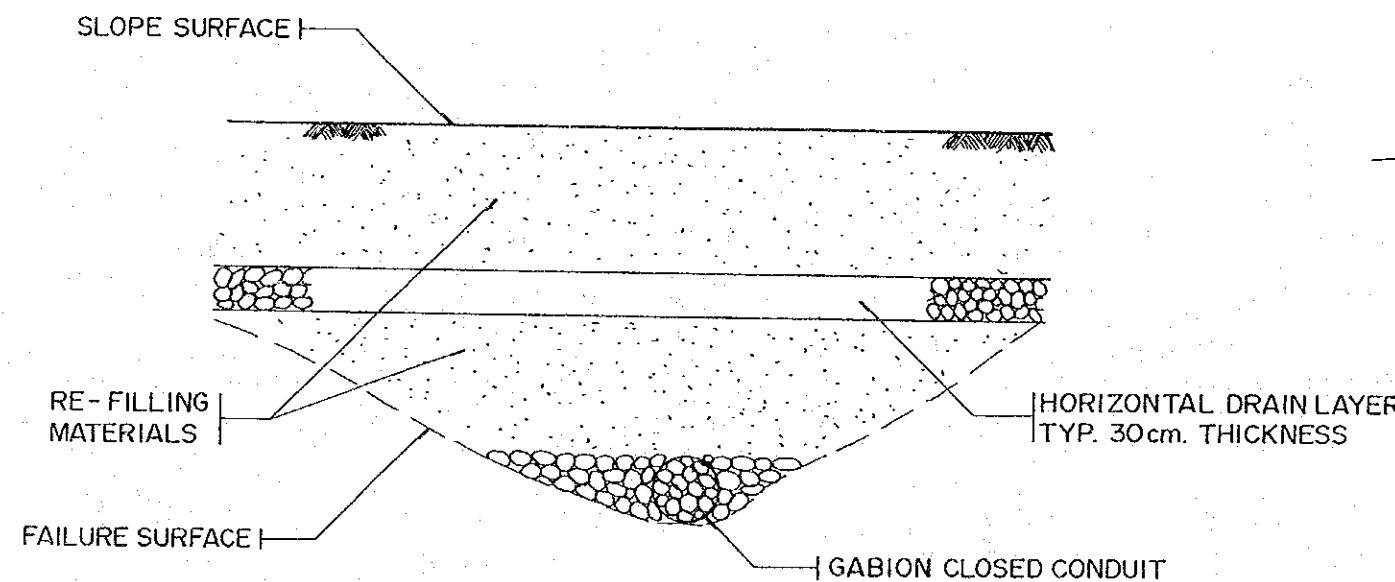
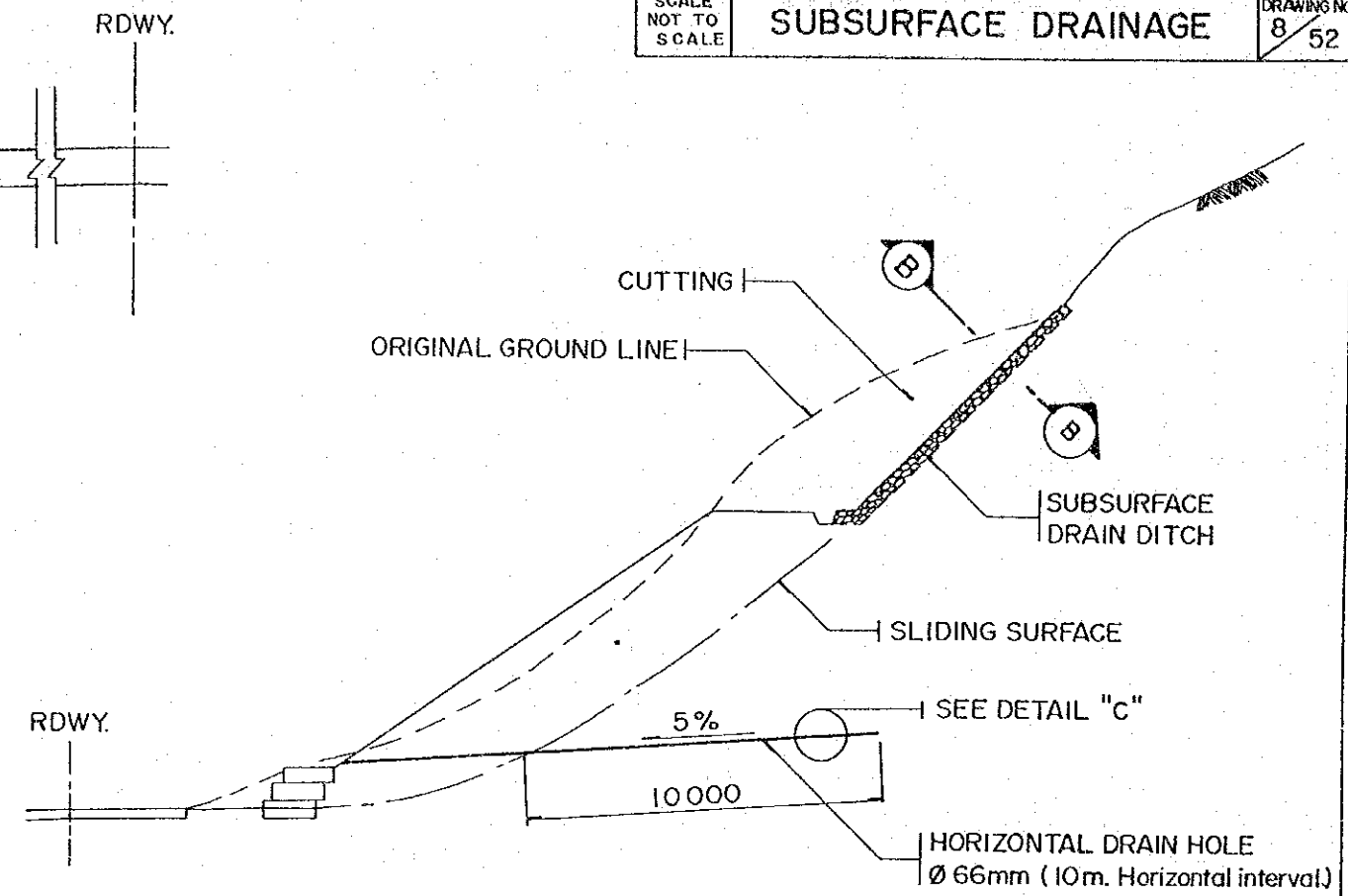
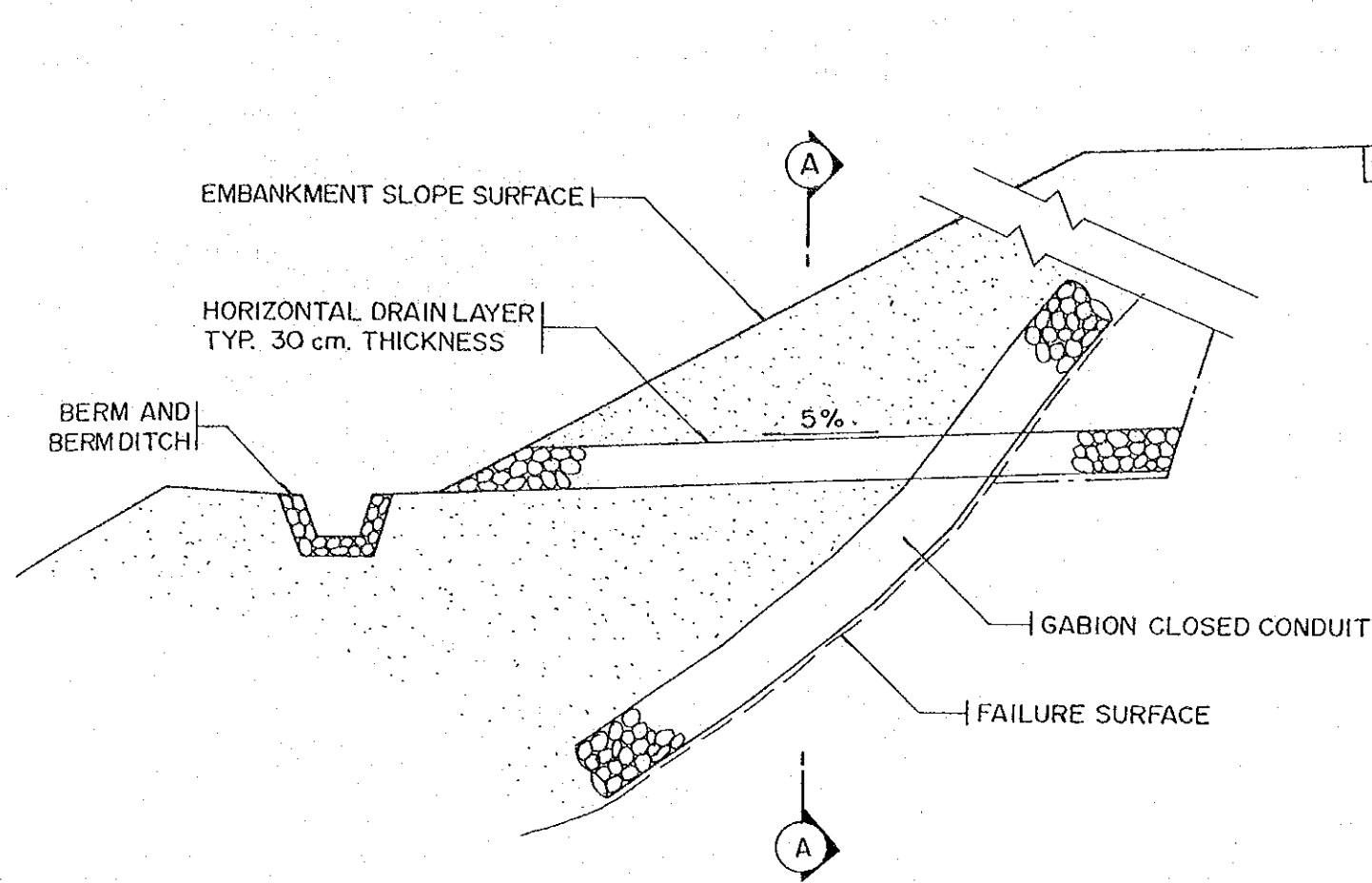


VERTICAL DITCH

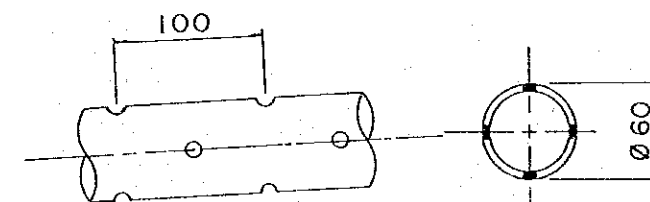


SECTION A

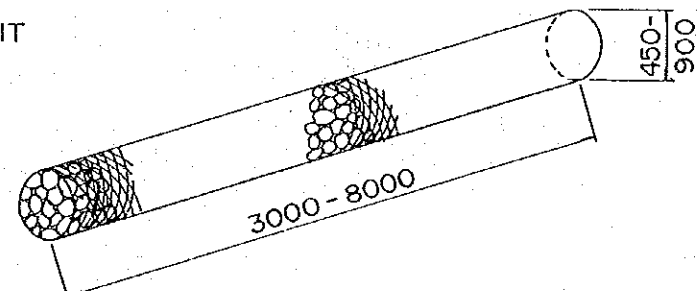
SUBSURFACE DRAINAGE



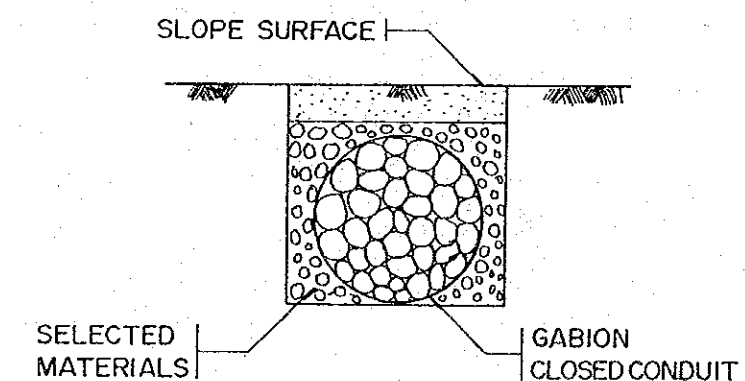
SECTION - A
GABION CLOSED CONDUIT
AND HORIZONTAL DRAIN LAYER
(FOR EMBANKMENT SLOPE)



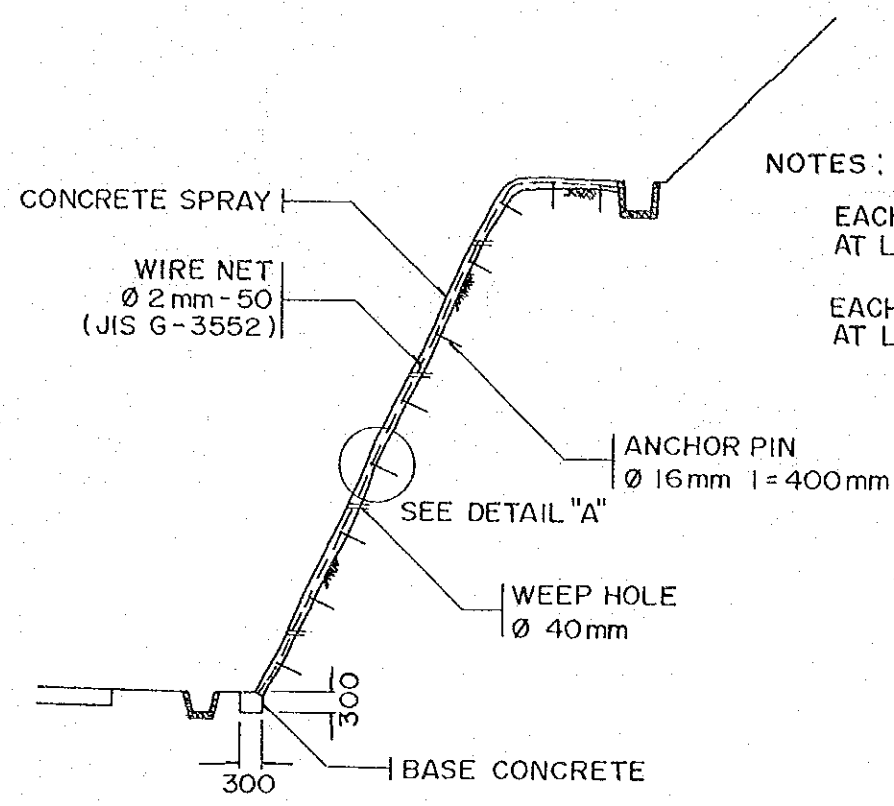
DETAILS OF "C"
PERFORATED PIPE
(FOR HORIZONTAL DRAIN HOLE)



DETAILS OF GABION CLOSED CONDUIT



SECTION - B
HORIZONTAL DRAIN HOLE
AND SUBSURFACE DRAIN DITCH
(FOR CUT SLOPE)

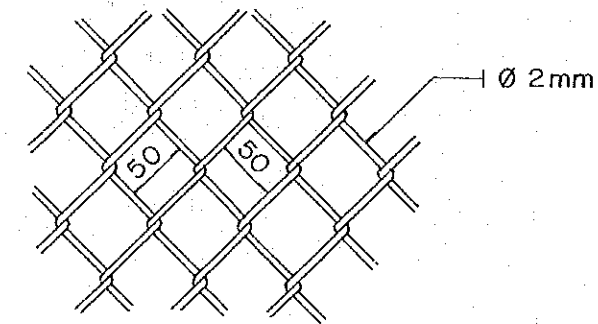


NOTES :

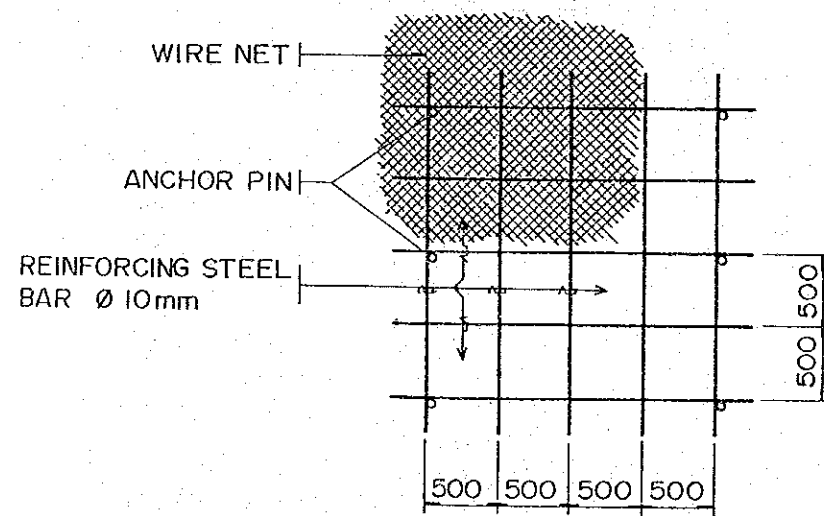
EACH ANCHOR PIN SHALL BE PLACED
AT LEAST FOR EVERY 1 SQ. M.

EACH WEEP HOLE SHALL BE PLACED
AT LEAST FOR EVERY 2 SQ. M.

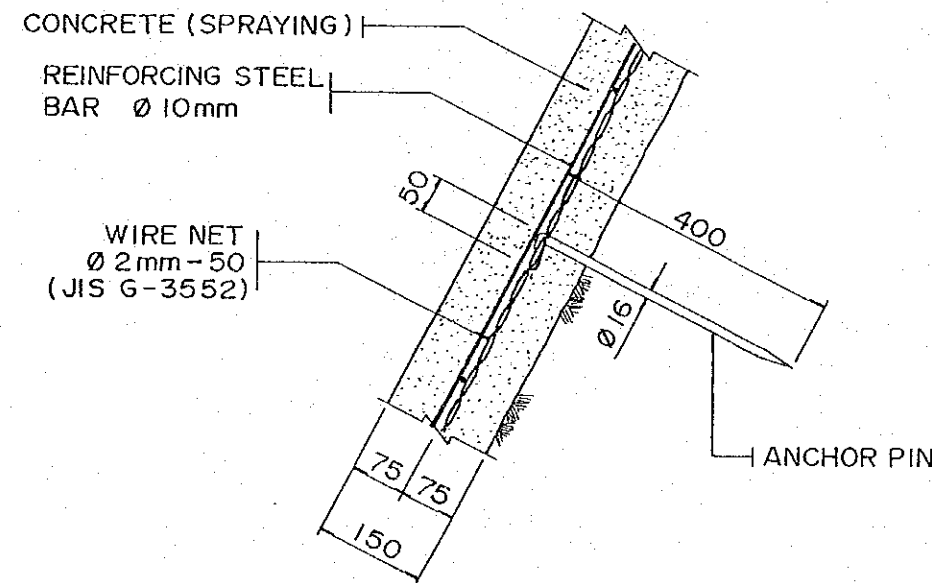
CONCRETE SPRAYING



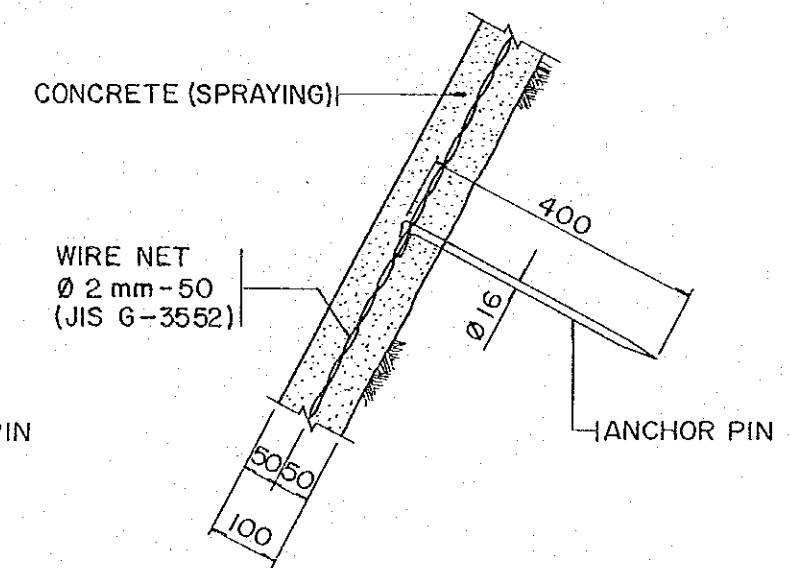
DETAILS OF WIRE NET
(Ø 2mm-50) (JIS G-3552)



BAR ARRANGEMENT
THICKNESS 15 cm.



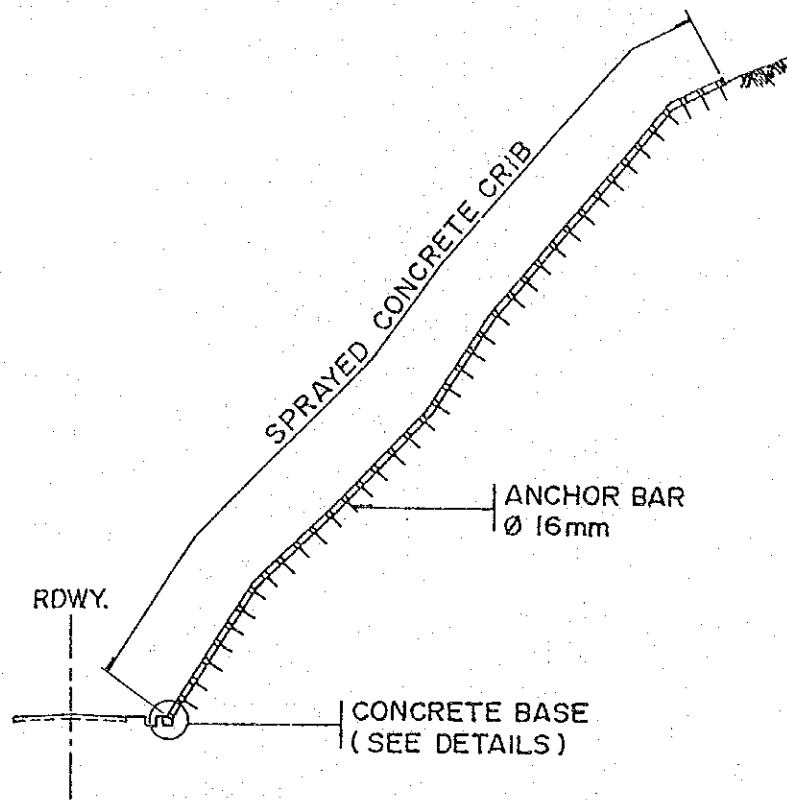
DETAILS OF "A"
THICKNESS 15 cm.



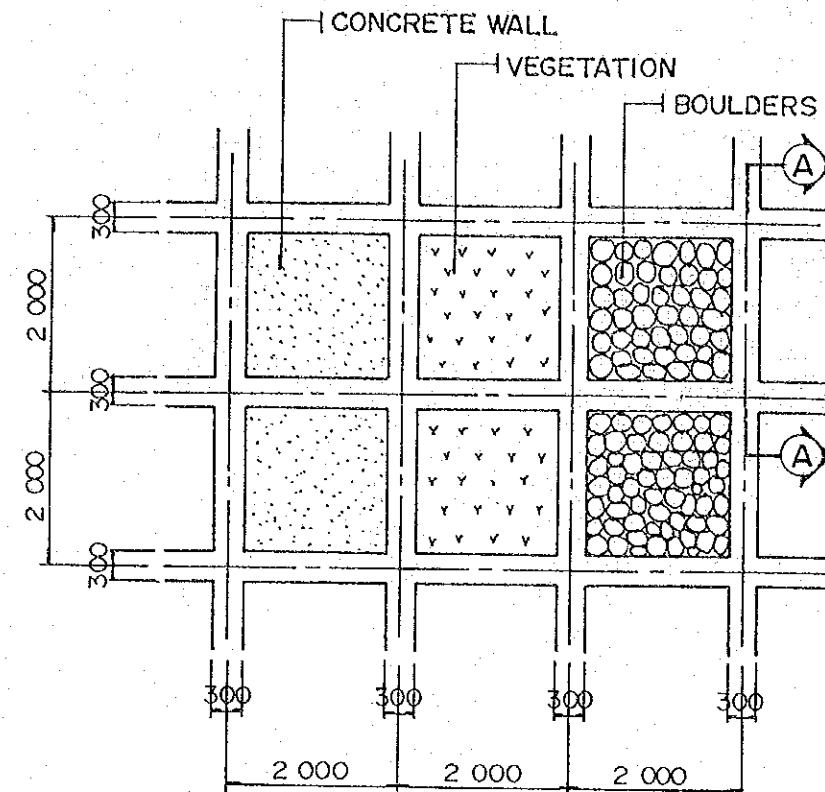
DETAILS OF "A"
THICKNESS 10 cm.

NOTE :

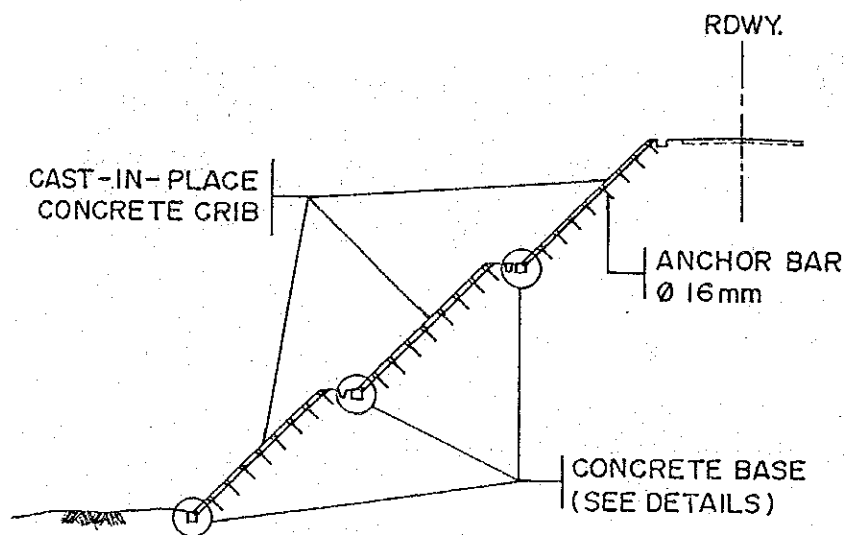
THE SPACE BETWEEN CRIBS IS PROTECTED BY VEGETATION, BOULDERS AND CONCRETE WALL, DEPENDING ON SLOPE GRADIENT, DEGREE OF WEATHERING AND CONDITION OF SPRING WATER.



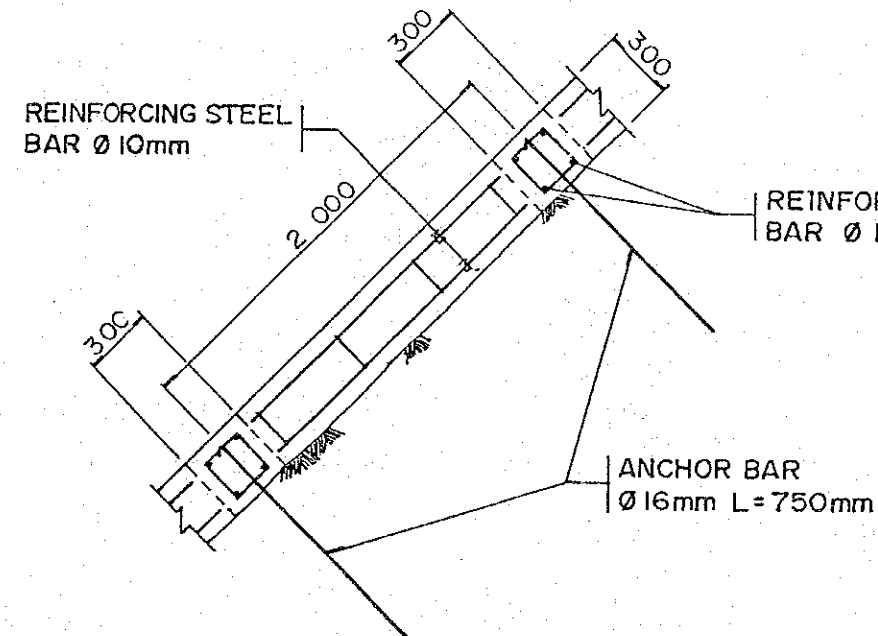
**SPRAYED CONCRETE CRIB
(FOR CUT SLOPE)**



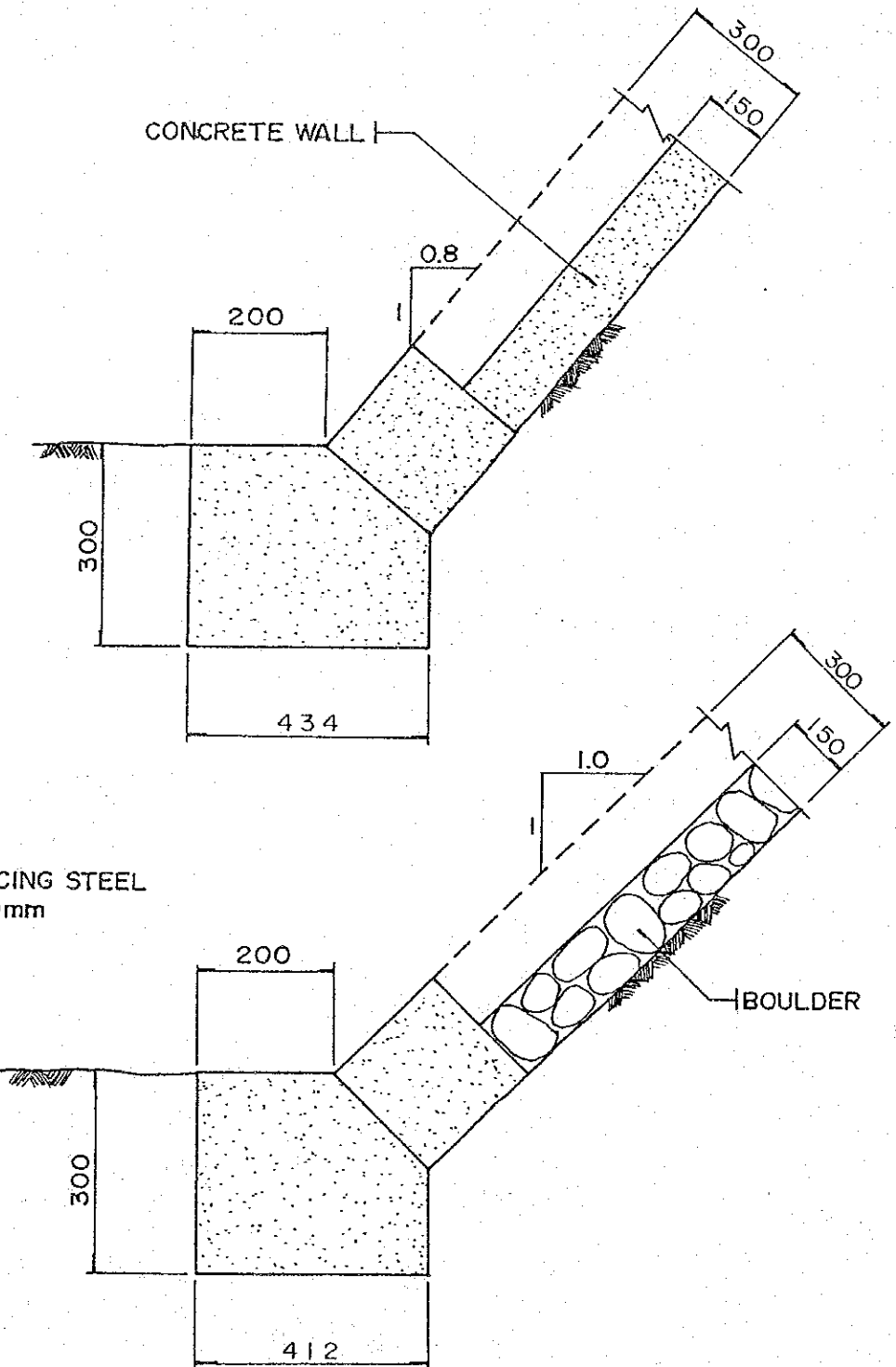
DEVELOPED PLAN



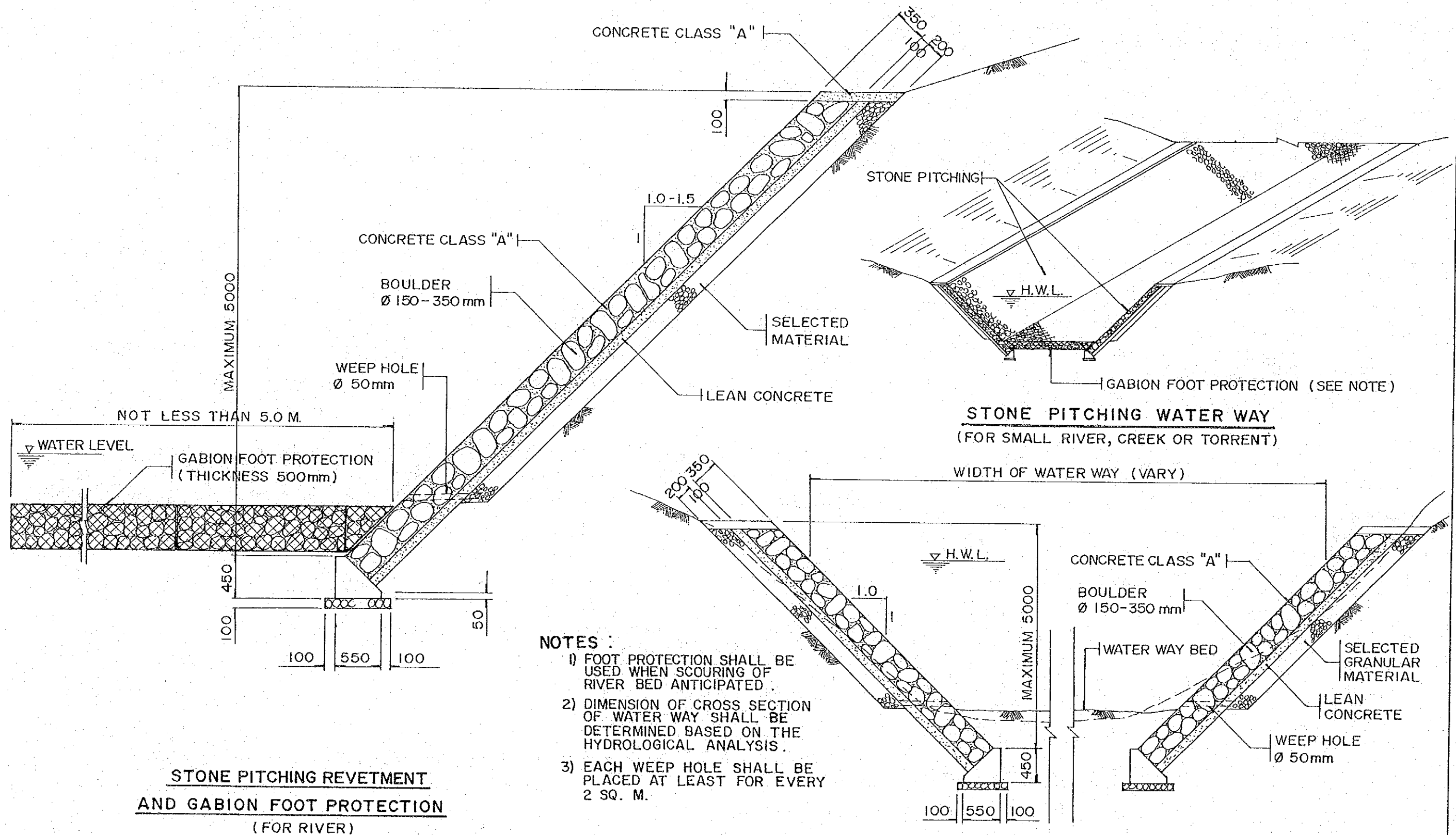
**CAST-IN-PLACE CONCRETE CRIB
(FOR EMBANKMENT SLOPE)**

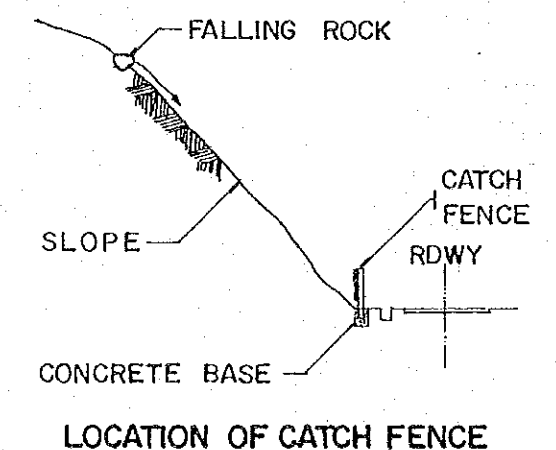


SECTION - A



DETAILS OF BASE





DIMENSION TABLE OF ROCK NET

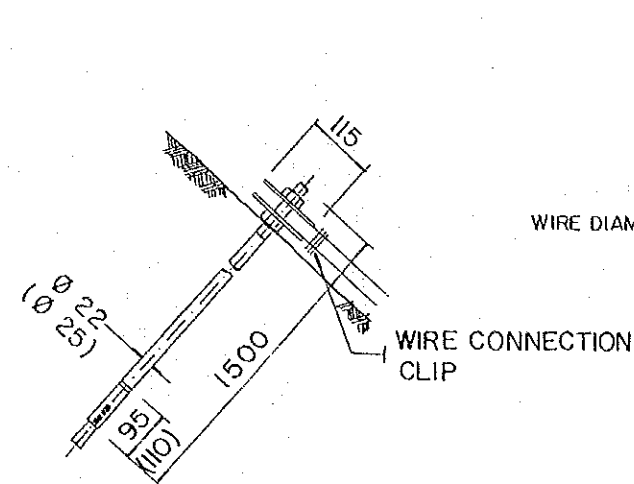
ITEM TYPE	WIRE NET	WIRE ROPE ^{*1}		CONDITION OF SLOPE AND ROCK			ANCHOR
	GALVANIZED WIRE NET	MAIN ROPE	SUB ROPE	MAXIMUM SLOPE LENGTH	MAXIMUM SLOPE GRADIENT	ALLOWABLE ^{*2} WEIGHT OF ROCK	ROCK ANCHOR
1500	Ø 4.0mm x 50 x 50	Ø 16	Ø 12	50 m	0.5:1	1500 kg	Ø 25
1000	Ø 3.2mm x 50 x 50	Ø 16	Ø 12	70 m	0.5:1	1000 kg	Ø 25
500	Ø 2.6mm x 50 x 50	Ø 12	Ø 12	70 m	0.5:1	500 kg	Ø 22

*1 JIS - G 3525 3x7 G/O TYPE

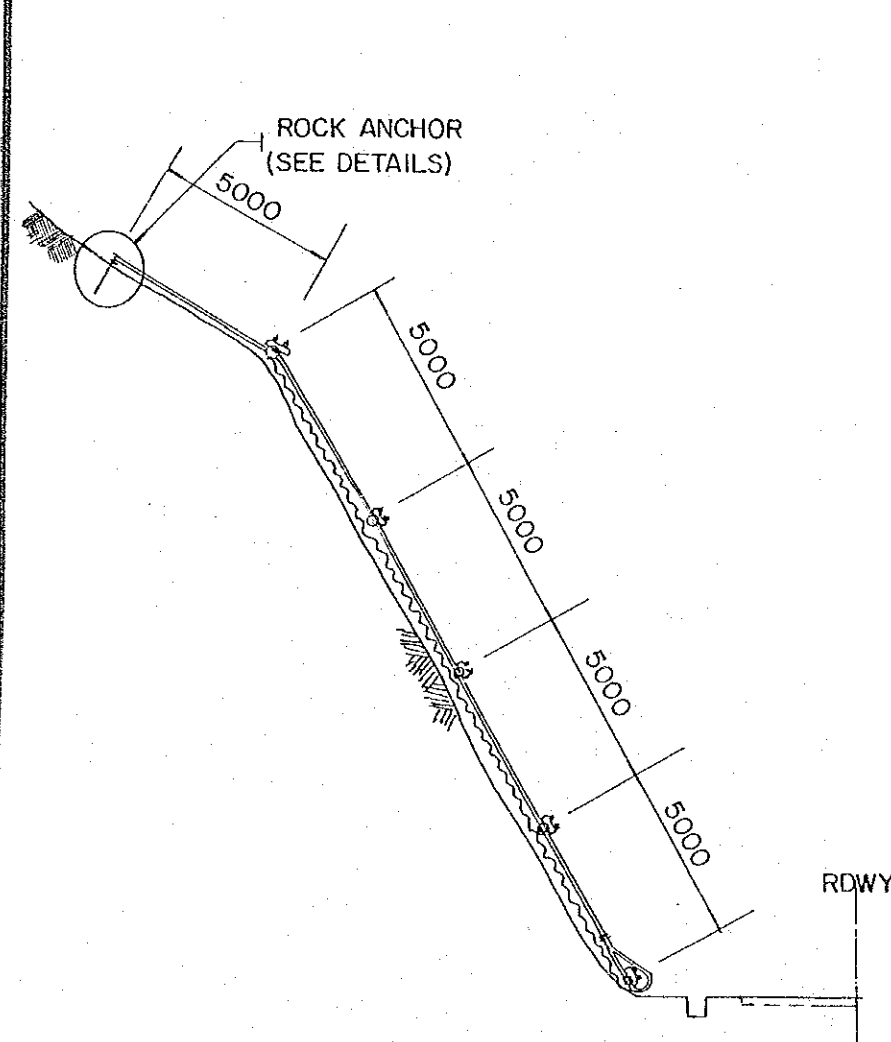
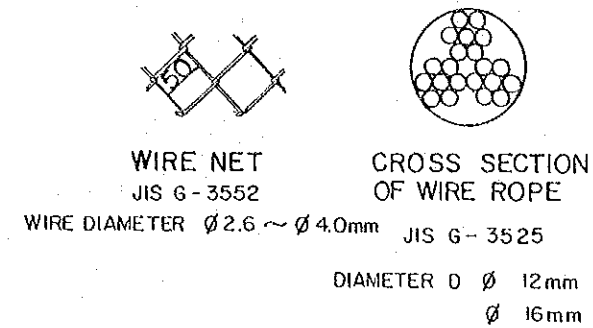
ULTIMATE TENSILE STRENGTH MORE THAN 7000 kg FOR Ø 12 mm

MORE THAN 12000 kg FOR Ø 16 mm

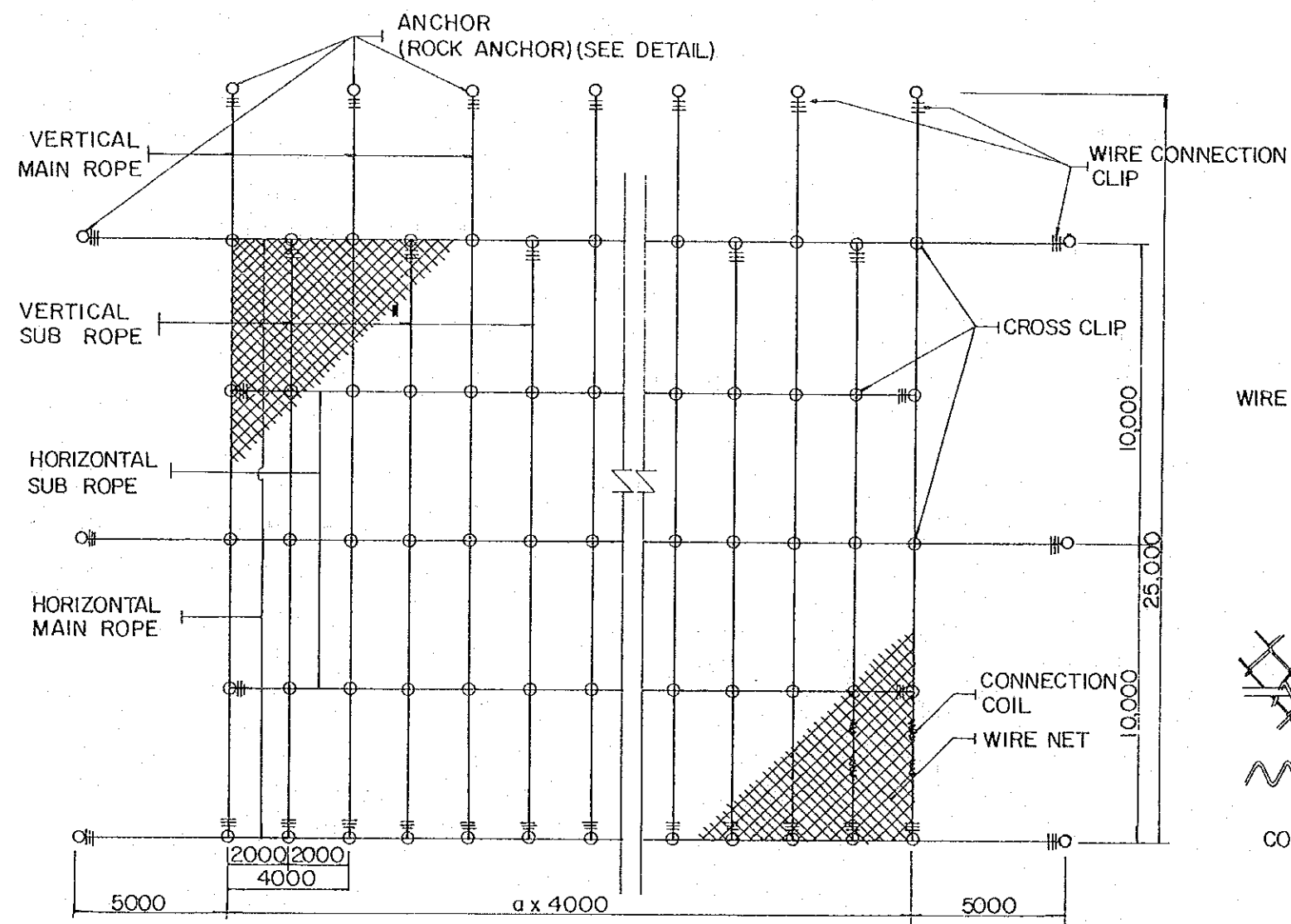
*2 UNIT ; PER 40 SQUARE METER (4m x 10m)



DETAILS OF ROCK ANCHOR



CROSS SECTION

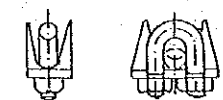


DEVELOPED PLAN

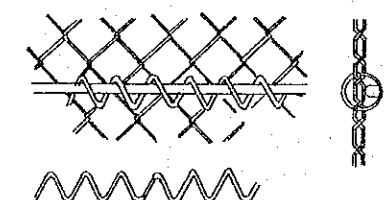
ANCHOR WIRE NET



CROSS CLIP



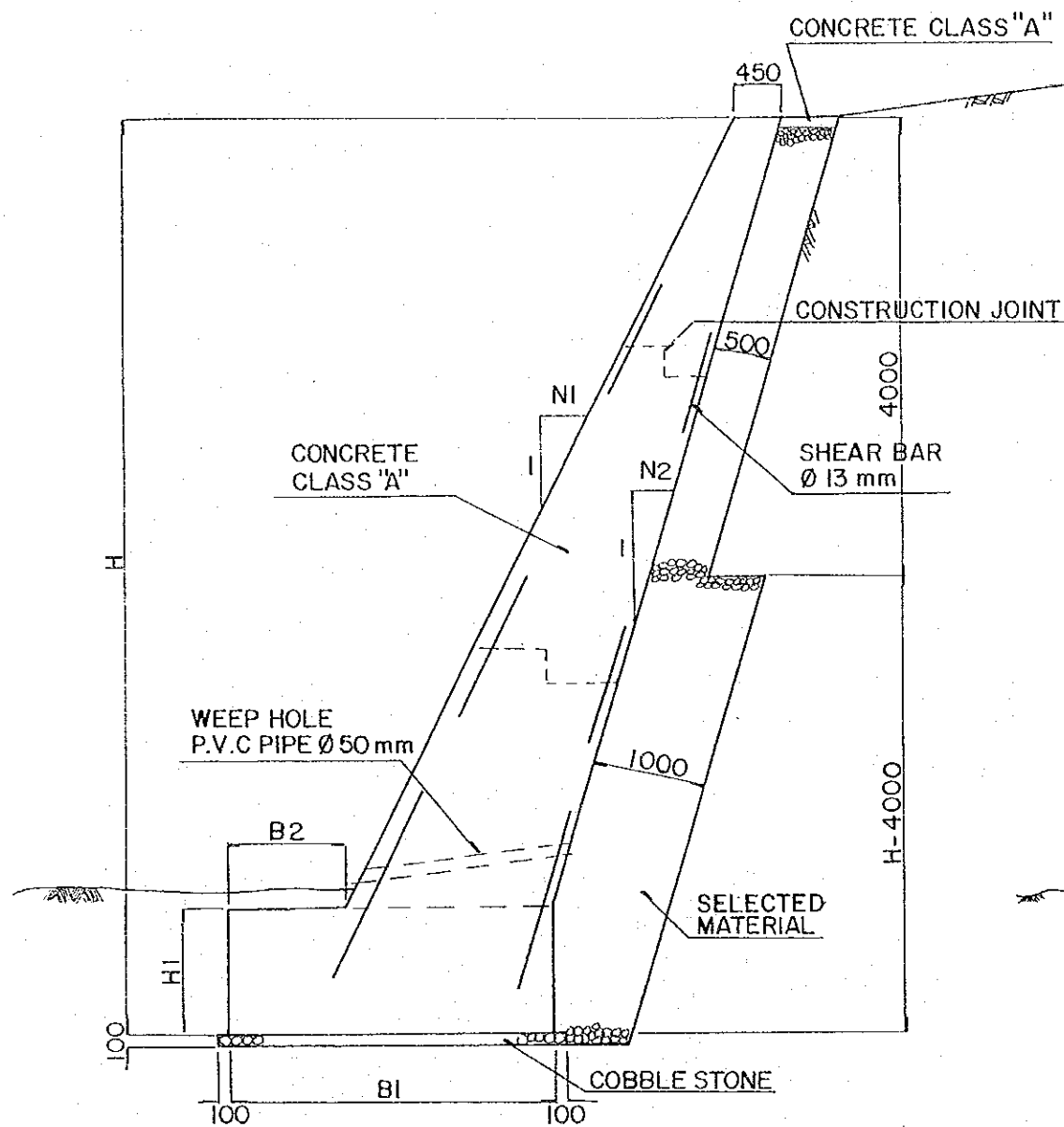
WIRE CONNECTION CLIP



CONNECTION COIL

NOTES :

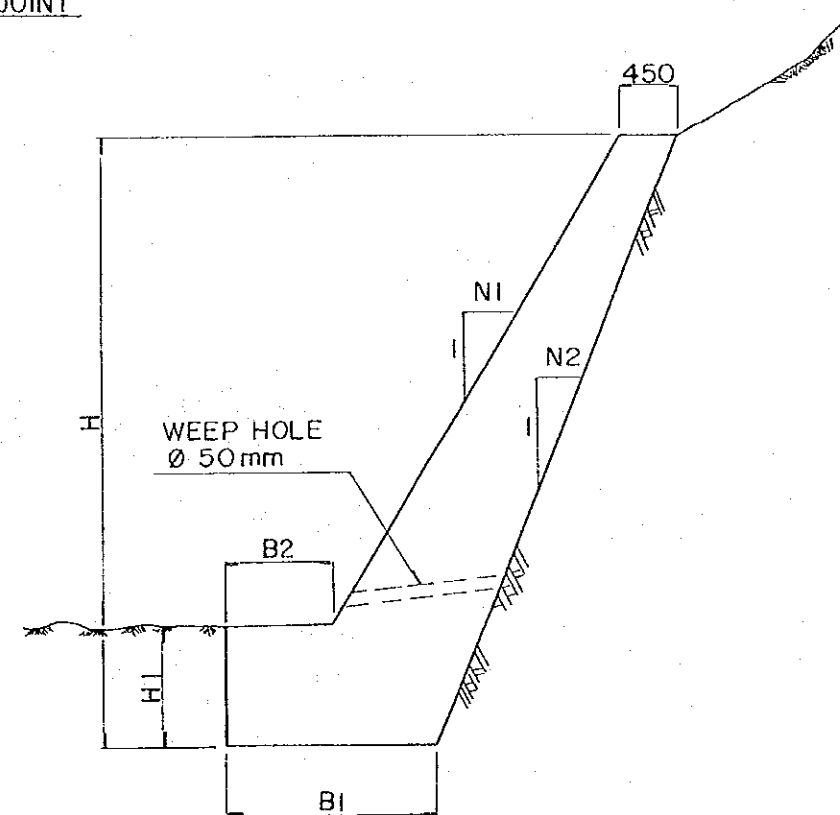
- (1) EACH WEEP HOLES SHALL BE PROVIDED AT LEAST FOR EVERY 2.0 Sq.M.
- (2) SHEAR BARS SHALL BE PROVIDED AT EVERY CONSTRUCTION JOINT.



FOR EMBANKMENT SLOPE

DIMENSION TABLE

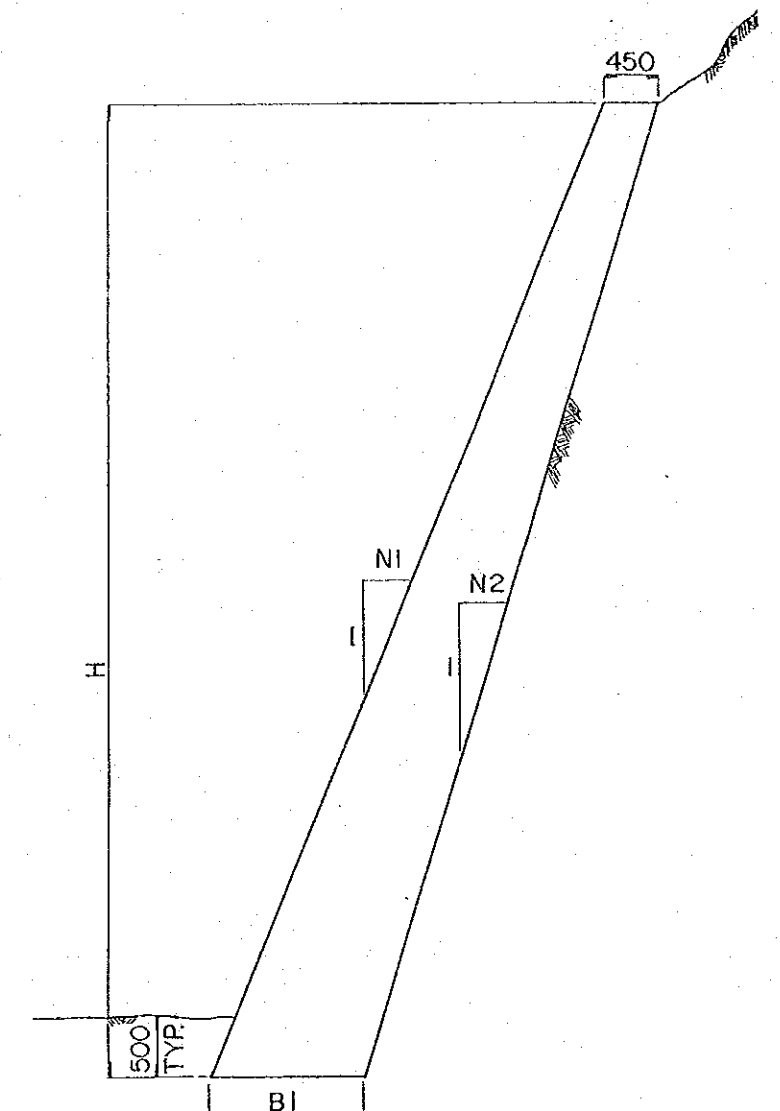
H	N1	N2	H1	B1	B2
3000	0.40	0.35	600	1100	530
4000	0.40	0.30	700	1400	620
5000	0.45	0.35	800	1600	730
6000	0.45	0.30	900	2050	840
7000	0.50	0.35	1000	2250	900
8000	0.50	0.30	1100	2850	1020



FOR CUT SLOPE (SOFT ROCK)

DIMENSION TABLE

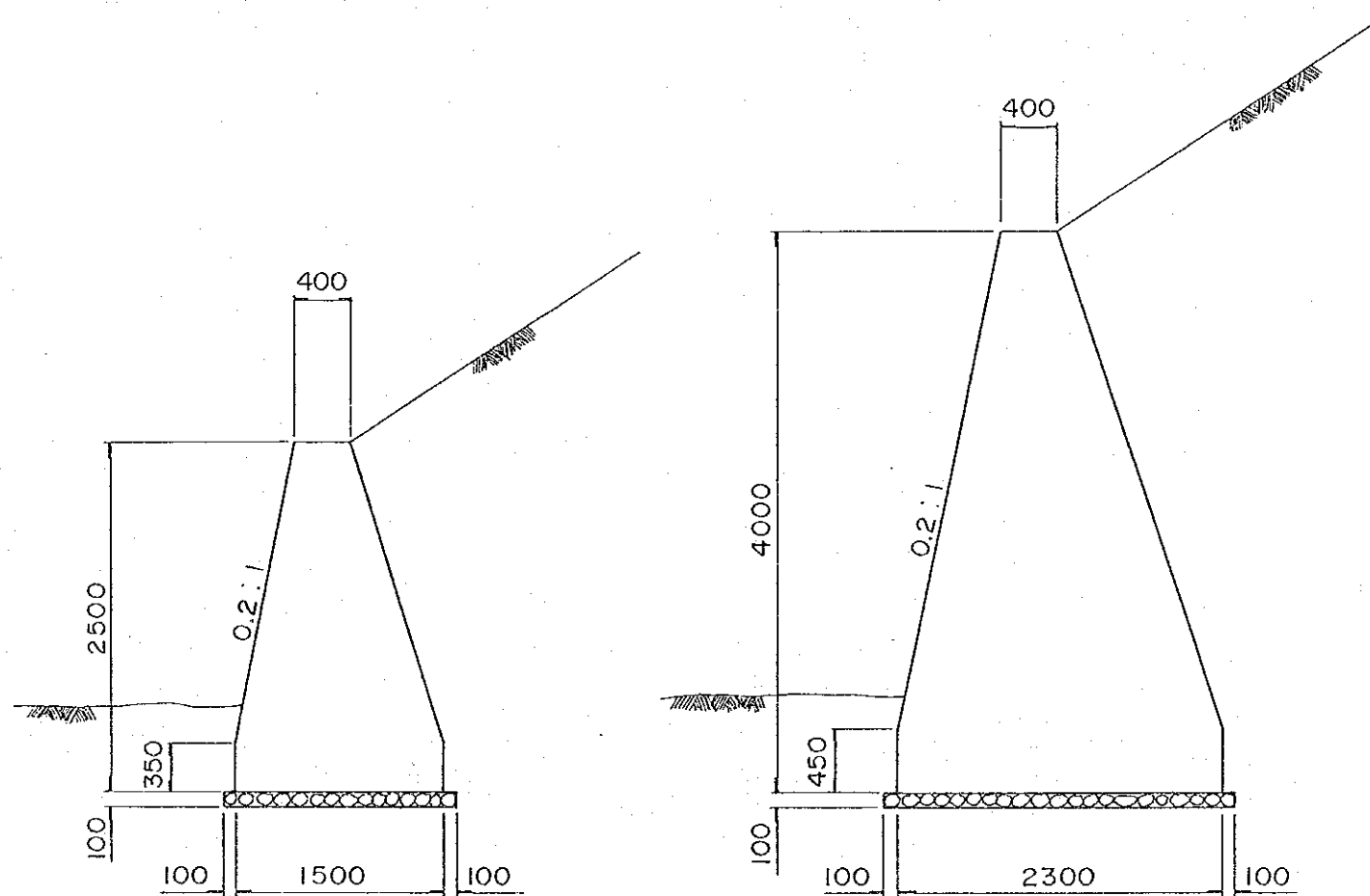
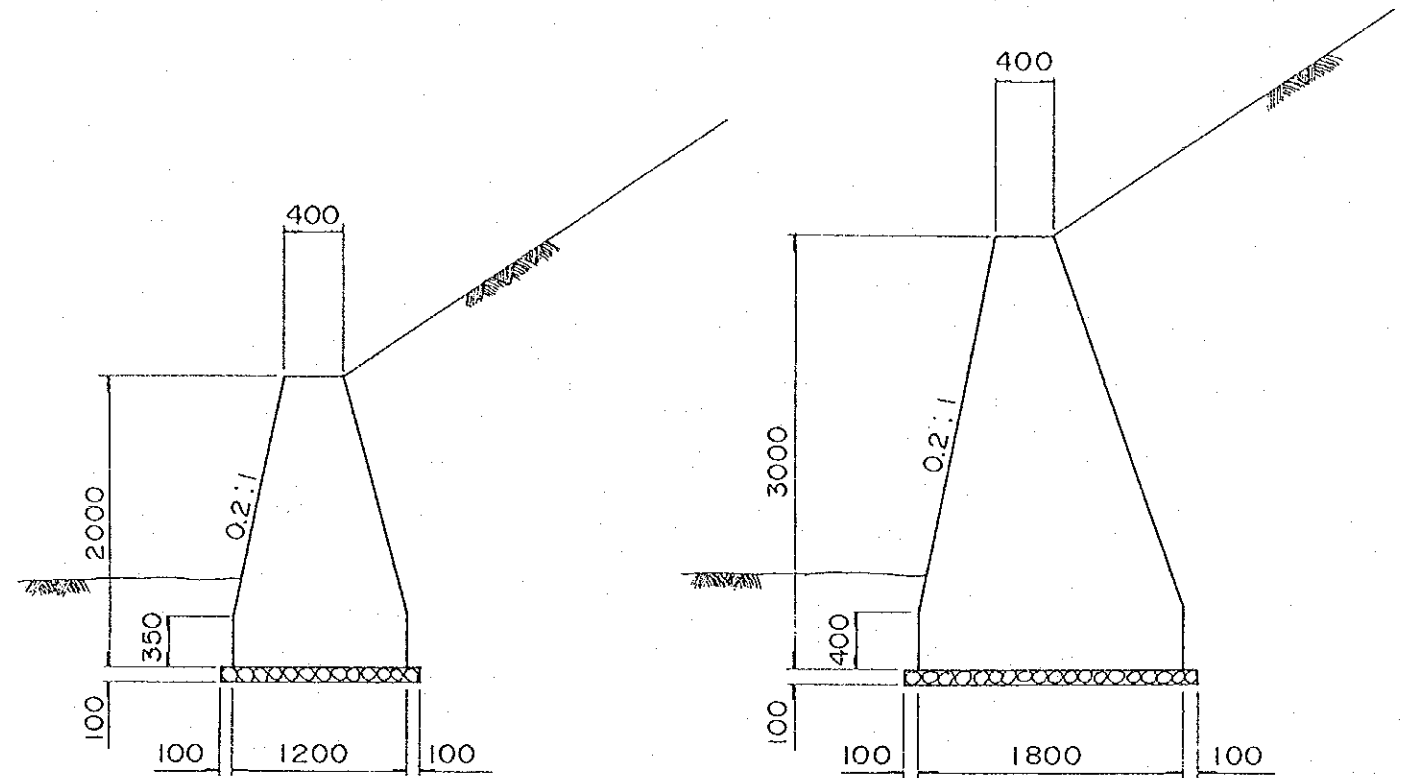
H	N1	N2	H1	B1	B2
3000	0.6	0.4	800	1620	950
5000	0.6	0.4	1000	1750	900



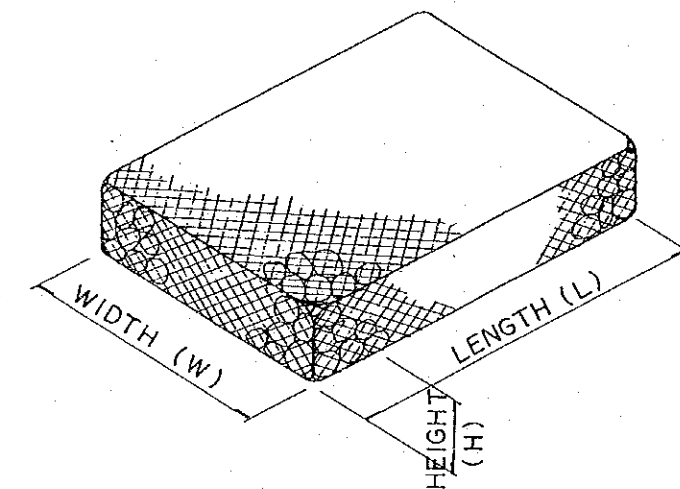
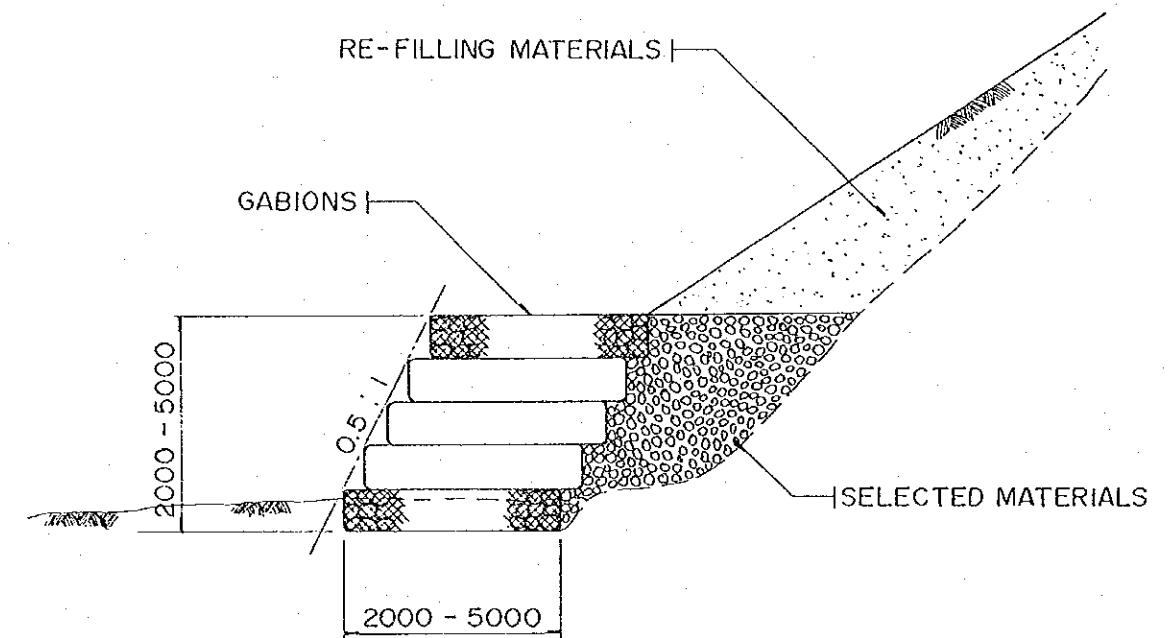
FOR CUT SLOPE (HARD ROCK)

DIMENSION TABLE

H	N1	N2	B1
3000	0.4	0.3	750
5000	0.4	0.3	950
8000	0.4	0.3	1250



GRAVITY TYPE RETAINING WALL



DIMENSION

W ; 1200 - 2000

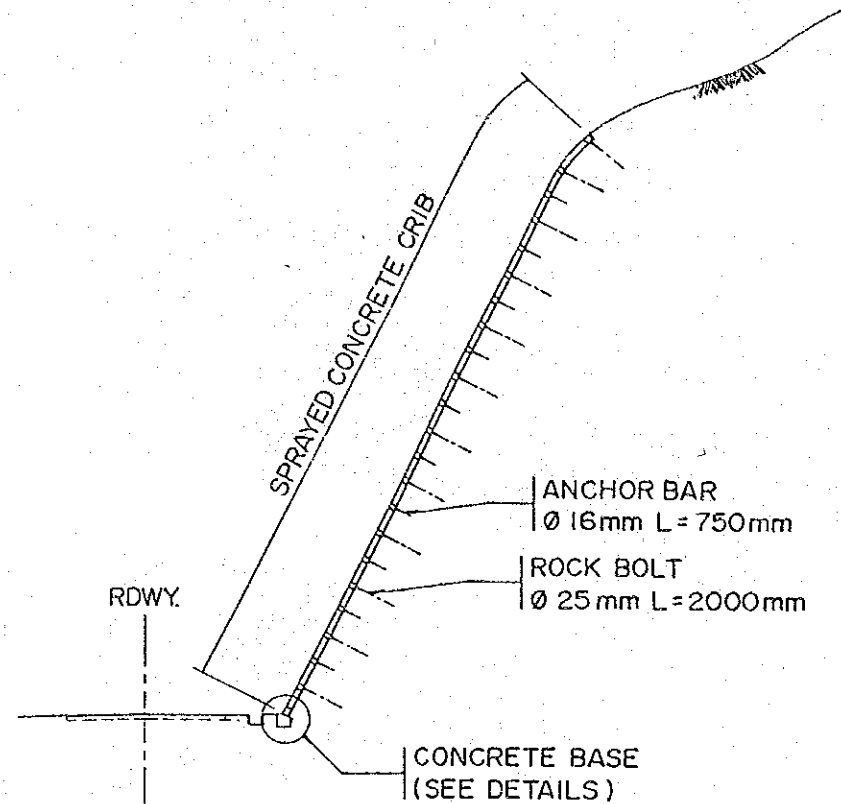
L ; 2000 - 5000

H ; 400 - 600

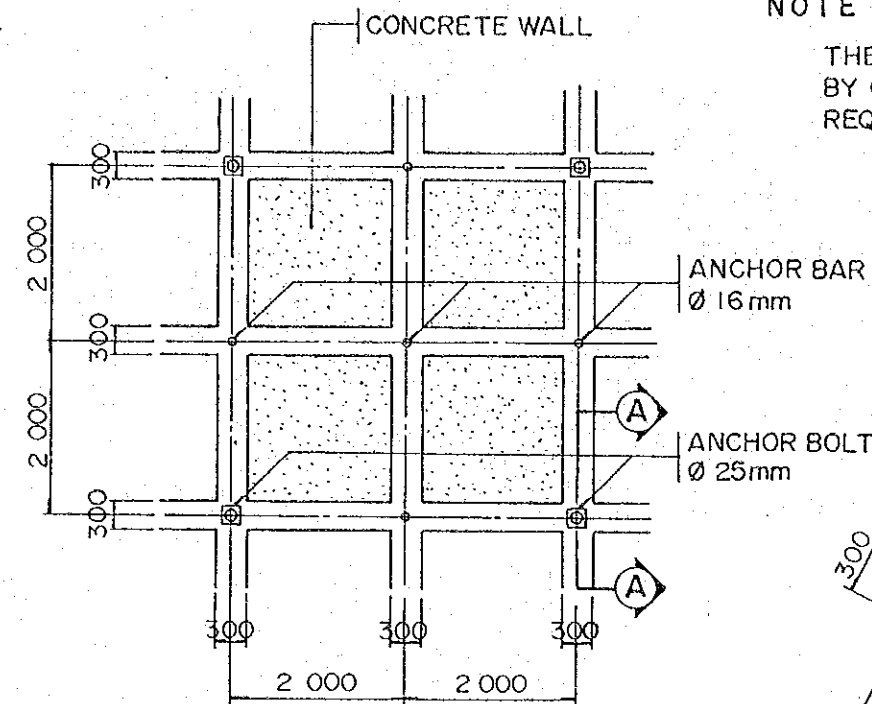
GABION RETAINING WALL

NOTE :

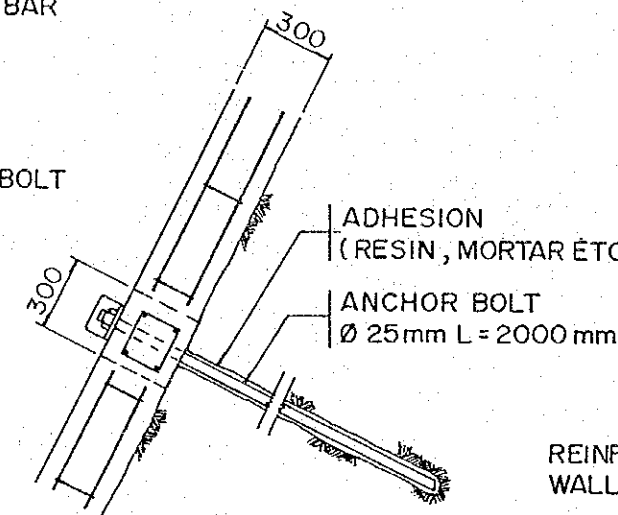
THE SPACE BETWEEN CRIBS IS PROTECTED BY CONCRETE WALL WHEN ANCHORING IS REQUIRED.



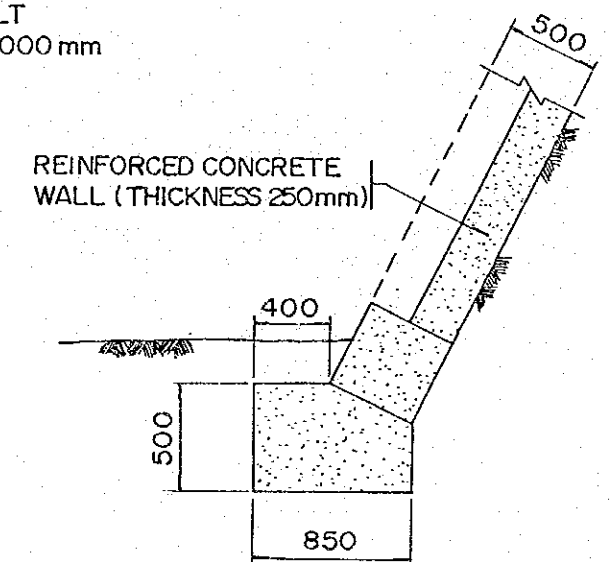
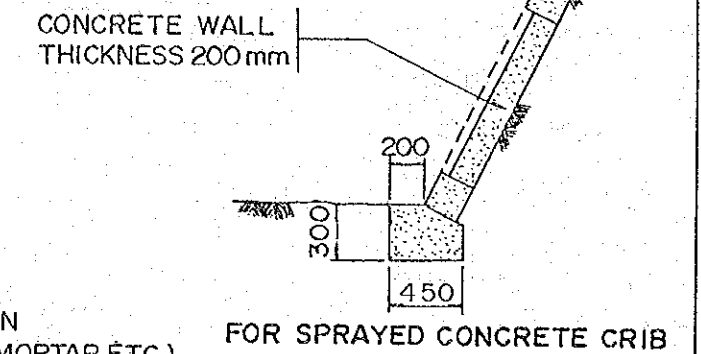
SPRAYED CONCRETE CRIB



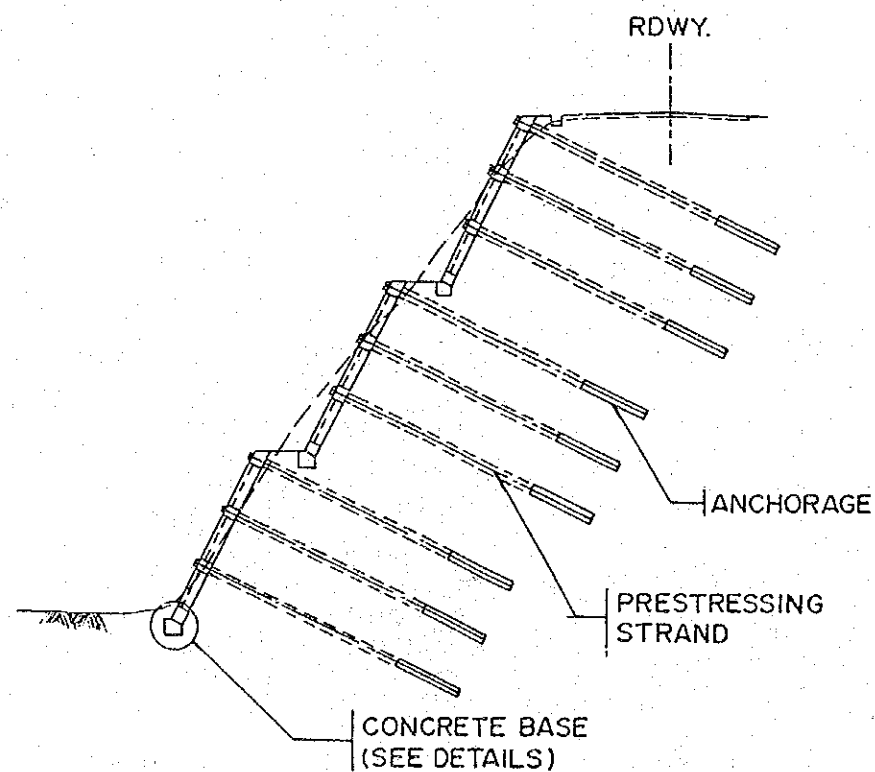
DEVELOPED PLAN
(FOR SPRAYED CONCRETE CRIB)



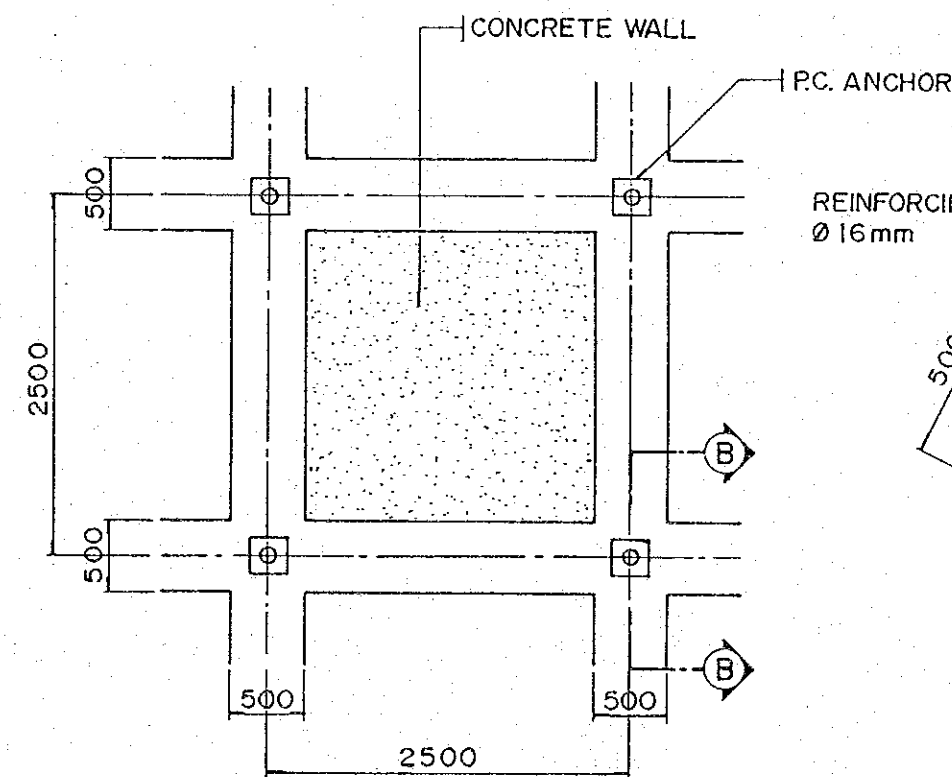
SECTION - A
DETAILS OF ROCK BOLT



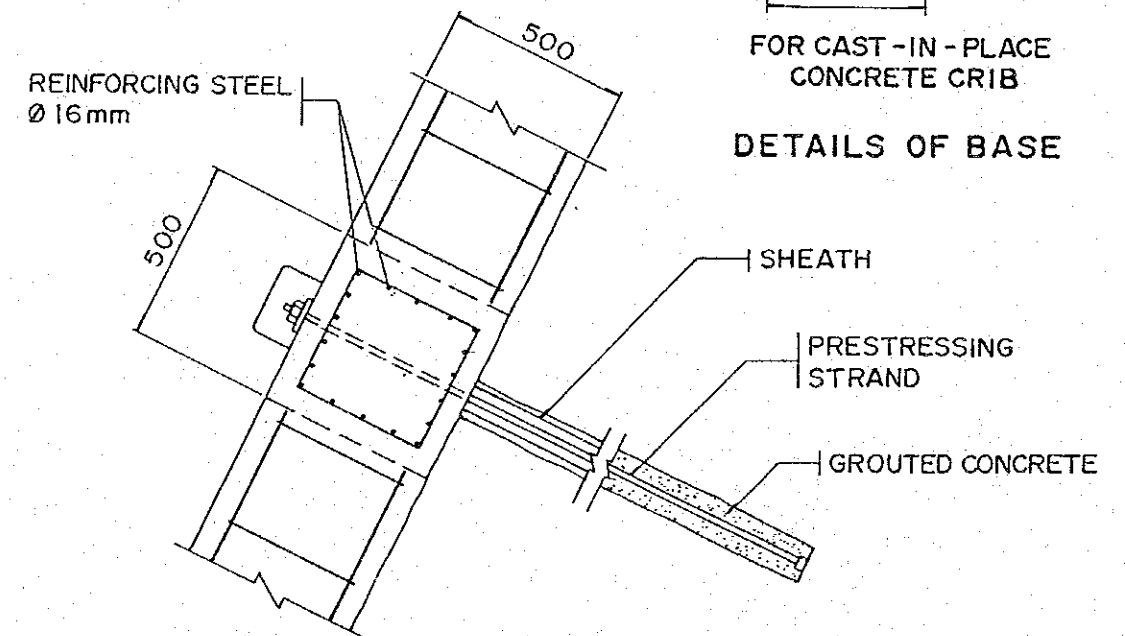
DETAILS OF BASE



CAST-IN-PLACE CONCRETE CRIB

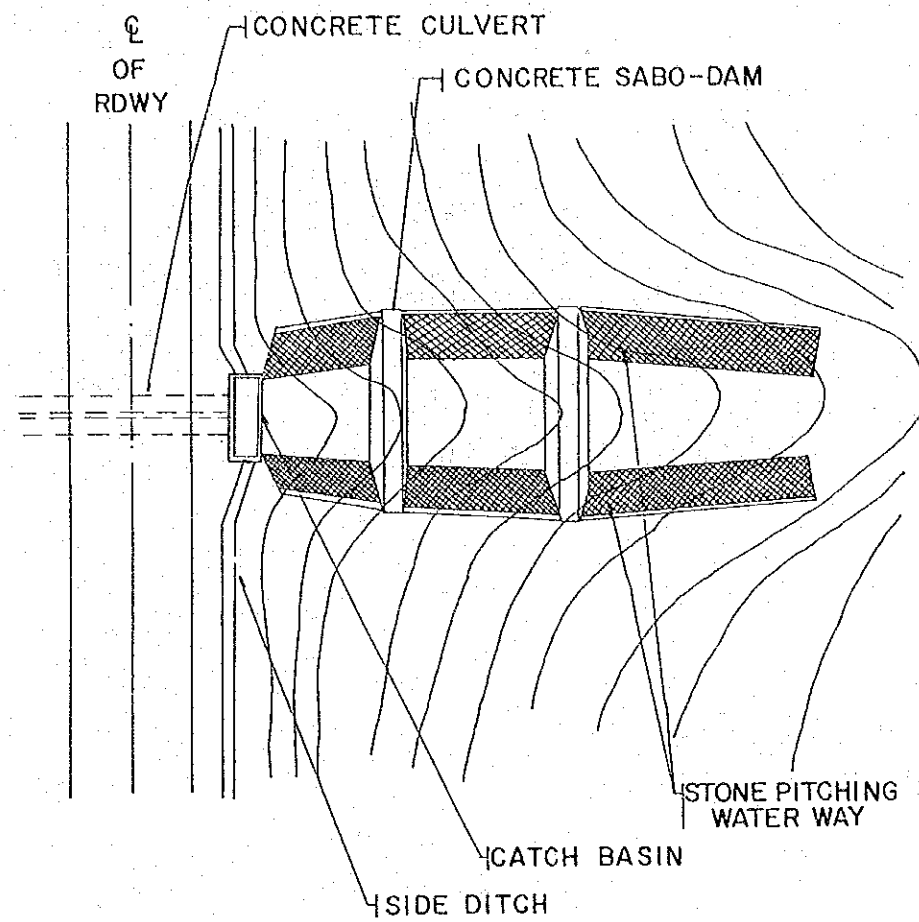


DEVELOPED PLAN
(FOR CAST-IN-PLACE CONCRETE CRIB)

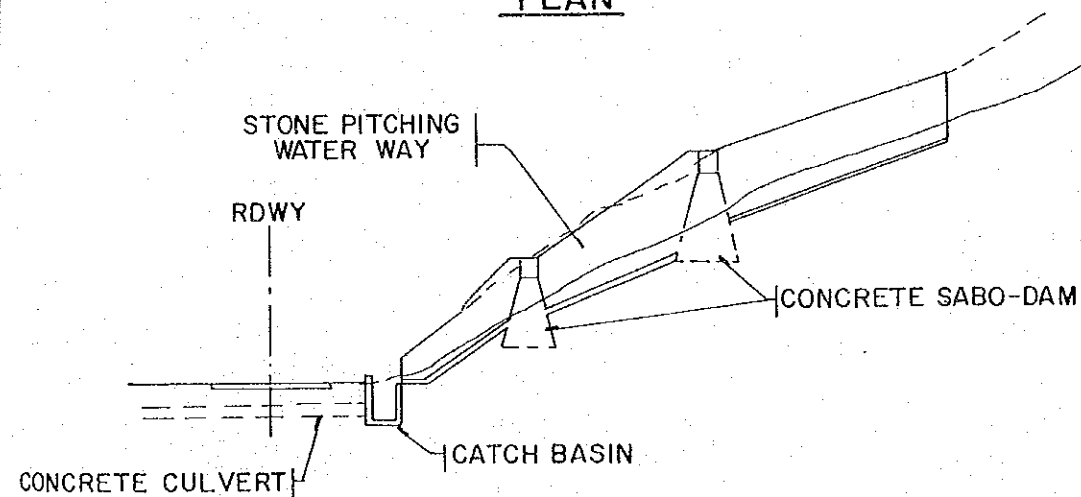


SECTION - B
DETAILS OF P.C. ANCHOR

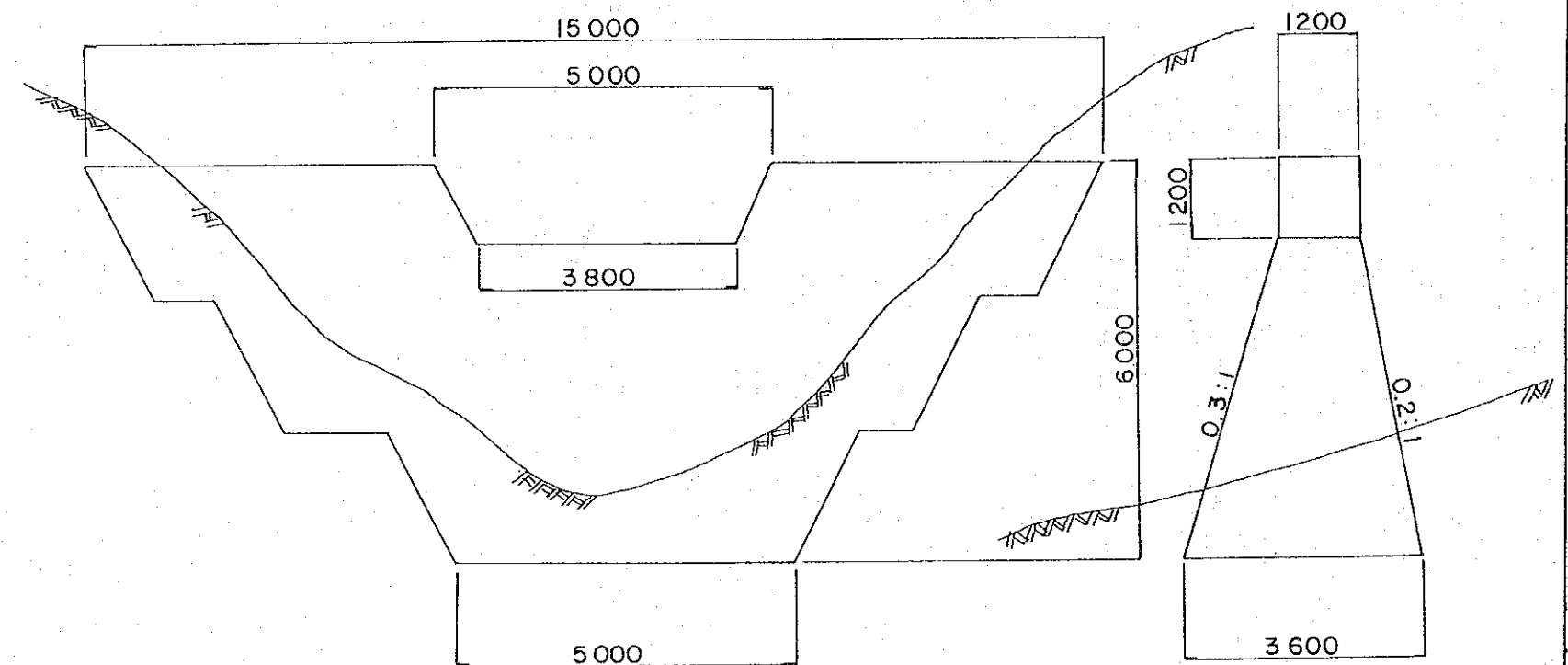
NOTE: DIMENSION OF CONCRETE SABO-DAM
SHALL BE DETERMINED BASED ON THE
HYDROLOGICAL ANALYSIS, TOPOGRAPHY
AND GEOLOGY.



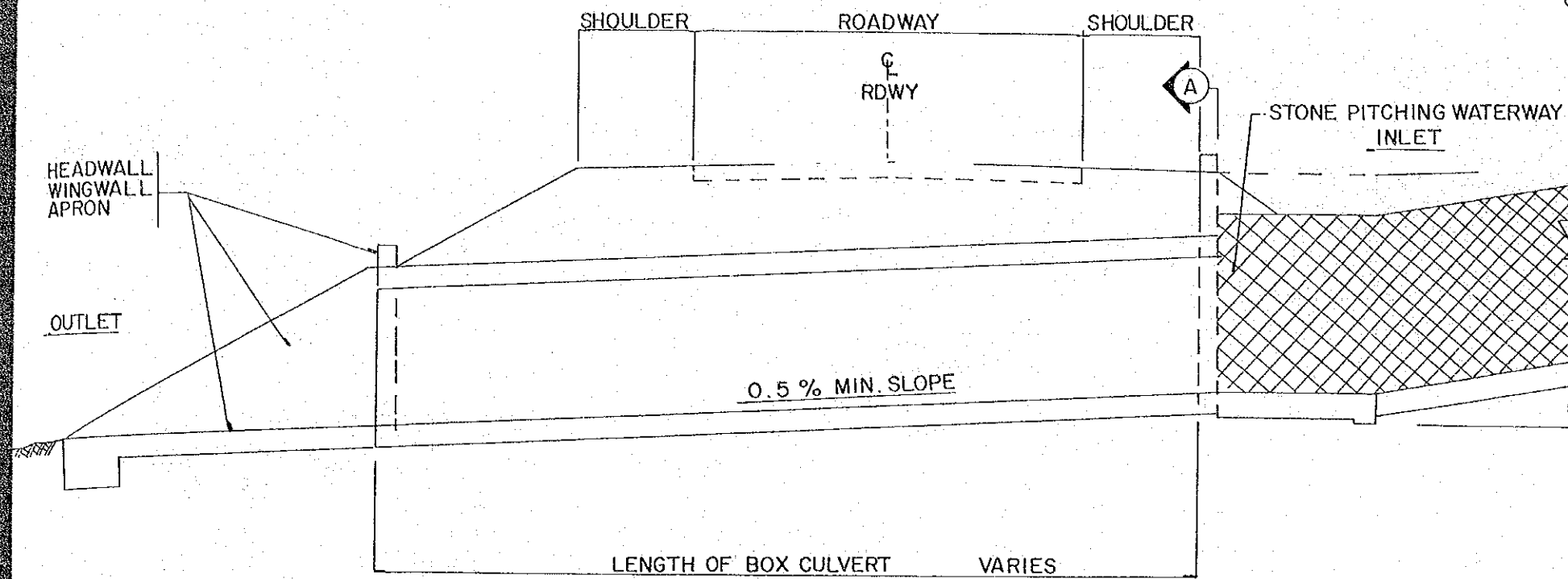
PLAN



ELEVATION

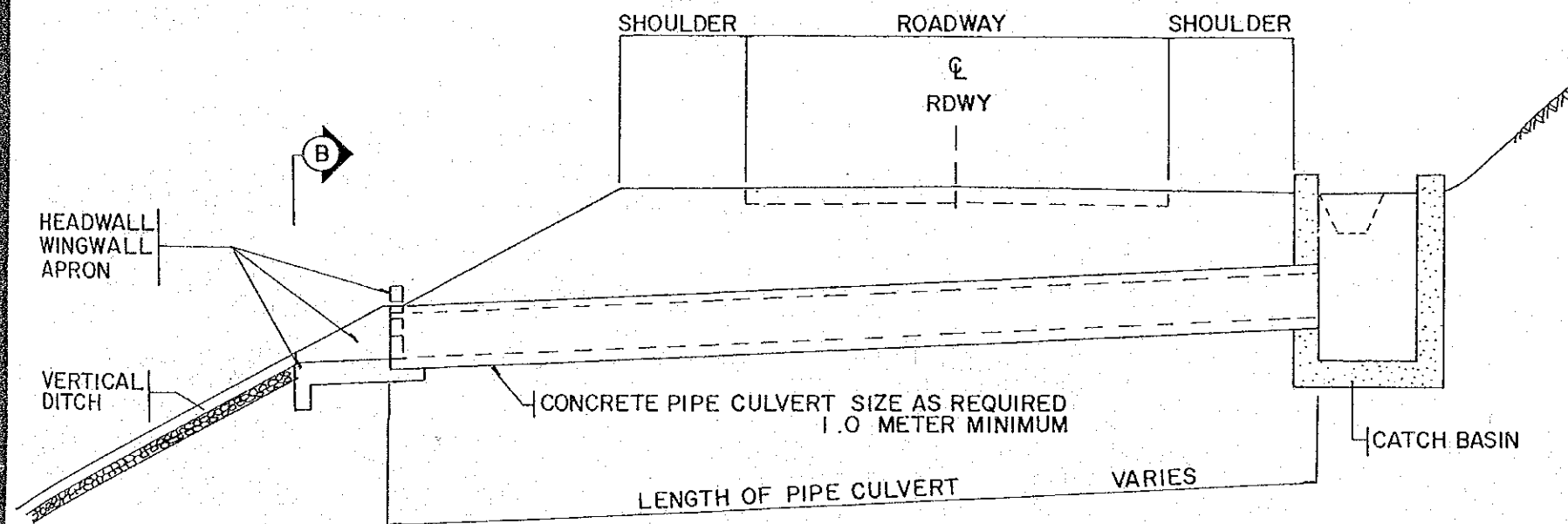


CONCRETE SABO-DAM

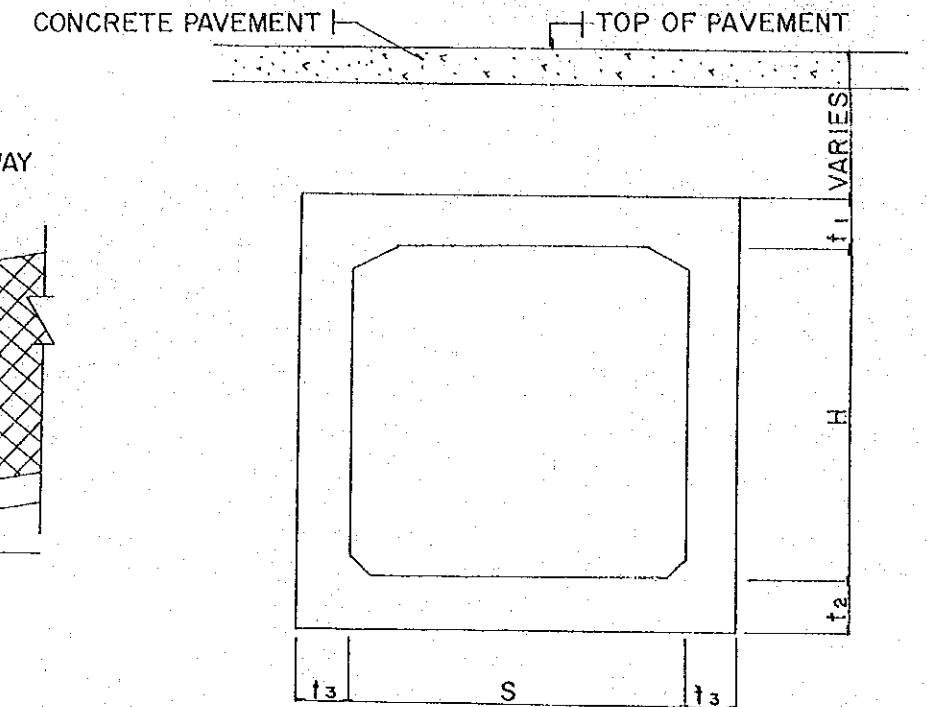


NOTE : DIMENSION OF CROSS SECTION SHALL BE DETERMINED BASED ON HYDROLOGICAL ANALYSIS. DIMENSIONS t_1 , t_2 AND t_3 DEPEND ON SIZE OF BOX CULVERT.

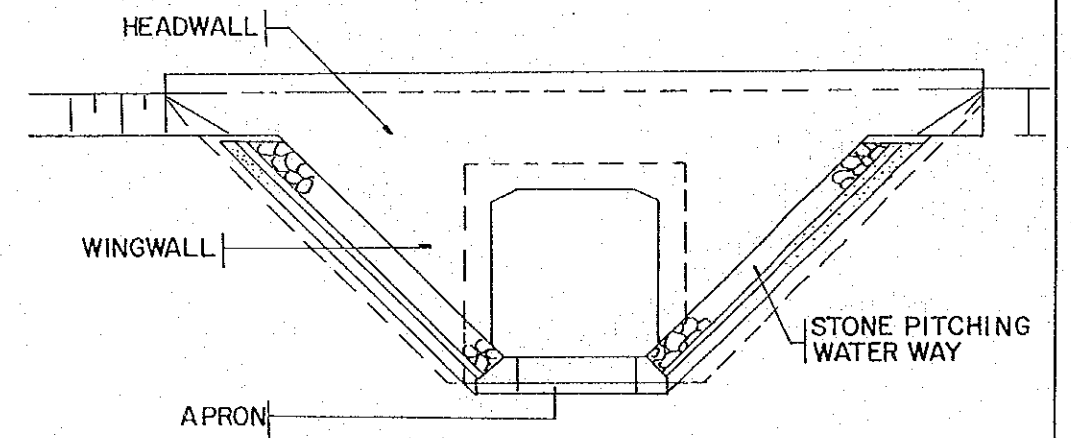
TYPICAL SECTION OF BOX CULVERT



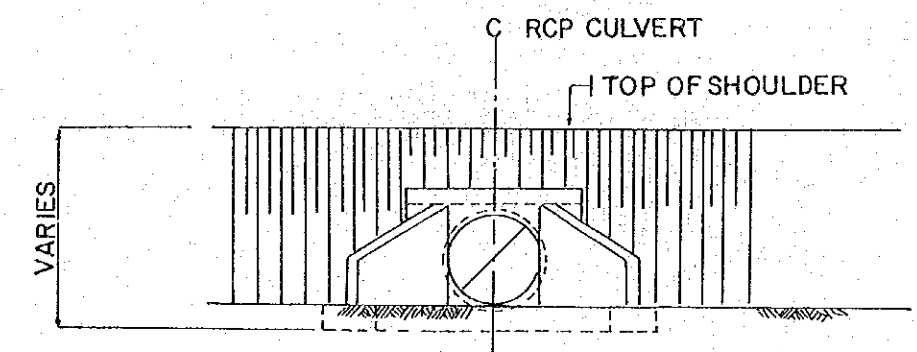
TYPICAL SECTION OF PIPE CULVERT



CROSS SECTION



ELEVATION A



ELEVATION B