

Package 3: G Baru Conveyance Channel



Name of Structure	BARU CONVEYANCE CHANNEL (BOX CULVERT)	Category of calculation	SUMMARY	Page	1 / 10
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**SUMMARY OF CHANNEL WORK AND INSPECTION ROAD VOLUME CALCULATION**

**I. CHANNEL WORKS**

1. Dewatering	=	LS	
2. Structure Excavation	=	14,030	m <sup>3</sup> ✓
3. Structure Excavation with Shoring	=	8,544	m <sup>3</sup> ✓
4. Back Fill with Sandy Soil	=	16,110	m <sup>3</sup> ✓
5. Concrete Structure (Type C1)	=	2981.5	m <sup>3</sup> ✓
6. Leveling concrete (Type E)	=	240.63	m <sup>3</sup> ✓
7. Water Stop with Rubber Filler	=	381.50	m <sup>r</sup> ✓
8. Form Work for Concrete Type C1	=	10,989.43	m <sup>2</sup>
9. Form work for Concrete Type E	=	166	m <sup>2</sup>

**II. REINFORCING BAR**

1. Box Culvert = 79650 + 54450	=	134,100	kg
2. Man Hole Block Type A	=	25,710	kg
3. Man Hole Block Type B	=	65,410	kg
	=	225,220	kg

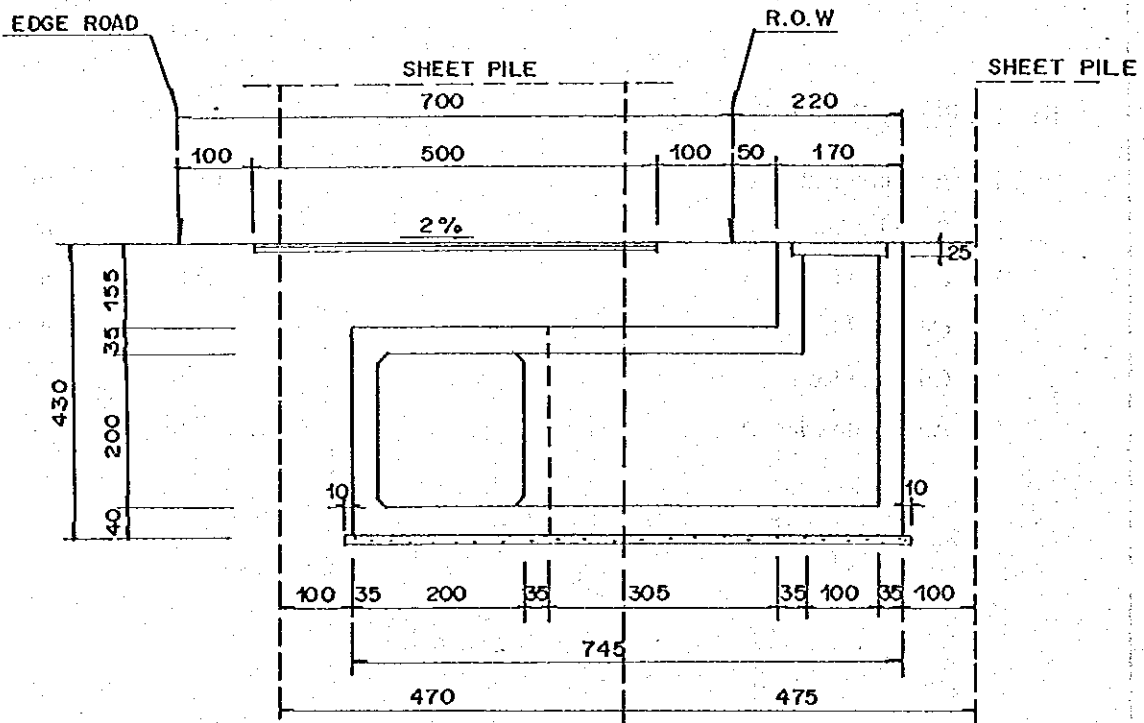
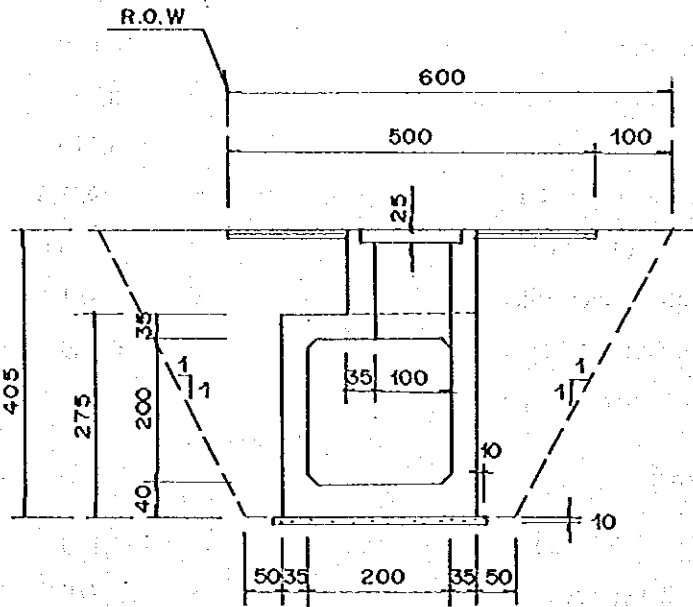
**III. INSPECTION ROAD**

1. Embankment	=	1,944	m <sup>3</sup>
2. Sand Bedding	=	79	m <sup>3</sup>
3. Concrete Conbloc	=	1,315	m <sup>2</sup>
4. Cement Mortar	=	3	m <sup>3</sup>
5. Concrete Kerb	=	32	m <sup>3</sup>
6. Aggregate Class A	=	225	m <sup>3</sup>

62. 63 / P3

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I. CHANNEL WORKS



Note :

$$h = 0.99 - 1.55 \text{ for } 9+00 - 257+00 = 263.5 \text{ m}$$

$$h = 2.00 - 1.55 \text{ for sta } 558+5.00 - 692+00 = 143.5 \text{ m}$$

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1. Denaturing = LS

2. Channel Excavation = --

3. Structure Excavation =

- Cross Section = Type A

- Length of Channel = 263.5 m and 143.5 m

$$\text{Volume} = \left( \frac{3.70 + 11.80}{2} \times 4.05 \times 263.5 \right) + \left( \frac{3.70 + 13.20}{2} \times 4.75 \times 143.5 \right)$$

$$= 8270.61 + 5759.73$$

$$V = 14030.34 \text{ m}^3$$

- Cross Section = Type B

- Length of Channel = 285 m

$$\text{Wide} = A_1 = 4.70 \times 4.30 = 20.21 \text{ m}^2$$

$$A_2 = 4.75 \times 4.30 = 20.425 \text{ m}^2$$

Volume :

$$V_1 = 20.210 \times 285 = 5759.85 \text{ m}^3$$

$$V_2 = (20.425 \times 4.70) \times 29 = 2783.94 \text{ m}^3$$

$$\text{Total Volume} = V_1 + V_2$$

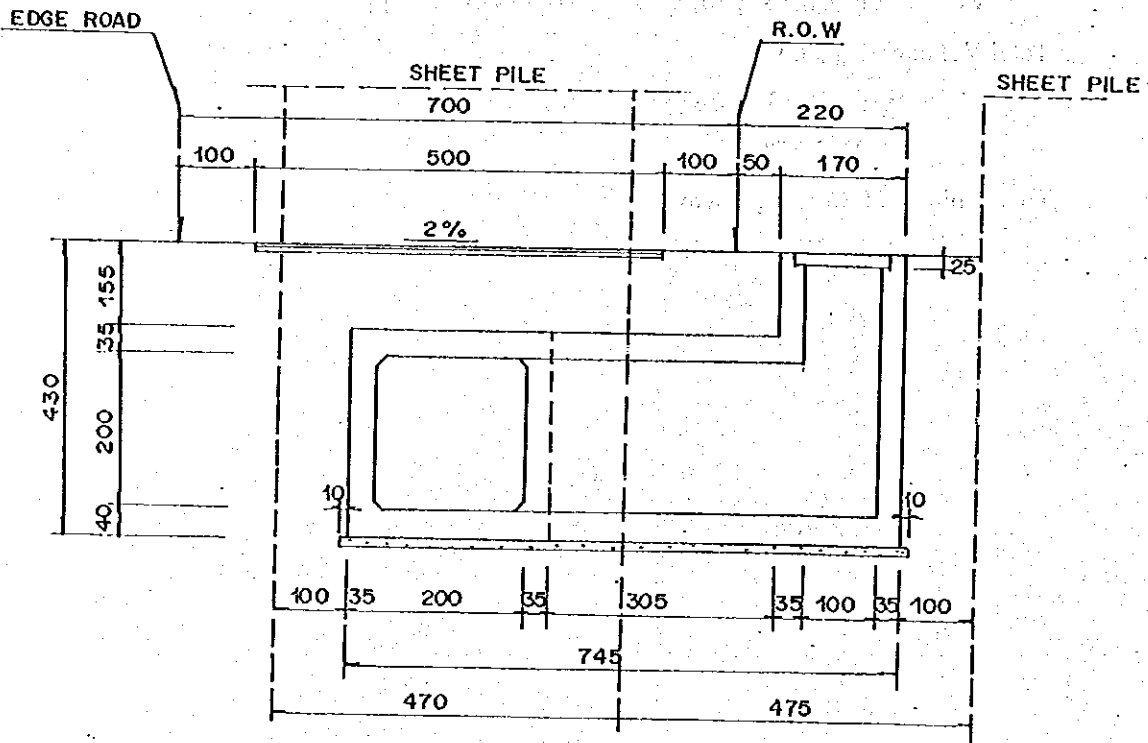
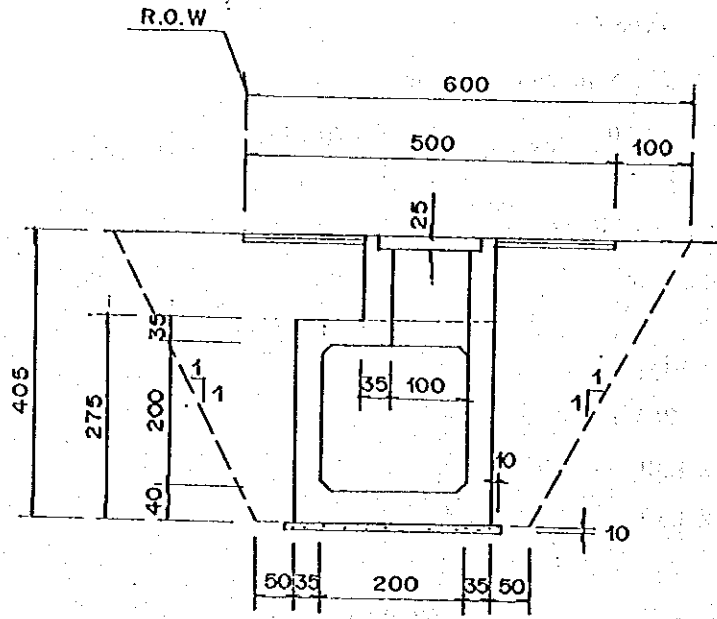
$$V = (5759.83 + 2783.94) \text{ m}^3$$

$$V = 8543.778 \text{ m}^3$$

Total Volume of Structure Excavation :

$$V = 14030.34 + 8543.78 = 22574.12 \text{ m}^3$$

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4. Back Fill with Sandy Soil

- Cross Section = Type A
- Length of Channel = 263.5 m and 143.5 m

$$\begin{aligned}
 \text{Volume} &= V_{\text{EXC}} - V_{\text{STRUCTURE}} \\
 &= 1403.34 - [(2.70 \times 2.75 \times 407) + (1.70 \times 1.70 \times 1.27 \times 25) + \\
 &\quad (1.70 \times 1.70 \times 2.00 \times 14)] \\
 &= 1403.34 - (3021.98 + 91.76 + 80.92) \\
 &= 1403.34 - 3194.65
 \end{aligned}$$

$$V = 10835.70 \text{ m}^3$$

- Cross Section = Type B
- Length of Channel = 285 m

$$\begin{aligned}
 \text{Volume} &= V_{\text{EXC}} - V_{\text{STRUCTURE}} \\
 &= 8543.78 - [(2.70 \times 2.75 \times 285) + [(2.70 \times 2.75 \times 4.75) + \\
 &\quad (1.70 \times 1.55 \times 1.70)]] \times 29 \\
 &= 8543.78 - [2116.125 + (35.269 + 4.480) \times 29] \\
 &= 8543.78 - (2116.125 + 1152.69) \\
 &= 8543.78 - 3268.82
 \end{aligned}$$

$$V = 5274.25 \text{ m}^3$$

Total Volume of Back Fill :

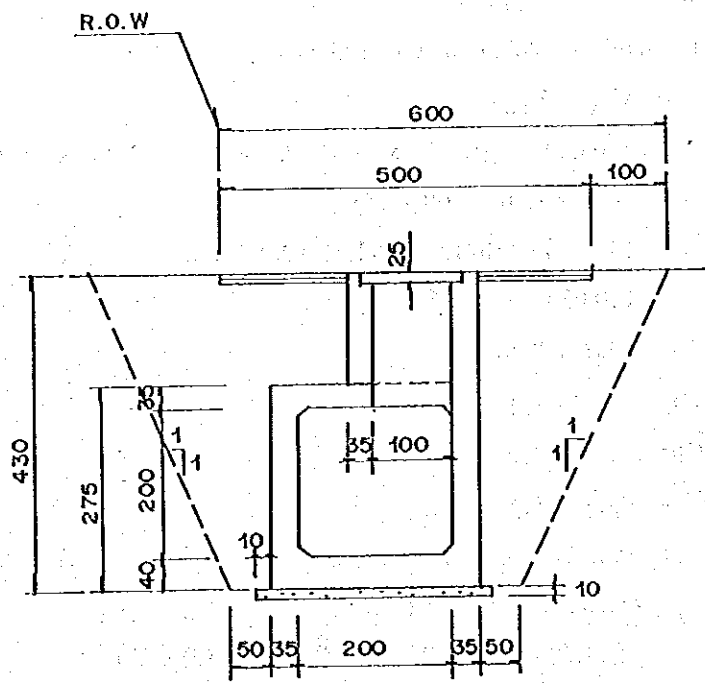
$$V = 10835 + 5274.95 = 16110.65 \text{ m}^3$$

5a. Wet Masonry : \_\_\_\_\_

5b. Concrete Structure :

- Cross Section = Type A
- Length of Channel = 407 m

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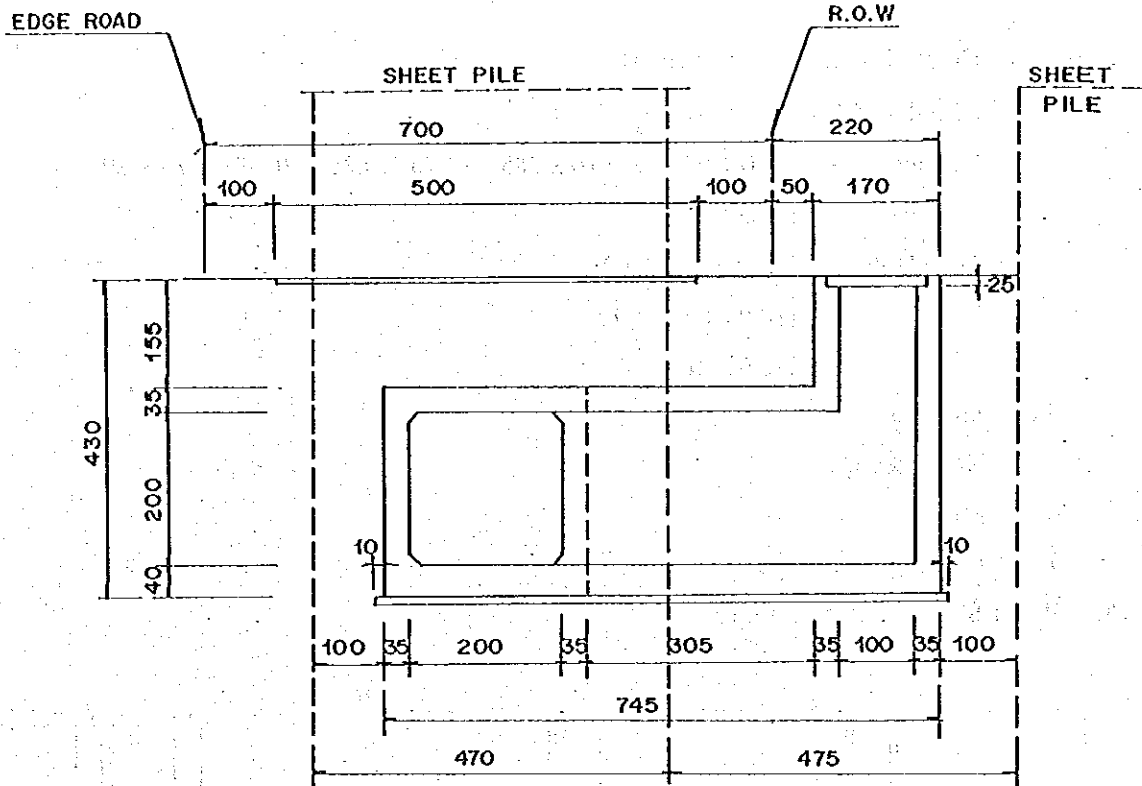
Wide :  $A_1 = 2.70 \times 2.75 = 7.425 \text{ m}^2$   
 $A_2 = 2.00 \times 2.00 = 4.00 \text{ m}^2$

Volume =  $(7.425 - 4.00) \times 407 + [(1.70 \times 1.70) - (1.00 \times 1.00)] \times 1.225 \times 39 +$   
 $+ (1.30 \times 1.30 \times 0.25) \times 39 - (1.00 \times 0.35) \times 39$   
 $V = 1487.1 \text{ m}^3$



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- Cross Section = Type B
- Length of Channel = 285 m



$$\begin{aligned} \text{Wide : } A_1 &= 2.70 \times 2.75 = 7.425 \text{ m}^2 \\ A_2 &= 2.00 \times 2.00 = 4.00 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume} &= (7.425 - 4.00) \times 285 + [(2.70 \times 2.75) - (2.00 \times 2.00)] \times 4.75 \times 29 + \\ &+ [(1.70 \times 1.70) - (1.00 \times 1.00)] \times 1.55 \times 29 + (1.30 \times 1.30 \times 0.25) \times 29 - \\ &+ [(2.00 \times 2.00 \times 0.35) + (1.00 \times 1.00 \times 0.35)] \times 29 \end{aligned}$$

$$V = 1494.38 \text{ m}^3$$

Total volume for concrete structure :

$$V_{\text{tot}} = 1487.1 + 1494.38 = 2981.47 \text{ m}^3$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	CHANNEL WORK VOLUME	Page	7 / 11
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5c. Leveling Concrete

- Cross Section = Type A
- Length of Channel = 407 m
- Volume =  $(2.70 + 0.20) \times 0.10 \times 407$
- $V_1 = 118.03 \text{ m}^3$

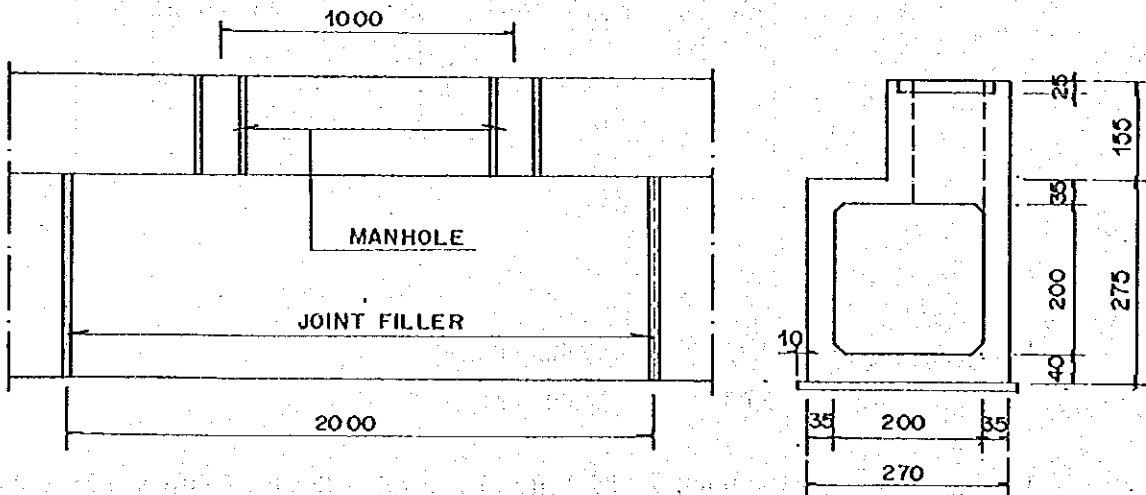
- Cross Section = Type B
- Length of Channel = 285 m
- Volume =  $(2.70 + 0.20) \times 0.10 \times 285 + (2.70 + 0.20) \times 0.10 \times 4.75 \times 29$
- $V_2 = 122.59 \text{ m}^3$
- Total Volume  $S_1 \leftrightarrow S_9 = V_1 + V_2$
- $= 118.03 + 122.59$
- $= 240.63 \text{ m}^3$

5d. Sodding

Not necessary

6. Mortar : \_\_\_\_\_
7. Pointing : \_\_\_\_\_

8. Water Stop with Rubber Filler



Left of Joint Filler =  $(2.75 \times 2) + (2.70 \times 2) = 10.90 \text{ m}'$

Number = 35

Total length =  $1090 \times 35 = 381.50 \text{ m}'$

9. Weep Hole : \_\_\_\_\_

10. Palm Fibre : \_\_\_\_\_

11. Form work for leveling concrete.

$2 \times 0.1 \times 692 + 29 \times 2 \times 0.1 \times (7.45 - 2.2) = 165.95 \text{ m}^2$

3 - 150

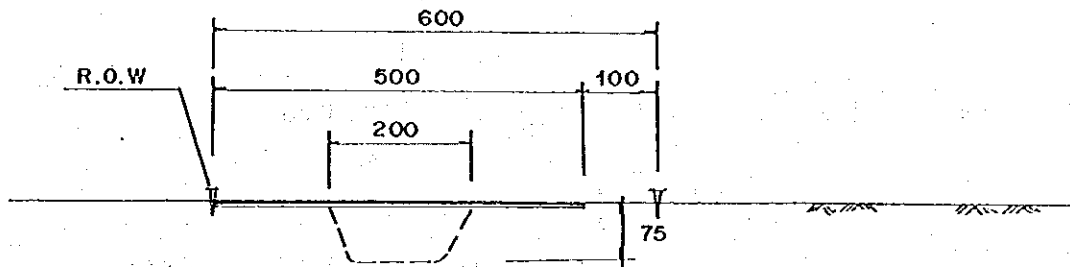
f. material

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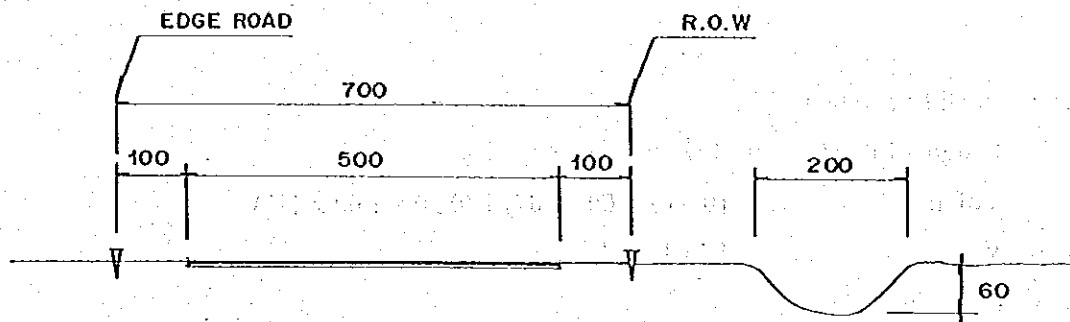
II. INSPECTION ROAD

I. Lands Striping

CROSSECTION TYPE A



CROSSECTION TYPE B



Length of Road = 285 m

Type A

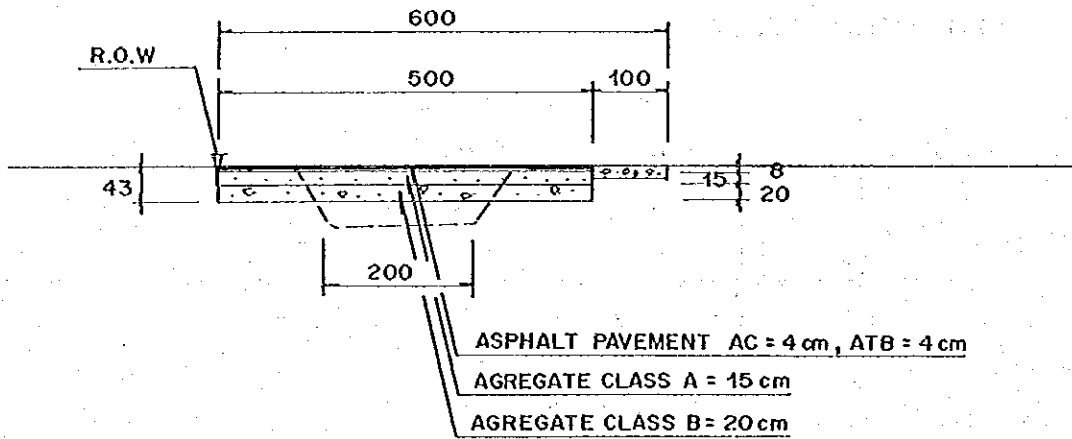
Not Necessary

Type B

Not Necessary

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2. Road Embankment



- Road Excavation

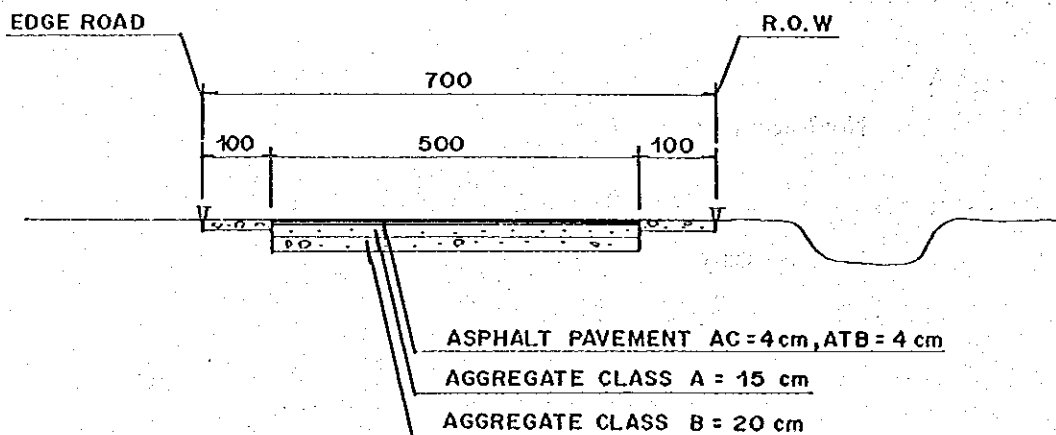
Length of Road = 407 m (Type A)

Volume =  $(0.43 \times 5.00 \times 407) + (0.20 \times 1.00 \times 407)$

V = 956.45 m<sup>3</sup>

- Road Embankment

Volume =  $0.20 \times 5.00 \times 407 = 407 \text{ m}^3$



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- Road Excavation

Length of Road = 285 m

Volume =  $(0.43 \times 5.00 \times 285) + (0.20 \times 1.00 \times 285 \times 2)$

V = 726.75 m<sup>3</sup>

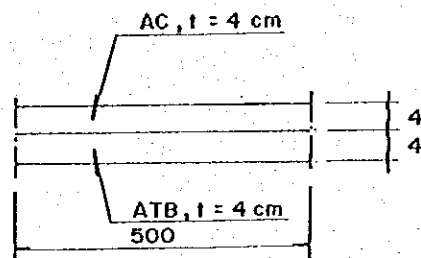
- Road Embankment

Volume =  $0.20 \times 5.00 \times 285 = 285 \text{ m}^3$

Total Volume Road Excavation = 1683.2 m<sup>3</sup>

Total Volume Road Embankment = 692 m<sup>3</sup>

3. Asphalt Concrete (AC)



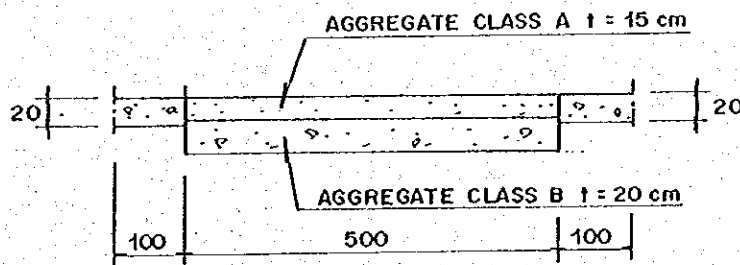
Volume =  $(0.04 \times 5.00) \times (407 + 285)$

V = 138.40 m<sup>3</sup>

4. Asphalt Treated Base (ATB)

Volume =  $0.04 \times 5.00 \times 692 = 138.40 \text{ m}^3$

5. Aggregate Class A



Volume =  $0.15 \times 5.00 \times 692 = 519 \text{ m}^3$

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6. Aggregate Class 3

Volume =  $0.20 \times (5.00 \times 2.00) \times 692$

V =  $1384 \text{ m}^3$

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SUMMARY REINFORCING BAR MAN HOLE TYPE A AND BOX CULVERT (STANDARD)

- Height from top box culvert to top of road is variable = (0.99 – 1.55) m = 24 pieces
- Height from top box culvert to top of road is constant = 2.00 m = 13 pieces
- Height of box culvert = 318.60 m'
  
- Total bar weight of man hole Type A (Block) :
  - Variable (0.99 – 1.55) m = 24 x 665 = 15960 kg
  - Constant 2.00 m = 13 x 750 = 9750 kg

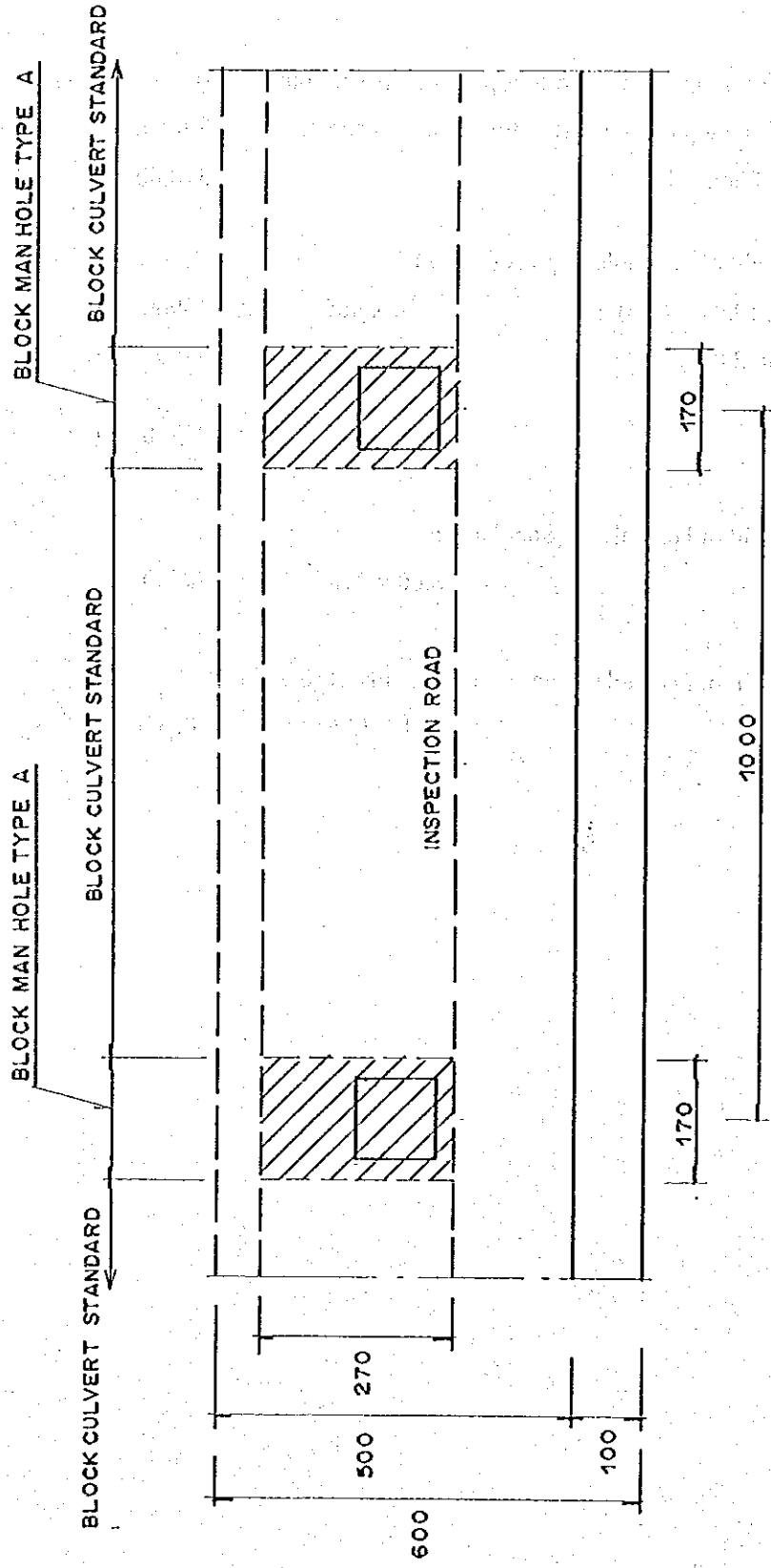
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TOTAL = 25710 kg ✓
  
- Total bar weight of box culvert (Standard) :
 

318.60 x 250 = 79650 kg
  
- Total bar weight of man hole Type A and box culvert (Standard) :
 

25710 + 79.650 = 105360 kg ✓

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	PLAN MAN HOLE VOLUME	Page	1 / 1
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Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING BOX CULVERT VOLUME	Page	1 / 1
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**BAR WEIGHT FOR STANDARD BOX CULVERT / m'**

TYPE	SHAPE	DIA	NUMBER	TOTAL LENGTH (m)	UNIT WEIGHT (Kg/m)	TOTAL WEIGHT (Kg)
S	1	5	4	21.52	1.04	22
	2	1	8	20.16	1.04	21
	3	6	8	7.76	1.04	8
	4	4	8	18.40	1.04	19
	5	1	20	20.00	1.04	21
	6	3	6	5.22	1.04	6
W	1	1	8	20.40	1.04	21
	2	1	28	28.00	1.04	29
	3	2	12	4.80	1.04	5
F	1	5	4	21.72	1.04	23
	2	1	8	20.16	1.04	21
	3	6	8	8.08	1.04	8
	4	4	8	18.00	1.04	19
	5	1	20	20.00	1.04	21
	6	3	6	5.52	1.04	6
TOTAL						250 kg

- Total bar weight for box culvert in Baru conveyance channel :
  - Length of channel = 248 + 133.50 = 381.50 m
  - Length of man hole = 37 x 1.70 = 62.90 m
  - Length of standard box culvert = 318.60 m
- Total bar weight for box culvert
 

$\Sigma W = 79.650 \text{ kg}$

**BAR WEIGHT FOR ONE BLOCK MAN HOLE TYPE A**

TYPE	SHAPE	DIA	NUMBER	TOTAL LENGTH (m)	UNIT WEIGHT (Kg/m)	TOTAL WEIGHT (Kg)		
S	1	5	13	4	28.424	1.04	30	
	2	1	13	8	17.952	1.04	19	
	3	6	13	8	6.596	1.04	7	
	4	4	13	8	15.640	1.04	16	
	5	1	13	20	22.000	1.04	23	
	6	3	13	6	3.654	1.04	4	
W	1	1	13	8	34.680	1.04	36	
	2	1	13	28	47.600	1.04	50	
	3	2	13	12	8.160	1.04	9	
F	1	5	13	4	36.924	1.04	38	
	2	1	13	8	34.272	1.04	36	
	3	6	13	8	13.736	1.04	14	
	4	4	13	8	30.600	1.04	32	
	5	1	13	20	34.000	1.04	35	
	6	3	13	6	9.384	1.04	10	
M	1	3	13	4	30.080	1.04	31	
	2	3	13	3	16.200	1.04	17	
	3	5	13	33	112.200	1.04	117	167
	4	4	13	15	30.600	46.050	32	48
	5	7	13	13	25.090	34.580	26	36
	6	7	13	13	26.520	36.010	28	38
	7	1	13	4	3.500	1.04	4	
	8	1	13	4	4.800	1.04	5	
C	1	2	19	7	12.460	2.23	28	
	2	1	19	4	5.120	1.04	5	
	3	1	19	5	3.050	1.04	3	
	4	2	19	5	5.550	1.04	6	
	5	6	19	2	1.540	2.23	3	
TOTAL						665 kg	750 kg	

• Bar Shorted Consequent for One Man Hole

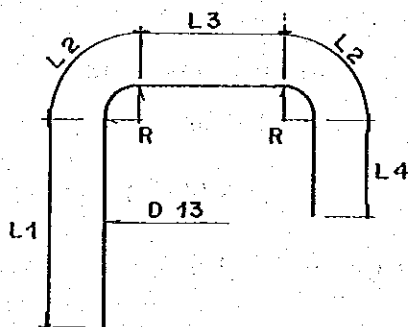
- $S_1 = (1.00 + 2 \times 0.10) \times 4 = 4.8 \text{ m}$
- $S_2 = 1.20 \times 8 = 9.60 \text{ m}$
- $S_3 = 0.970 \times 4 = 3.88 \text{ m}$
- $S_4 = 2.30 \times 4 = 9.20 \text{ m}$
- $S_5 = (1.20 \times 10) = 12.00 \text{ m}$
- $S_6 = 0.870 \times 6 = 5.22 \text{ m}$

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• Reinforcing Bar for One Block Man Hole

- $S_1 = (5.380 \times 4) - 4.80 = 16.72 \times 1.70 = 28.424 \text{ m}$
- $S_2 = (2.52 \times 8) - 9.60 = 10.56 \times 1.70 = 17.952 \text{ m}$
- $S_3 = (0.970 \times 8) - 3.88 = 3.88 \times 1.70 = 6.596 \text{ m}$
- $S_4 = (2.30 \times 8) - 9.20 = 9.20 \times 1.70 = 15.640 \text{ m}$
- $S_5 = (1.70 \times 20) - 12.00 = 22.000 \text{ m}$
- $S_6 = (0.870 \times 6) \times 1.70 - 5.22 = 3.654 \text{ m}$
- $W_1 = 2.55 \times 8 \times 1.70 = 34.680 \text{ m}$
- $W_2 = 1.00 \times 28 \times 1.70 = 47.600 \text{ m}$
- $W_3 = 0.40 \times 12 \times 1.70 = 8.160 \text{ m}$
- $F_1 = 5.43 \times 4 \times 1.70 = 36.924 \text{ m}$
- $F_2 = 2.52 \times 8 \times 1.70 = 34.272 \text{ m}$
- $F_3 = 1.01 \times 8 \times 1.70 = 13.736 \text{ m}$
- $F_4 = 2.25 \times 8 \times 1.70 = 30.600 \text{ m}$
- $F_5 = 1.70 \times 20 = 34.000 \text{ m}$
- $F_6 = 0.920 \times 6 \times 1.70 = 9.384 \text{ m}$

•  $S_1$  (Shape : 5) : D.13



Length of Bar :

$$L_1 = \frac{1}{2} (275 - 10) + 30 \phi - R$$

$$= 132.50 + 39 - 14 = 157.5 \text{ cm}$$

$$L_1 = 1.575 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14$$

$$L_2 = 21.98 \text{ cm} = 0.220 \text{ m}$$

$$L_3 = (270 - 18) - 2R$$

$$L_3 = 252 - 28 = 224 \text{ cm} = 2.240 \text{ m}$$

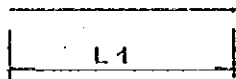
$$L_4 = \frac{1}{2} (275 - 23) - R = 126 - 14 = 112 \text{ cm} = 1.120 \text{ m}$$

$$\text{Total length} = \Sigma L = 1.575 + 0.22 \times 2 + 2.24 + 1.12$$

$$L = 5.375 \text{ m} \sim 5.380 \text{ m}$$

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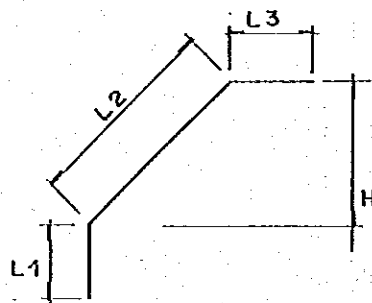
- S<sub>2</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 270 - 18 = 252 \text{ m}$$

- S<sub>3</sub> (Shape : 6) : D.13



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

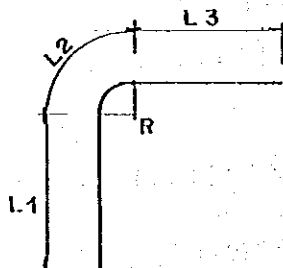
$$L_2 = \sqrt{2H^2} = \sqrt{2 \times (54.3)^2} = 76.80 \text{ cm}$$

$$L_2 = 0.768 \text{ m}$$

$$L_3 = 10 \text{ cm} = 0.10 \text{ m}$$

$$\text{Total length} = \Sigma L = 0.10 + 0.768 + 0.10 = 0.968 \text{ m} \sim 0.970 \text{ m}$$

- S<sub>4</sub> (Shape : 5) : D.13



Length of Bar :

$$L_1 = \frac{1}{2} (275 - 24) - R = 125.5 - 14 = 111.5 \text{ cm} = 1.115 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14 = 21.98 \text{ cm}$$

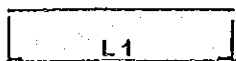
$$L_2 = 22.0 \text{ cm} = 0.220 \text{ m}$$

$$L_3 = \frac{1}{2} (270 - 23) - 2R = 123.5 - 28$$

$$L_3 = 95.5 \text{ cm} = 0.955 \text{ m}$$

$$\text{Total length of Bar} = \Sigma L = 1.115 + 0.22 + 0.955 = 2.29 \text{ m} \sim 2.30 \text{ m}$$

- S<sub>5</sub> (Shape : 1) : D.13

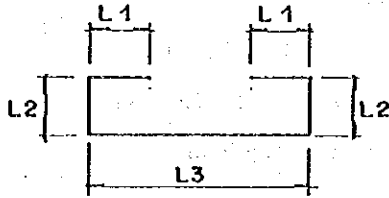


Length of Bar :

$$L_1 = 100 \text{ cm} = 1.00 \text{ m/m'}$$

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- $S_6$  (Shape : 3) : D.13



Length of Bar :

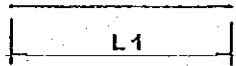
$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = 17 + 2\phi = 19 \text{ cm} = 0.196 \text{ m}$$

$$L_3 = (35 - 10) + 2\phi = 27.6 \text{ cm} = 0.276 \text{ m}$$

$$\begin{aligned} \text{Total length} &= \Sigma L = 2(0.10 + 0.196) + 0.276 \\ &= 0.868 \text{ m} \sim 0.870 \text{ m} \end{aligned}$$

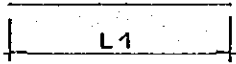
- $W_1$  (Shape : 1) : D.13



Length of Bar :

$$L_1 = 275 - 20 = 255 \text{ cm} = 2.55 \text{ m}$$

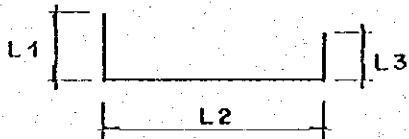
- $W_2$  (Shape : 1) : D.13



Length of Bar :

$$L_1 = 100 \text{ cm} = 1.0 \text{ m}$$

- $W_3$  (Shape : 2) : D.13



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

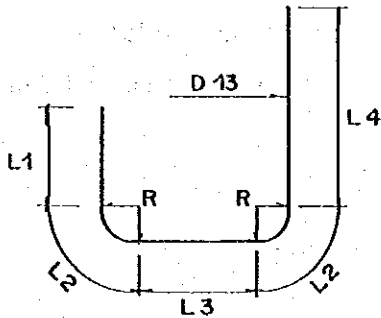
$$L_2 = 17 + 2\phi = 19.6 \text{ cm} = 0.196 \text{ m}$$

$$L_3 = 10 \text{ cm} = 0.10 \text{ m}$$

$$\begin{aligned} \text{Total length} &= \Sigma L = 0.10 + 0.196 + 0.10 \\ L &= 0.396 \text{ m} \sim 0.40 \text{ m} \end{aligned}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE VOLUME	Page	5 / 9
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- F<sub>1</sub> (Shape : 5) : D.13



Length of Bar :

$$L_4 = \frac{1}{2}(275 - 10) + 30 \phi - R$$

$$= 132.50 + 39 - 14 = 157.5 \text{ cm}$$

$$L_4 = 1.575 \text{ m} \sim 1.600 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14$$

$$L_2 = 21.98 \text{ cm} = 0.220 \text{ m}$$

$$L_3 = (270 - 18) - 2R$$

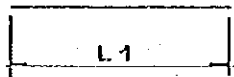
$$L_3 = 252 - 28 = 224 \text{ cm} = 2.240 \text{ m}$$

$$L_1 = \frac{1}{2}(275 - 18) - R = 128.50 - 14 = 114.50 \text{ cm} = 1.145 \text{ m}$$

$$\text{Total length} = \Sigma L = 1.600 + 0.22 \times 2 + 2.24 + 1.145$$

$$L = 5.425 \text{ m} \sim 5.430 \text{ m}$$

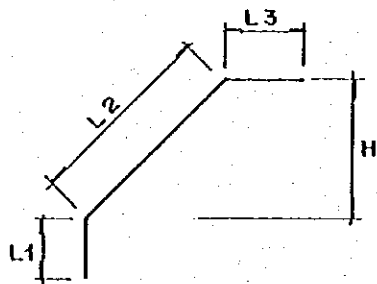
- F<sub>2</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 270 - 18 = 2.52 \text{ m}$$

- F<sub>3</sub> (Shape : 6) : D.13



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = \sqrt{2H^2} = \sqrt{2 \times (56.8)^2} = 80.5 \text{ cm}$$

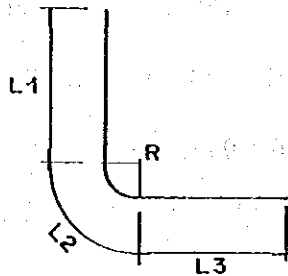
$$L_2 = 0.803 \text{ m}$$

$$L_3 = 10 \text{ cm} = 0.10 \text{ m}$$

$$\text{Total length} = \Sigma L = 0.10 + 0.803 + 0.10 = 1.003 \text{ m} \sim 1.010 \text{ m}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE VOLUME	Page	6 / 9
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- F<sub>4</sub> (Shape : 5) : D.13



Length of Bar :

$$L_1 = \frac{1}{2}(275 - 18) - 1\frac{1}{2}R = 128.5 - 21$$

$$L_1 = 107.5 \text{ cm} = 1.075 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14 = 21.98 \text{ cm}$$

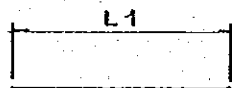
$$L_2 = 22.0 \text{ cm} = 0.220 \text{ m}$$

$$L_3 = \frac{1}{2}(270 - 23) - 2R = 123.5 - 28 = 95.5 \text{ cm}$$

$$L_3 = 0.955 \text{ m}$$

$$\text{Total length of beam} = \Sigma L = 1.075 + 0.22 + 0.955 = 2.25 \text{ m}$$

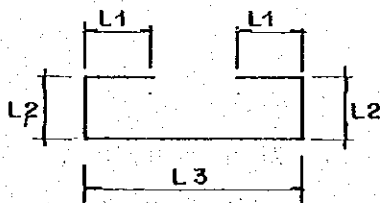
- F<sub>5</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 100 \text{ cm} = 1.00 \text{ m/m'}$$

- F<sub>6</sub> (Shape : 3) : D.13



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = 19.5 + 2\phi = 22.1 \text{ cm} = 0.221 \text{ m}$$

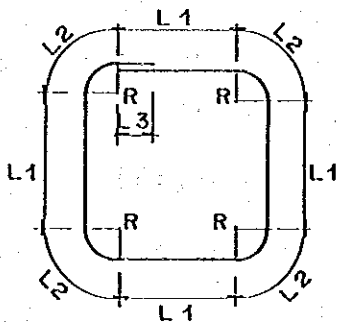
$$L_3 = (35 - 10) + 2\phi = 27.6 \text{ cm} = 0.276 \text{ m}$$

$$\text{Total length} = \Sigma L = 2 \times (0.10 + 0.221) + 0.276$$

$$= 0.918 \text{ m} \sim 0.920 \text{ m}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE VOLUME	Page	7 / 9
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- M<sub>1</sub> (Shape : 3) : D.13



Length of Bar :

$$L_1 = 170 - 2 \times 7 = 156 \text{ cm} = 1.56 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14 = 21.98 \text{ cm}$$

$$L_2 = 22 \text{ cm} = 0.220 \text{ m}$$

$$L_3 = 30 \phi = 39 \text{ cm} \sim 0.40 \text{ m}$$

$$\text{Total length} = 4L_1 + 4L_2 + L_3 = 4 \times 1.56 + 4 \times 0.22 + 0.40$$

$$L = 7.520 \text{ m}$$

- M<sub>2</sub> (Shape : 3) : D.13

Length of Bar :

$$L_1 = 100 + 2 \times 7 = 114 \text{ cm} = 1.14 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 7 = 10.99 \text{ cm}$$

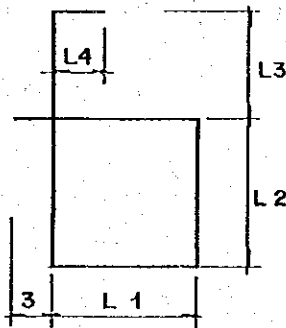
$$L_2 = 11 \text{ cm} = 0.110 \text{ m}$$

$$L_3 = 30 \phi = 39 \text{ cm} \sim 0.40 \text{ m}$$

$$\text{Total length} = 4L_1 + 4L_2 + L_3 = 4 \times 1.14 + 4 \times 0.11 + 0.40$$

$$L = 5.40 \text{ m}$$

- M<sub>3</sub> (Shape : 5) : D.13



Length of Bar :

$$L_1 = 35 - 14 = 21 \text{ cm} = 0.210 \text{ m}$$

$$L_2 = (35 + 127) - (25 + 7) = 130 \text{ cm} \\ = 1.30 \text{ m}$$

$$L_2' = (35 + 200) - (25 + 7) = 203 \text{ cm}$$

$$L_2' = 2.03 \text{ m}$$

$$L_3 = 25 + 7 - 7 = 25 \text{ cm} = 0.25 \text{ m}$$

$$L_4 = 10 \text{ cm} = 0.10 \text{ m}$$

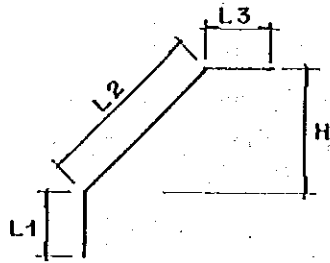
$$\text{Total length} = 2 \times L_1 + 0.03 + 2L_2 + L_3 + 0.10$$

$$\Sigma L = 0.45 + 2.60 + 0.25 + 0.10 = 3.40 \text{ m}$$



Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE VOLUME	Page	8 / 9
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- M<sub>4</sub> (Shape : 4) : D.13



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = \sqrt{2H_1^2} = \sqrt{2 \times (1.30)^2} = 1.840 \text{ m'}$$

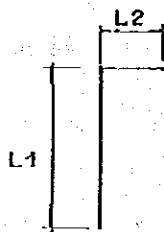
$$L_2' = \sqrt{2H_2^2} = \sqrt{2 \times (2.30)^2} = 2.87 \text{ m}$$

$$L_3 = 10 \text{ cm} = 0.10 \text{ m}$$

Total length  $\Sigma L = 0.10 + 1.840 + 0.10 = 2.040 \text{ m} \dots\dots\dots(1)$

$\Sigma L = 0.10 + 2.87 + 0.10 = 3.07 \text{ m' } \dots\dots\dots(2)$

- M<sub>5</sub> (Shape : 7) : D.13



Length of Bar :

$$L_1 = 130 + 30 \phi = 169 \text{ cm} = 1.69 \text{ m}$$

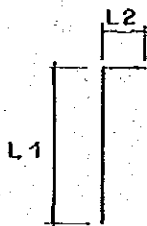
$$L_1' = 203 + 30 \phi = 242 \text{ cm} = 2.42 \text{ m}$$

$$L_2 = 21 + 3 = 24 \text{ cm} = 0.24 \text{ m}$$

Total length  $\Sigma L = 1.69 + 0.24 = 1.93 \text{ m} \dots\dots\dots(1)$

$= 2.42 + 0.24 = 2.66 \text{ m' } \dots\dots\dots(2)$

- M<sub>6</sub> (Shape : 7) : D.13



Length of Bar :

$$L_1 = (130 + 25) + 30 \phi = 194 \text{ cm} = 1.94 \text{ m}$$

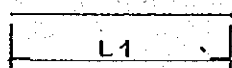
$$L_1' = (203 + 25) + 30 \phi = 267 \text{ cm} = 2.67 \text{ m}$$

$$L_2 = 10 \text{ cm} = 0.10 \text{ m}$$

Total length  $\Sigma L = 1.94 + 0.10 = 2.04 \text{ m} \dots\dots\dots(1)$

$= 2.67 + 0.10 = 2.77 \text{ m' } \dots\dots\dots(2)$

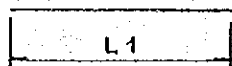
- M<sub>7</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 87.5 \text{ cm} = 0.875 \text{ m}$$

- M<sub>8</sub> (Shape : 8) : D.13

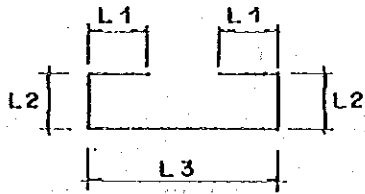


Length of Bar :

$$L_1 = 120 \text{ cm} = 0.12 \text{ m}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE VOLUME	Page	9 / 9
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- C<sub>1</sub> (Shape : 2) : D.19



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

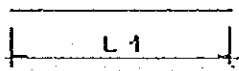
$$L_2 = 25 - 10 = 15 \text{ cm} = 0.15 \text{ m}$$

$$L_3 = 138 - 10 = 128 \text{ cm} = 1.28 \text{ m}$$

$$\text{Total length} = 2L_1 + 2L_2 + L_3 = (2 \times 0.10) + (2 \times 0.15) + 1.28$$

$$L = 1.78 \text{ m}$$

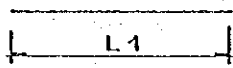
- C<sub>2</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 138 - 10 = 128 \text{ cm} = 1.28 \text{ m}$$

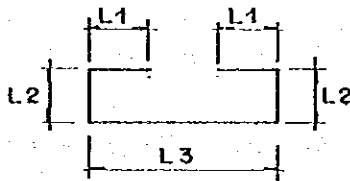
- C<sub>3</sub> (Shape : 1) : D.13



Length of Beam :

$$L_1 = 69 - 8 = 61 \text{ cm} = 0.61 \text{ m}$$

- C<sub>4</sub> (Shape : 2) : D.13



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

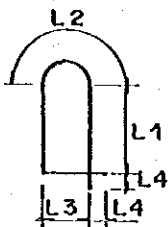
$$L_2 = 25 - 10 = 15 \text{ cm} = 0.15 \text{ m}$$

$$L_3 = 69 - 8 = 61 \text{ cm} = 0.61 \text{ m}$$

$$\text{Total length} = 2L_1 + 2L_2 + L_3 = 0.20 + 0.30 + 0.61$$

$$L = 1.11 \text{ m}$$

- C<sub>5</sub> (Shape : 6) : D.13



Length of Bar :

$$L_1 = 0.20 \text{ m}$$

$$L_2 = 10 \phi = 19 \text{ cm} = 0.19 \text{ m}$$

$$L_3 = 12 \text{ cm} = 0.12 \text{ m}$$

$$L_4 = 3 \text{ cm} = 0.03 \text{ m}$$

$$\text{Total length } \Sigma L = (2 \times 0.20) + 0.19 + 0.12 + (2 \times 0.03)$$

$$= 0.77 \text{ m}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE VOLUME	Page	1 / 1
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SUMMARY REINFORCING BAR MAN HOLE TYPE B AND BOX CULVERT (STANDARD)

- Man hole number = 31 pieces
- Total bar weight for all block man hole Type B in Baru conveyance channel.  
 Total bar weight man hole Type B = 31 x 2110 = 65410 kg ✓
- Length of box culvert = 21.80 m  
 Total bar weight of box culvert = 54450 kg ✓
- Total bar weight of man hole Type B and box culvert :  
 65410 + 54450 = 119860 kg

275.220

Name of Structure

BARU CONVEYANCE CHANNEL

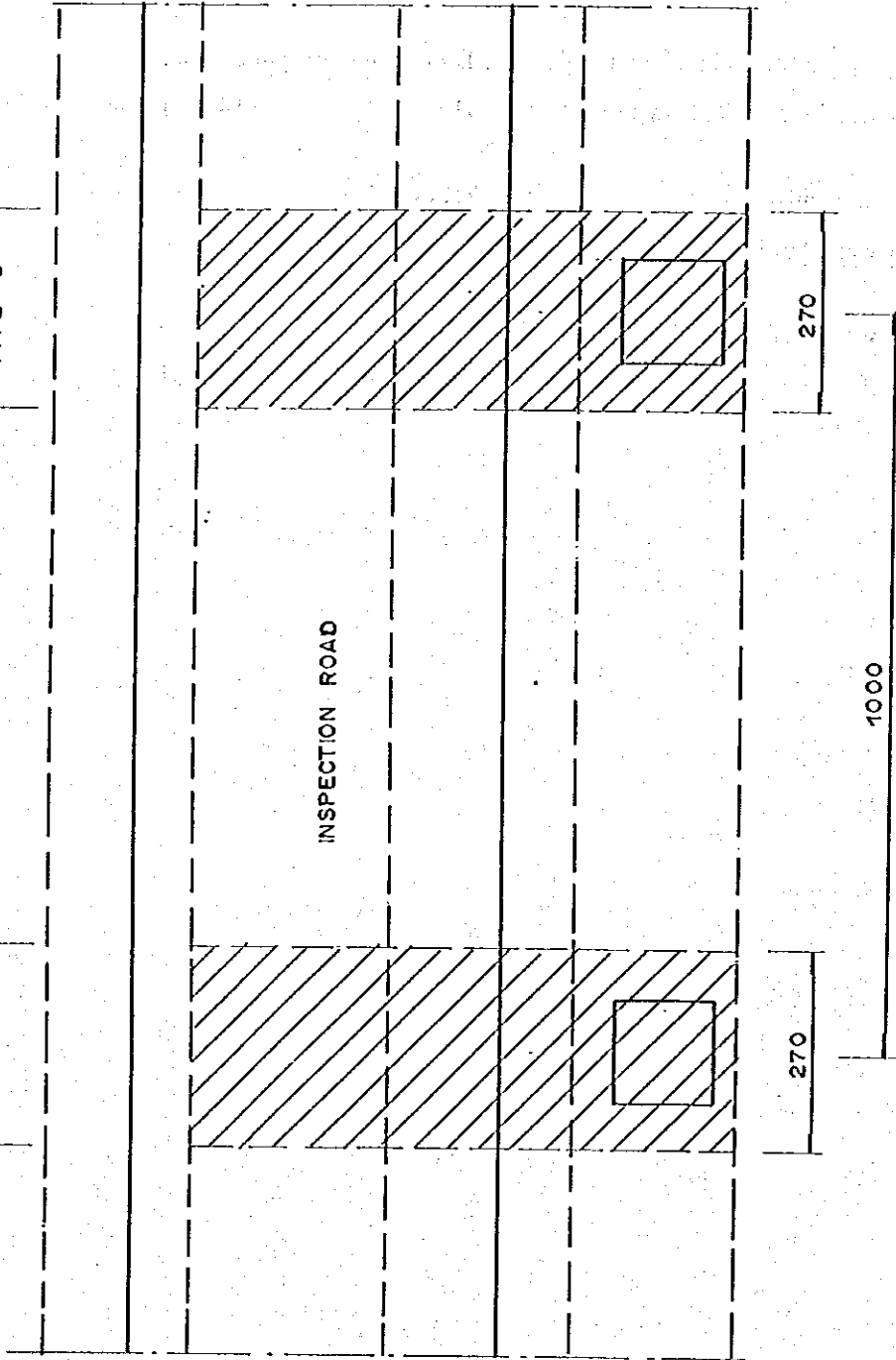
Category of calculation

PLAN MAN HOLE VOLUME

Page

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BLOCK CULVERT STANDARD  
BLOCK MANHOLE TYPE B  
BLOCK CULVERT STANDARD  
BLOCK MANHOLE TYPE B  
BLOCK CULVERT STANDARD



Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING BOX CULVERT VOLUME	Page	1 / 1
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**BAR WEIGHT FOR STANDARD BOX CULVERT / m'**

TYPE	SHAPE	DIA	NUMBER	TOTAL LENGTH (m)	UNIT WEIGHT (Kg/m)	TOTAL WEIGHT (Kg)	
S	1	5	13	4	5.38	1.04	22
	2	1	13	8	2.52	1.04	21
	3	6	13	8	0.97	1.04	8
	4	4	13	8	2.30	1.04	19
	5	1	13	20	1.00	1.04	21
	6	3	13	6	0.87	1.04	6
W	1	1	13	8	2.55	1.04	21
	2	1	13	28	1.00	1.04	29
	3	2	13	12	0.40	1.04	5
F	1	5	13	4	5.43	1.04	23
	2	1	13	8	2.52	1.04	21
	3	6	13	8	1.01	1.04	8
	4	4	13	8	2.25	1.04	19
	5	1	13	20	1.00	1.04	21
	6	3	13	6	0.92	1.04	6
<b>TOTAL</b>						<b>250 kg</b>	

• Total bar weight for box culvert in Baru conveyance channel :

- Length of channel = \_\_\_\_\_ = 301.50 m
- Length of man hole Type B = 31 x 2.70 = 83.70 m
- Length of standard box culvert (Standard) = 217.80 m

• Total bar weight for box culvert (Standard) :

$$2.50 \times 217.80 = 54.450 \text{ kg}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE VOLUME	Page	1 / 2
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**BAR WEIGHT FOR ONE BLOCK MAN HOLE TYPE B**

TYPE	SHAPE	DIA	NUMBER	TOTAL LENGTH (m)	UNIT WEIGHT (Kg/m)	TOTAL WEIGHT (Kg)
S	1	5	12	5.38	1.04	67
	2	1	42	2.52	1.04	110
	3	6	31	0.97	1.04	31
	4	4	31	2.30	1.04	74
	5	1	20	7.45	1.04	155
	6	3	34	0.87	1.04	24
W	1	1	49	2.55	1.04	130
	2	1	14	12.20	1.04	178
	3	2	73	0.40	1.04	30
F	1	5	30	5.43	1.04	169
	2	1	60	2.52	1.04	657
	3	6	60	1.01	1.04	63
	4	4	60	2.25	1.04	140
	5	1	20	7.45	1.04	155
	6	3	44	0.92	1.04	42
M	1	3	8	7.52	1.04	63
	2	3	7	5.40	1.04	39
	3	5	27	3.96	1.04	111
	4	4	5	2.44	1.04	13
	5	7	10	2.21	1.04	23
	6	7	9	2.32	1.04	22
	7	1	9	0.875	1.04	8
	8	1	4	1.20	1.04	5
C	1	2	7	1.78	2.23	28
	2	1	4	1.28	1.04	5
	3	1	5	0.61	1.04	3
	4	2	5	1.11	1.04	6
	5	6	2	0.77	2.23	3
<b>TOTAL</b>						<b>1850 kg</b>

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE VOLUME	Page	2 / 2
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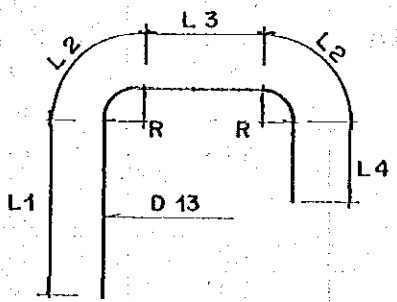
**BAR WEIGHT FOR ONE BLOCK MAN HOLE TYPE B**

TYPE	SHAPE	DIA	NUMBER	TOTAL LENGTH (m)	UNIT WEIGHT (Kg/m)	TOTAL WEIGHT (Kg)
S 1T	5	13	11	4.24	1.04	49
2T	1	13	9	1.38	1.04	13
3	6	13	-	-	-	-
4T	4	13	18	1.985	1.04	37
5T	1	13	10	0.47	1.04	5
6T	3	13	7	0.87	1.04	6
7	1	13	16	1.00	1.04	17
8	1	13	16	1.00	1.04	17
W 1T	1	13	-	-	-	-
2T	1	13	-	-	-	-
3T	2	13	-	-	-	-
F 7	1	13	16	1.00	1.04	17
8	1	13	16	1.00	1.04	17
F 1T	5	13	11	3.69	1.04	42
4T	4	13	11	1.035	1.04	12
M 9	1	13	4	0.75	1.04	3
L	3	9	9	1.05	2.23	21
TOTAL						256 kg

Total bar weight for one block man hole Type B = 1854 + 256 = 2110 kg

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE TYPE B	Page	1 / 8
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• S<sub>1</sub> (Shape : 5) : D.13



Length of Bar :

$$L_1 = \frac{1}{2}(275 - 10) + 30 \phi - R$$

$$= 132.50 + 39 - 14 = 157.5 \text{ cm}$$

$$L_1 = 1.575 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14$$

$$L_2 = 21.98 \text{ cm} = 0.220 \text{ m}$$

$$L_3 = (270 - 18) - 2R$$

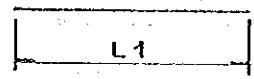
$$L_3 = 252 - 28 = 224 \text{ cm} = 2.240 \text{ m}$$

$$L_4 = \frac{1}{2}(275 - 23) - R = 126 - 14 = 112 \text{ cm} = 1.120 \text{ m}$$

$$\text{Total length} = \Sigma L = 1.575 + 0.22 \times 2 + 2.24 + 1.12$$

$$L = 5.375 \text{ m} \sim 5.380 \text{ m}$$

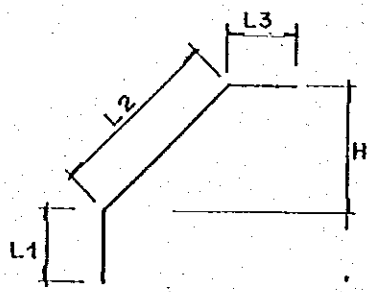
• S<sub>2</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 270 - 18 = 252 \text{ cm} = 2.52 \text{ m}$$

• S<sub>3</sub> (Shape : 6) : D.13



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = \sqrt{2H^2} = \sqrt{2 \times (54.3)^2} = 76.80 \text{ cm}$$

$$L_2 = 0.768 \text{ m}$$

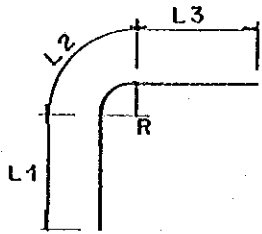
$$L_3 = 10 \text{ cm} = 0.10 \text{ m}$$

$$\text{Total length} = \Sigma L = 0.10 + 0.768 + 0.10 = 0.968 \text{ m} \sim 0.970 \text{ m}$$



Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE TYPE B	Page	2 / 8
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- S<sub>4</sub> (Shape : 5) : D.13



Length of Bar :

$$L_1 = \frac{1}{2}(275 - 24) - R = 125.5 - 14 = 111.5 \text{ cm} = 1.115 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14 = 21.98 \text{ cm}$$

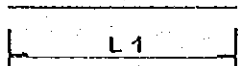
$$L_2 = 22.0 \text{ cm} = 0.220 \text{ m}$$

$$L_3 = \frac{1}{2}(270 - 23) - 2R = 123.5 - 28$$

$$L_3 = 95.5 \text{ cm} = 0.955 \text{ m}$$

$$\begin{aligned} \text{Total length of bar} &= \Sigma L = 1.115 + 0.22 + 0.955 \\ &= 2.29 \text{ m} \sim 2.30 \text{ m} \end{aligned}$$

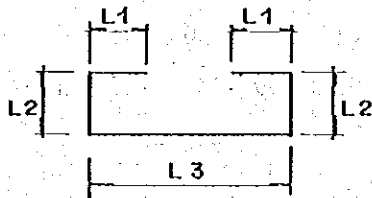
- S<sub>5</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 100 \text{ cm} = 1.00 \text{ m/m'}$$

- S<sub>6</sub> (Shape : 3) : D.13



Length of Bar :

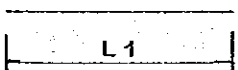
$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = 17 + 2\phi = 19.6 \text{ cm} = 0.196 \text{ m}$$

$$L_3 = (35 - 10) + 2\phi = 27.6 \text{ cm} = 0.276 \text{ m}$$

$$\begin{aligned} \text{Total length} &= \Sigma L = 2 \times (0.10 + 0.196) + 0.276 \\ &= 0.868 \text{ m} \sim 0.870 \text{ m} \end{aligned}$$

- W<sub>1</sub> (Shape : 1) : D.13

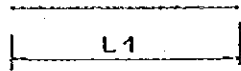


Length of Bar :

$$L_1 = 275 - 20 = 255 \text{ cm} = 2.55 \text{ m}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE TYPE B	Page	3 / 8
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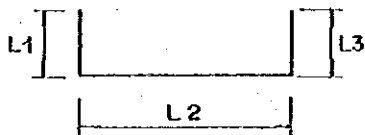
- $W_2$  (Shape : 1) : D.13



Length of Bar :

$$L_1 = 100 \text{ cm} = 1.0 \text{ m}$$

- $W_3$  (Shape : 2) : D.13



Length of Bar :

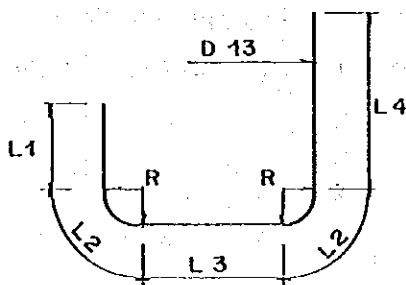
$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = 17 + 2 \phi = 19.6 \text{ cm} = 0.196 \text{ m}$$

$$L_3 = 10 \text{ cm} = 0.10 \text{ m}$$

$$\begin{aligned} \text{Total length} &= \Sigma L = 0.10 + 0.196 + 0.10 \\ L &= 0.396 \text{ m} \sim 0.40 \text{ m} \end{aligned}$$

- $F_1$  (Shape : 5) : D.13



Length of Bar :

$$\begin{aligned} L_4 &= \frac{1}{2}(275 - 10) + 30 \phi - R \\ &= 132.50 + 39 - 14 = 157.5 \text{ cm} \end{aligned}$$

$$L_4 = 1.575 \text{ m} \sim 1.600 \text{ m}$$

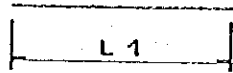
$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14$$

$$L_2 = 21.98 \text{ cm} = 0.220 \text{ m}$$

$$\begin{aligned} L_3 &= (270 - 18) - 2R \\ L_3 &= 252 - 28 = 224 \text{ cm} = 2.240 \text{ m} \\ L_1 &= \frac{1}{2}(275 - 18) - R = 128.50 - 14 = 114.50 \text{ cm} = 1.145 \text{ m} \\ \text{Total length} &= \Sigma L = 1.600 + 0.22 \times 2 + 2.24 + 1.145 \\ L &= 5.425 \text{ m} \sim 5.430 \text{ m} \end{aligned}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE TYPE B	Page	4 / 8
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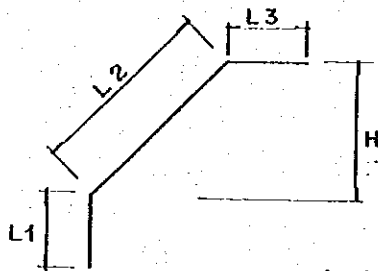
- F<sub>2</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 270 - 18 = 252 \text{ cm} = 2.52 \text{ m}$$

- F<sub>3</sub> (Shape : 6) : D.13



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

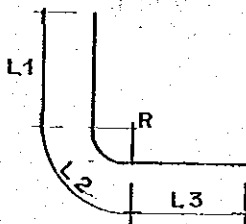
$$L_2 = \sqrt{2H^2} = \sqrt{2 \times (56.8)^2} = 80.5 \text{ cm}$$

$$L_2 = 0.803 \text{ m}$$

$$L_3 = 10 \text{ cm} = 0.10 \text{ m}$$

$$\text{Total length} = \Sigma L = 0.10 + 0.803 + 0.10 = 1.003 \text{ m} \sim 1.010 \text{ m}$$

- F<sub>4</sub> (Shape : 4) : D.13



Length of Bar :

$$L_1 = \frac{1}{2}(275 - 18) - 1\frac{1}{2}R = 128.5 - 21$$

$$L_1 = 107.5 \text{ cm} = 1.075 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14 = 21.98 \text{ cm}$$

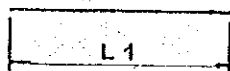
$$L_2 = 22.0 \text{ cm} = 0.220 \text{ m}$$

$$L_3 = \frac{1}{2}(270 - 23) - 2R = 123.5 - 28 = 95.5 \text{ cm}$$

$$L_3 = 0.955 \text{ m}$$

$$\text{Total length of beam} = \Sigma L = 1.075 + 0.22 + 0.955 = 2.25 \text{ m}$$

- F<sub>5</sub> (Shape : 1) : D.13

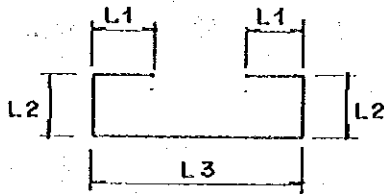


Length of Bar :

$$L_1 = 100 \text{ cm} = 1.00 \text{ m/m'}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE TYPE B	Page	5 / 8
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- F<sub>6</sub> (Shape : 3) : D.13



Length of Bar :

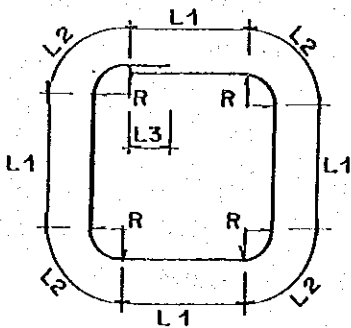
$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = 19.5 + 2\phi = 22.1 \text{ cm} = 0.221 \text{ m}$$

$$L_3 = (35 - 10) + 2\phi = 27.6 \text{ cm} = 0.276 \text{ m}$$

$$\begin{aligned} \text{Total length} &= \Sigma L = 2 \times (0.10 + 0.221) + 0.276 \\ &= 0.918 \text{ m} \sim 0.920 \text{ m} \end{aligned}$$

- M<sub>1</sub> (Shape : 3) : D.13



Length of Bar :

$$L_1 = 170 - 2 \times 7 = 156 \text{ cm} = 1.56 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 14 = 21.98 \text{ cm}$$

$$L_2 = 22 \text{ cm} = 0.220 \text{ m}$$

$$L_3 = 30\phi = 39 \text{ cm} \sim 0.40 \text{ m}$$

$$\begin{aligned} \text{Total length} &= 4L_1 + 4L_2 + L_3 = 4 \times 1.56 + 4 \times 0.22 + 0.40 \\ L &= 7.520 \text{ m} \end{aligned}$$

- M<sub>2</sub> (Shape : 3) : D.13

Length of Bar :

$$L_1 = 100 + 2 \times 7 = 114 \text{ cm} = 1.14 \text{ m}$$

$$L_2 = \frac{2\pi R}{4} = \frac{1}{2} \times 3.14 \times 7 = 10.99 \text{ cm}$$

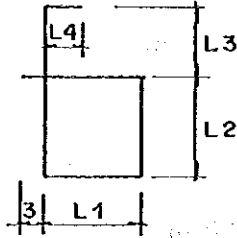
$$L_2 = 11 \text{ cm} = 0.110 \text{ m}$$

$$L_3 = 30\phi = 39 \text{ cm} \sim 0.40 \text{ m}$$

$$\begin{aligned} \text{Total length} &= 4L_1 + 4L_2 + L_3 = 4 \times 1.14 + 4 \times 0.11 + 0.40 \\ L &= 5.40 \text{ m} \end{aligned}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE TYPE B	Page	6 / 8
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- M<sub>3</sub> (Shape : 5) : D.13



Length of Bar :

$$L_1 = 35 - 14 = 21 \text{ cm} = 0.210 \text{ m}$$

$$L_2 = (35 + 155) - (25 + 7) = 158 \text{ cm} = 1.58 \text{ m}$$

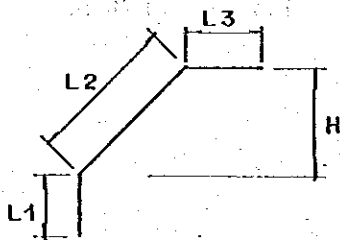
$$L_3 = 25 + 7 - 7 = 25 \text{ cm} = 0.25 \text{ m}$$

$$L_4 = 10 \text{ cm} = 0.10 \text{ m}$$

$$\text{Total length} = 2 \times L_1 + 0.03 + 2L_2 + L_3 + 0.10$$

$$\Sigma L = 0.45 + 3.16 + 0.25 + 0.10 = 3.96 \text{ m}$$

- M<sub>4</sub> (Shape : 4) : D.13



Length of Bar :

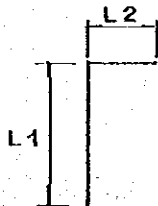
$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = \sqrt{2H_1^2} = \sqrt{2 \times (1.58)^2} = 2.234 \text{ m}$$

$$L_3 = 10 \text{ cm} = 0.10 \text{ m}$$

$$\text{Total length } \Sigma L = 0.10 + 2.234 + 0.10 = 2.44 \text{ m}$$

- M<sub>5</sub> (Shape : 7) : D.13



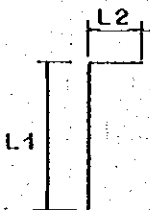
Length of Bar :

$$L_1 = 158 + 30 \phi = 197 \text{ cm} = 1.97 \text{ m}$$

$$L_2 = 21 + 3 = 24 \text{ cm} = 0.24 \text{ m}$$

$$\text{Total length } \Sigma L = 1.97 + 0.24 = 2.21 \text{ m}$$

- M<sub>6</sub> (Shape : 7) : D.13



Length of Bar :

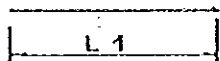
$$L_1 = (158 + 25) + 30 \phi = 222 \text{ cm} = 2.22 \text{ m}$$

$$L_2 = 10 \text{ cm} = 0.10 \text{ m}$$

$$\text{Total length } \Sigma L = 2.22 + 0.10 = 2.32 \text{ m}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE TYPE B	Page	7 / 8
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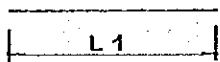
- M<sub>7</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 87.5 \text{ cm} = 0.875 \text{ m}$$

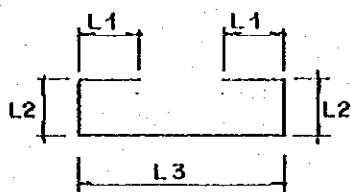
- M<sub>8</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 120 \text{ cm} = 1.20 \text{ m}$$

- C<sub>1</sub> (Shape : 2) : D.19



Length of Bar :

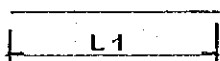
$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

$$L_2 = 25 - 10 = 15 \text{ cm} = 0.15 \text{ m}$$

$$L_3 = 138 - 10 = 128 \text{ cm} = 1.28 \text{ m}$$

$$\begin{aligned} \text{Total length} &= 2L_1 + 2L_2 + L_3 = (2 \times 0.10) + (2 \times 0.15) + 1.28 \\ L &= 1.78 \text{ m} \end{aligned}$$

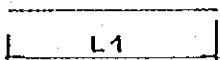
- C<sub>2</sub> (Shape : 1) : D.13



Length of Bar :

$$L_1 = 138 - 10 = 128 \text{ cm} = 1.28 \text{ m}$$

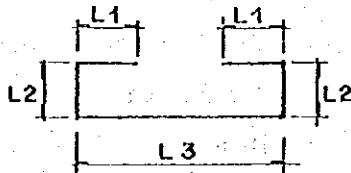
- C<sub>3</sub> (Shape : 1) : D.13



Length of Beam :

$$L_1 = 69 - 8 = 61 \text{ cm} = 0.61 \text{ m}$$

- C<sub>4</sub> (Shape : 2) : D.13



Length of Bar :

$$L_1 = 10 \text{ cm} = 0.10 \text{ m}$$

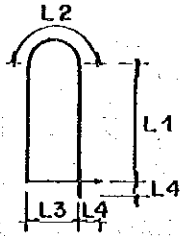
$$L_2 = 25 - 10 = 15 \text{ cm} = 0.15 \text{ m}$$

$$L_3 = 69 - 8 = 61 \text{ cm} = 0.61 \text{ m}$$

$$\begin{aligned} \text{Total length} &= 2L_1 + 2L_2 + L_3 = 0.20 + 0.30 + 0.61 \\ L &= 1.11 \text{ m} \end{aligned}$$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	REINFORCING MAN HOLE TYPE B	Page	8 / 8
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- C<sub>5</sub> (Shape : 6) : D.13



Length of Bar :

$$L_1 = 0.20 \text{ m}$$

$$L_2 = 10 \phi = 19 \text{ cm} = 0.19 \text{ m}$$

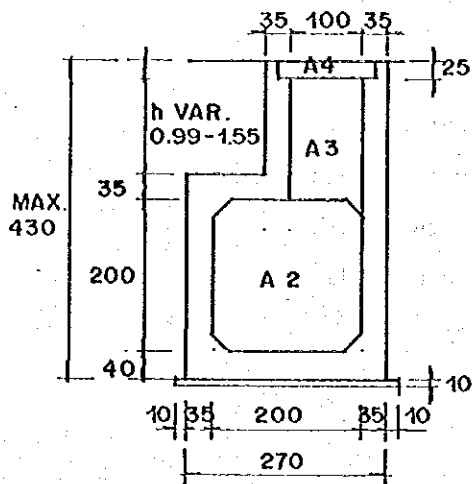
$$L_3 = 12 \text{ cm} = 0.12 \text{ m}$$

$$L_4 = 3 \text{ cm} = 0.03 \text{ m}$$

Total length  $\Sigma L = (2 \times 0.20) + 0.19 + 0.12 + (2 \times 0.03)$   
 $= 0.77 \text{ m}$

Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	FORM VOLUME	Page	1 / 2
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• CONCRETE STRUCTURE



Wide :

$$A_1 = (0.10 \times 407) \times 2 = 81.40 \text{ m}^2$$

$$A_2 = [(2.75 \times 2) + (2.00 \times 3)] \times 381.50$$

$$A_2 = 4680.50 \text{ m}^2$$

$$A_3 = [(1.70 \times 1.27) \times 4 + (1.00 \times 1.62 \times 4)] \times 25 + [(1.70 \times 2.00) + (1.00 \times 2.35)] \times 14 \times 4$$

$$A_3 = 493.00 \text{ m}^2$$

$$A_4 = (1.30 \times 0.25) \times 4 \times 39 = 50.7 \text{ m}^2$$

Length of concrete Type A

$$L = 263.5 + 143.5 = 407 \text{ m}$$

$$\text{Total wide for Type A} = 81.40 + 4680.5 + 493 + 50.70$$

$$= 5305.6 \text{ m}^2$$

Wide :

$$A_1 = (0.10 \times 285) \times 2 = 57 \text{ m}^2$$

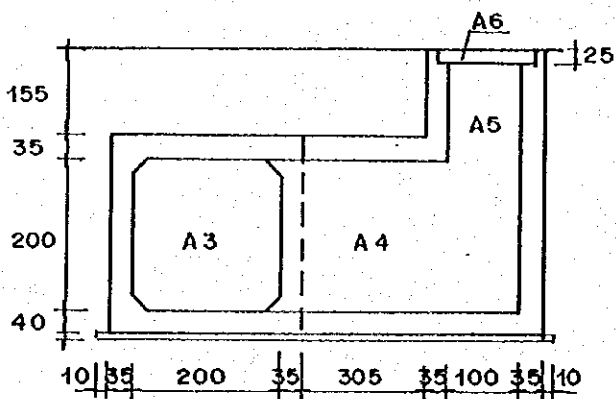
$$A_2 = (0.10 \times 4.75) \times 2 = 0.95 \text{ m}^2$$

$$A_3 = [(2.75 \times 2) + (2.00 \times 3)] \times 285.50 - (2.00 \times 2 \times 29) \times 2.70$$

$$A_3 = 2964.3 \text{ m}^2$$

Length of concrete Type B

$$L = 285 \text{ m}$$



$$A_4 = [(2.75 \times 2) + (2.00 \times 3)] \times 4.75 \times 29 + (2.75 \times 2.70) \times 29 - (1.00 \times 1.00 \times 29) + (2.0 \times 270 \times 29)$$

$$A_4 = 1927.05 \text{ m}^2$$

$$A_5 = [(1.55 \times 1.70 \times 4) + (1.90 \times 1.00 \times 4)] \times 29$$

$$A_5 = 526.06 \text{ m}^2$$



Name of Structure	BARU CONVEYANCE CHANNEL	Category of calculation	FORM VOLUME	Page	2 / 2
<p data-bbox="263 365 1066 405">Total wide for Type B = 57 + 0.95 + 2964.3 + 1927.5 + 526.06</p> <p data-bbox="529 414 762 454">A = 5475.36 m<sup>2</sup></p> <p data-bbox="263 465 826 506">Total form volume = 5035.6 + 5475.36</p> <p data-bbox="577 515 778 555">= 10780.96 m<sup>2</sup></p>					

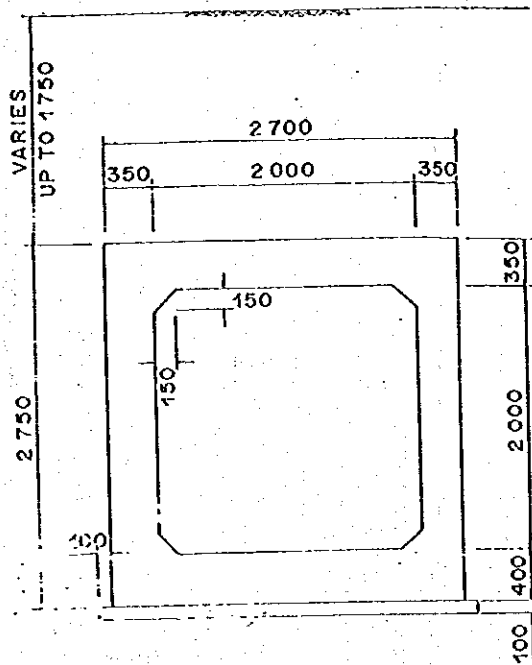
September 28, 1999

Name of Structure	SCAFOLDING AND FORM SUPPORT, FOR BANDARHARJO DRAINAGE SYST.	Category of calculation	WORK VOLUME	Page
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SUMMARY OF SCAFDOLDING AND FORM SUPPORT VOLUME, FOR BANDARHARJO BRAINAGE SYSTEM.

No	VOLUME		
	STRUCTURE		
1	BARU PUMPING STATION	SCAFOLDING (m <sup>2</sup> ) 1049	FORM SUPPORT (m <sup>3</sup> ) 549
2	BARU PUMPING STA. GATE	350	120
3	BARU CONVEYANCE CH.	6574	2768
4	BARU CONVEYANCE CH INLET STRUCTURE	150	35
5	BARU CONVEYANCE CH OUTLET STRUCTURE	106	20
6	BANDARHARJO EAST SECONDARY CHANNEL	1166	491
7	BANDARHARJO EAST SECONDARY CHANNEL OUTLET STRUCT.	90	31
8	BARU RETARDING POND INLET STRUCTURE NO 1	-	77
9	BARU RETARDING POND INLET STRUCTURE NO 2	-	42
10	FUEL TANK BOX FOR BARU PUMPING STATION	133	62
TOTAL		9618	4195

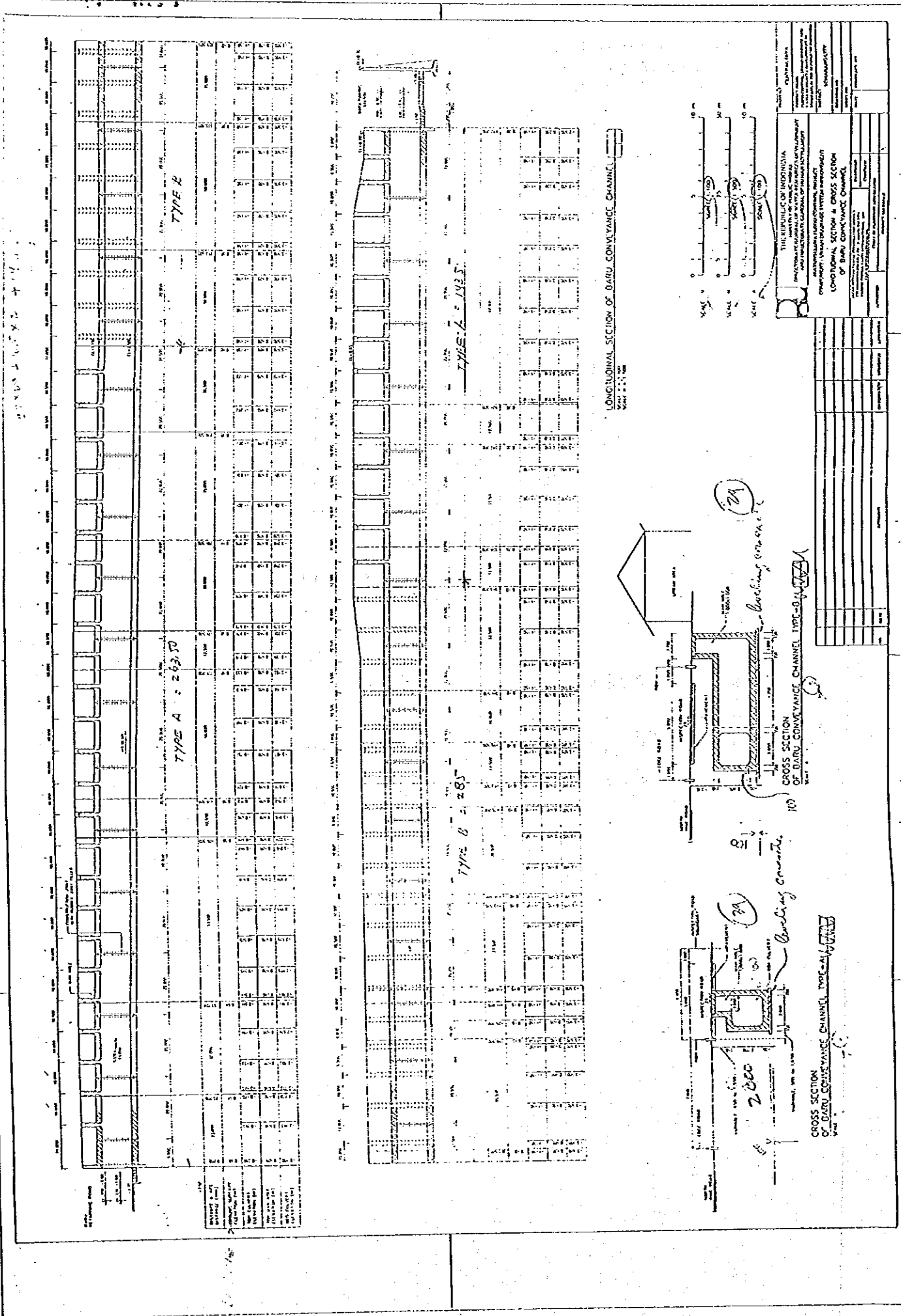
Name of Structure	BARU CONVEYANCE CH. SCAFOLDING AND FORM SUPPORT	Category of calculation	WORK VOLUME	Page	//
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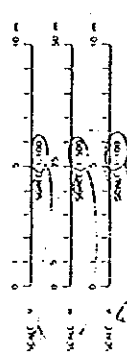
GENERAL CROSS SECTION  
SCALE A

Length of Box Culvert = 692 m.

1. Scaffolding area =  $(2 \times 2.75 + 2 \times 2.0) \times 692 = 6574 \text{ sq. m}$
2. Support area =  $2.0 \times 2.0 \times 692 = 2768 \text{ cu m}$



THE REPUBLIC OF INDONESIA	
DEPARTMENT OF PUBLIC WORKS	
AND INFRASTRUCTURE DEVELOPMENT	
GENERAL ENGINEERING DIVISION	
PROJECT: DARU CONDUYANCE CHANNEL	
DRAWING NO: 100	
DATE: 1985	
DRAWN BY: [Signature]	
CHECKED BY: [Signature]	
APPROVED BY: [Signature]	
SCALE: 1:1000	



Package 3: H Bandarharjo West Secondary  
Channel

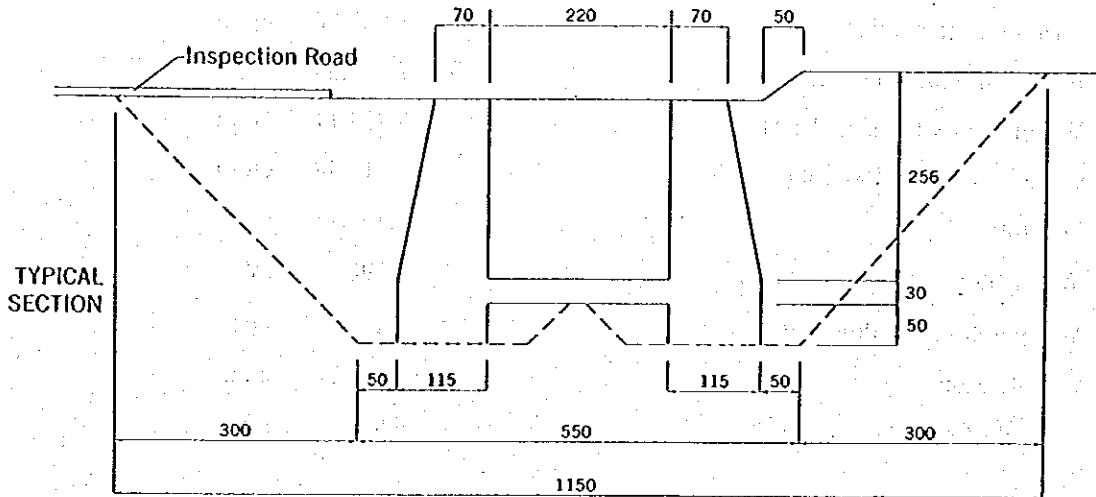


Name of Structure	BANDARHARJO WEST SECOND CHANNEL (OPEN CHANNEL)	Category of calculation	SUMMARY CHANNEL WORK VOLUME	Page	1 / 8
<u>CHANNEL</u>					
<b>SUMMARY OF WORK AND INSPECTION ROAD VOLUME CALCULATION</b>					
<b>I. CHANNEL WORKS</b>					
1.	Dewatering	=	LS		
2.	Channel Excavation	=	11,239.65	cu.m	✓
3.	Structure Excavation	=	1,967.96	cu.m	✓
4.	Back Fill with Sandy Soil	=	7,848.98	cu.m	✓
5.	Wet masonry (c : s = 1 : 4)	=	3,753.11	cu.m	✓
6.	Cement Mortar Plestering	=	15.42	cu.m	✓
7.	Pointing	=	2,399.25	sq.m	✓
8.	Water Stop with Rubber Filler	=	198	m'	✓
9.	Weep hole, PVC Pipe φ 50	=	1,433	nos	✓
10.	Cobble Stone	=	231.36	cu.m	✓
11.	Log pile φ 150, L= 3.0 cm	=	6,864	m'	✓
<b>II. INSPECTION ROAD</b>					
1.	Land Striping	=	3,513.19	sq.m	✓
2.	Road Embankment	=	1,670.906	cu.m	✓
3.	Compacted Sand	=	171.38	cu.m	✓
4.	Aggregate Class A	=	428.44	cu.m	✓
5.	Aggregate Class B	=	628.38	cu.m	✓
6.	Concrete Curb	=	68.55	cu.m	✓
7.	Sand bedding	=	171.38	cu.m	✓
8.	Concrete block pavement	=	2,856.25	sq.m	✓
9.	Cement mortar	=	6.856	cu.m	✓

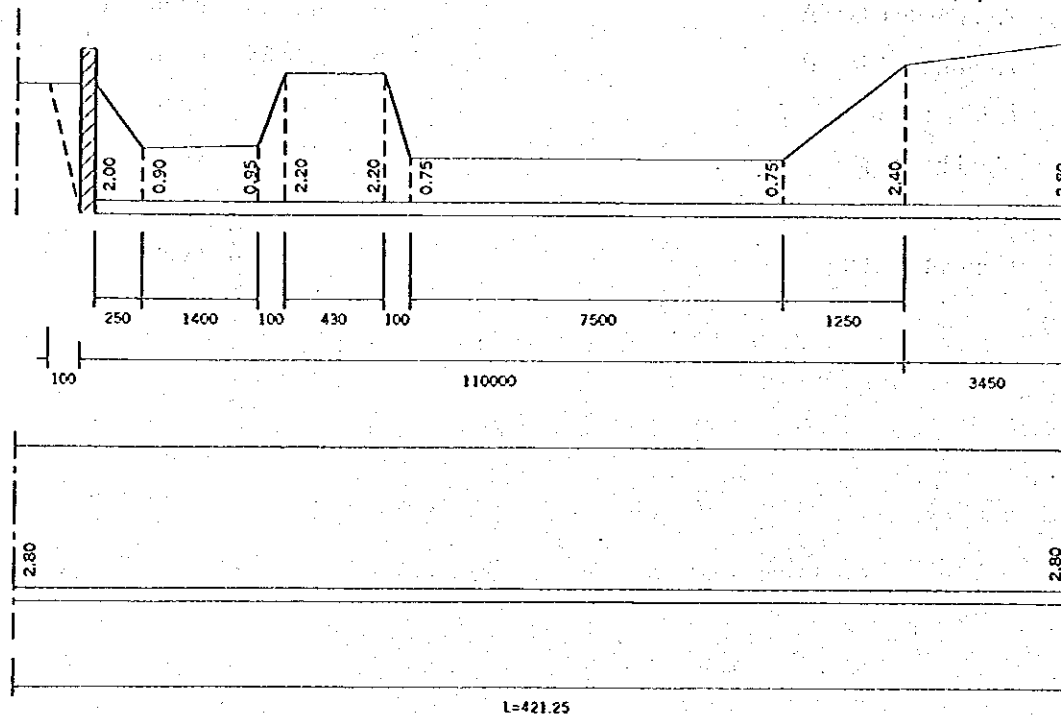
42.113 / 93.

Name of Structure	BANDARHARJO WEST SECOND CHANNEL (OPEN CHANNEL)	Category of calculation	CHANNEL WORK VOLUME	Page	2 / 8
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I. CHANNEL WORKS



1. Dewatering
2. Channel Excavation





Name of Structure	BANDARHARJO WEST SECOND CHANNEL (OPEN CHANNEL)	Category of calculation	CHANNEL WORK VOLUME	Page	3 / 8
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Wide : (Length = 1.00 + 110.00 + 34.50 = 145.50 m)

$$\begin{aligned}
 \bullet \quad A_1 &= (0.5 \times 1 \times 2) + \left( \frac{2 + 0.90}{2} \times 2.5 \right) + \left( \frac{0.90 + 0.95}{2} \times 14 \right) + \left( \frac{0.95 + 2.20}{2} \times 1 \right) + \\
 &\quad (2.20 \times 4.30) + \left( \frac{2.20 + 0.75}{2} \times 1 \right) + (0.75 \times 75) + \left( \frac{0.75 + 2.40}{2} \times 12.50 \right) + \\
 &\quad \left( \frac{2.40 + 2.80}{2} \times 34.50 \right)
 \end{aligned}$$

$$= 1.00 + 3.625 + 12.95 + 1.575 + 9.46 + 1.475 + 56.25 + 19.69 + 89.70$$

$$A_1 = 195.725 \text{ m}^2$$

$$\bullet \quad A_2 = \left( \frac{11.5 + 6.5}{2} \times 2.50 \right)$$

$$= 22.50$$

$$A_2 = 22.50 \text{ m}^2$$

• Volume

$$V_1 = A_1 \times B_{(\text{mean})}$$

$$= 195.725 \times \left( \frac{11.5 + 6.5}{2} \right)$$

$$V_1 = 195.725 \times 9 = 1761.525 \text{ m}^3$$

$$V_2 = A_2 \times L_2$$

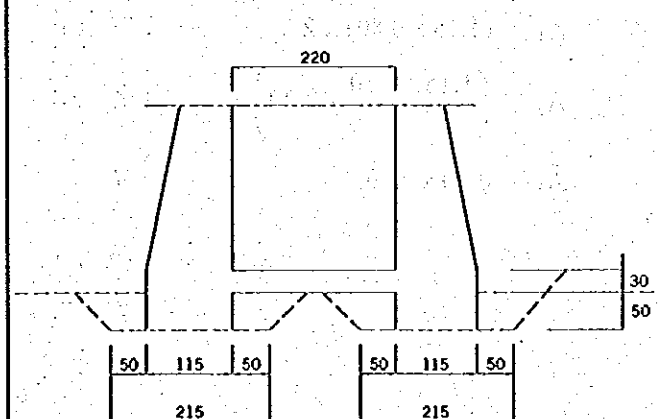
$$V_2 = 22.5 \times 421.25 = 9478.125 \text{ m}^3$$

$$\text{Total Volume} = V_1 + V_2$$

$$= 1761.525 + 9478.125$$

$$V = 11239.65 \text{ m}^3$$

### 3. Structure Excavation



Wide :

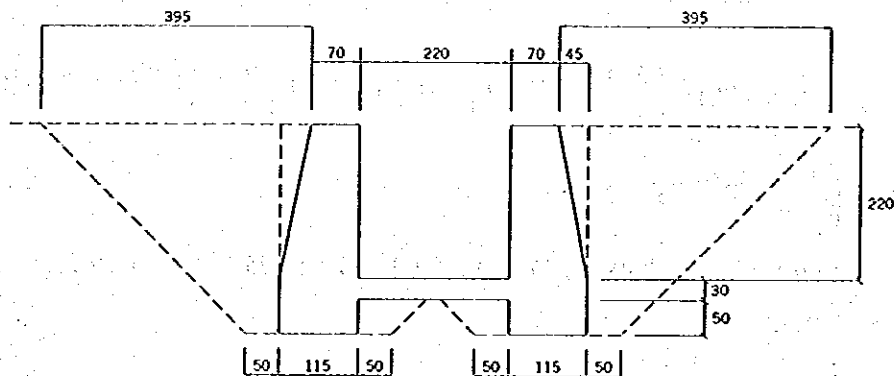
$$\begin{aligned}
 A &= \frac{2.15 + 3.15}{2} \times 0.65 \times 2 \\
 &= 3.445 \text{ m}^2
 \end{aligned}$$

Volume :

$$\begin{aligned}
 V &= A \times L \\
 &= 3.445 \times 571.25 \\
 V &= 1967.96 \text{ m}^3
 \end{aligned}$$

Name of Structure	BANDARHARJO WEST SECOND CHANNEL (OPEN CHANNEL)	Category of calculation	CHANNEL WORK VOLUME	Page	4 / 8
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4. Back Fill With Sandy Soil



Wide :

$$A_1 = \frac{0.5 + 1.30}{2} \times 0.80 \times 2 = 1.44 \text{ m}^2$$

$$A_2 = \frac{0.5 + 1.0}{2} \times 0.50 \times 2 = 0.75 \text{ m}^2$$

$$A_3 = \frac{1.30 + 3.50}{2} \times 2.20 \times 2 = 10.56 \text{ m}^2$$

$$A_4 = \frac{0.45 \times 2.20}{2} \times 2 = 0.99 \text{ m}^2$$

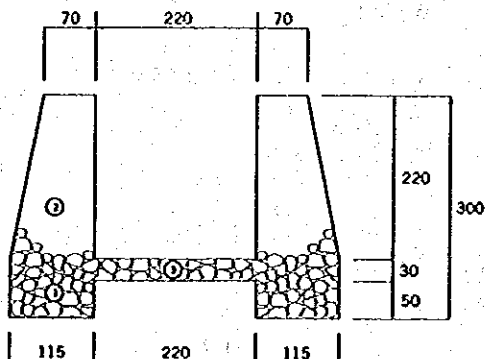
$$\text{Total} = 13.74 \text{ m}^2$$

Volume:

$$V = A \times L$$

$$V = 13.74 \times 571.25 = 7848.98 \text{ m}^3$$

5. Wet Masonry (c : s = 1 : 4)



Wide :

$$A_1 = (1.15 \times 0.80) \times 2 = 1.84 \text{ m}^2$$

$$A_2 = \left( \frac{1.15 + 0.70}{2} \times 2.20 \right) \times 2 = 4.07 \text{ m}^2$$

$$A_3 = 0.30 \times 2.20 = 0.66$$

$$\text{Total} = 6.57 \text{ m}^2$$

Name of Structure	BANDARHARJO WEST SECOND CHANNEL (OPEN CHANNEL)	Category of calculation	CHANNEL WORK VOLUME	Page	5 / 8
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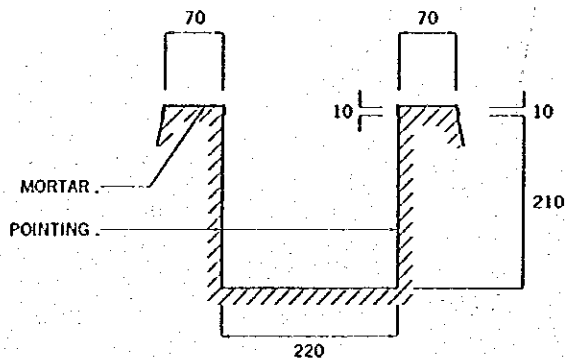
Volume :

$$V = A \times L$$

$$= (6.57 \times 571.25)$$

$$V = 3753.11 \text{ m}^3$$

6. Mortar



$$\text{Wide} = (0.10 \times 2 + 0.7) \times 2 = 1.80 \text{ m}^2$$

$$\text{Wide} = 1.80 \times 571.25$$

$$A = 1028.25 \text{ m}^2$$

$$\text{Volume} = 1028.25 \times 0.015$$

$$V = 15.42 \text{ m}^3$$

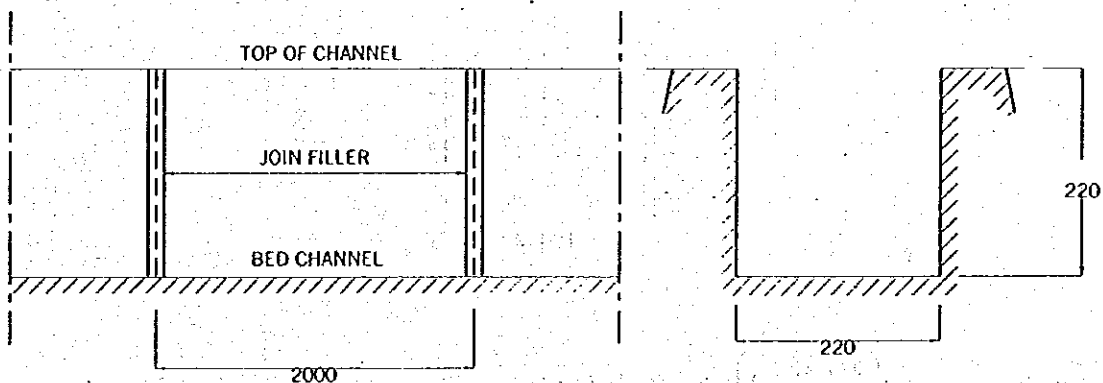
7. Pointing

$$\text{Wide} = 2.10 \times 2 = 4.20 \text{ m}^2$$

$$= 4.20 \times 571.25$$

$$A = 2399.25 \text{ m}^2$$

8. Water Stop With Rubber Filler



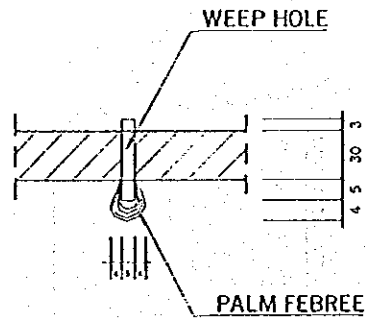
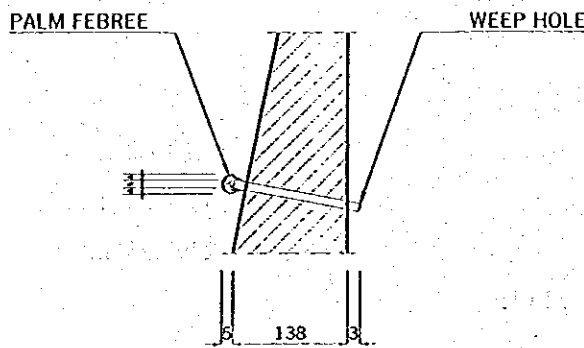
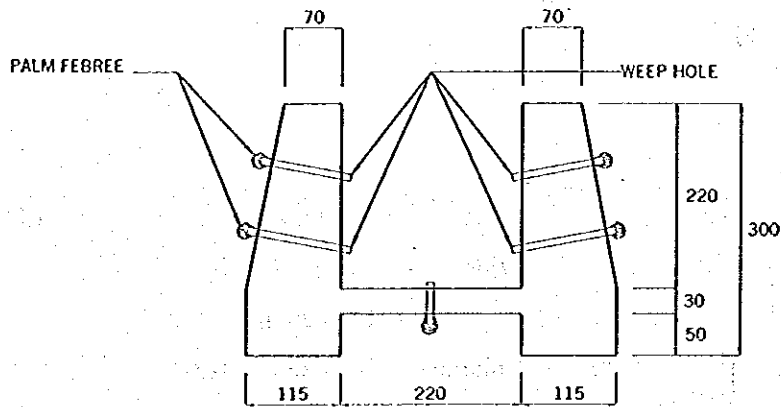
$$\text{Length} = (2.20 \times 2) + 2.20 = 6.60 \text{ m}$$

$$\text{Number} = \frac{571.25}{20} + 1 = 30$$

$$\text{Total length} = 6.60 \times 30 = 198 \text{ m}$$

Name of Structure	BANDARHARJO WEST SECOND CHANNEL (OPEN CHANNEL)	Category of calculation	CHANNEL WORK VOLUME	Page	6 / 8
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9. Weep Hole, PVC Pipe  $\phi$  50 mm



$$\text{Number} = \left( \frac{571.25}{2} + 1 \right) \times 5 = 1433 \text{ nos}$$

10. Cobble Stone  $1.35 \times 0.15 \times 2 \times 571.25 = 231.356 \text{ m}^3$

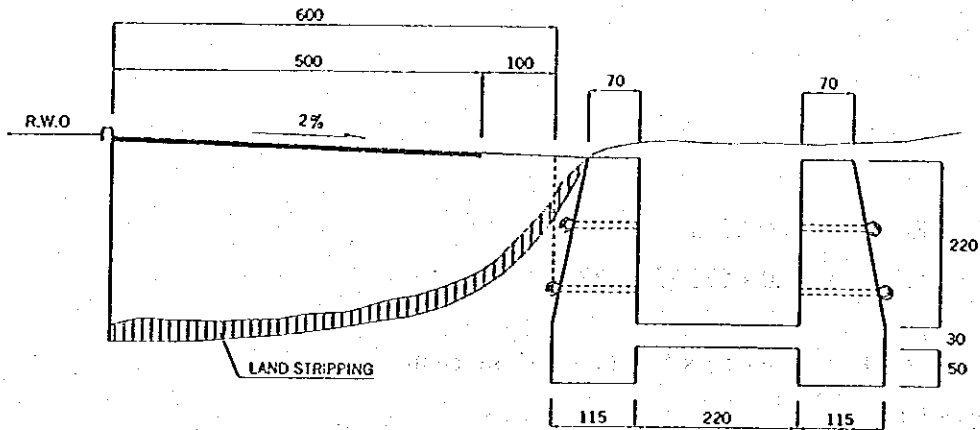
11. Log pile  $\phi 150$ ;  $L=3,000$

$$\left( \frac{571.25}{1.0} + 1 \right) \times 2 \times 2 \times 3.0 = 6864 \text{ m'}$$

Name of Structure	BANDARIJARJO WEST SECOND CHANNEL (OPEN CHANNEL)	Category of calculation	INSPECTION ROAD VOLUME	Page	7 / 8
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## II. INSPECTION ROAD

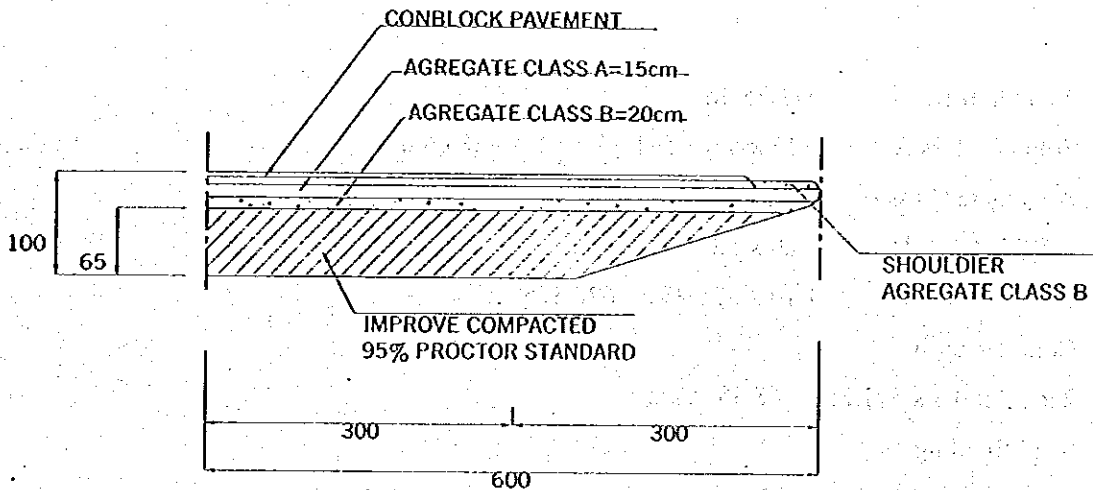
### 1. Lauds Stripping



Length of Road = 571.25 m

Wide of Striping =  $6.15 \times 571.25 = 3513,19 \text{ m}^2$

### 2. Road Embankment



Length of Road = 571.25 m

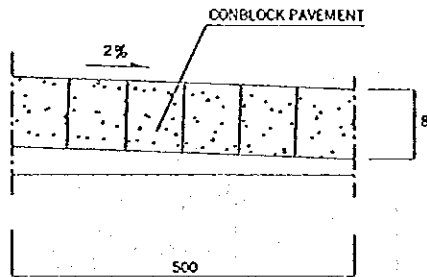
Wide =  $(0.65 \times 3.00) + (0.50 \times 0.65 \times 3.00)$

A =  $1.95 + 0.975 = 2.925 \text{ m}^2$

Volume =  $A \times L = 2.925 \times 571.25 = 1670.906 \text{ m}^3$

Name of Structure	BANDARHARJO WEST SECOND CHANNEL (OPEN CHANNEL)	Category of calculation	INSPECTION ROAD VOLUME	Page	8 / 8
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3. Conblock Pavement

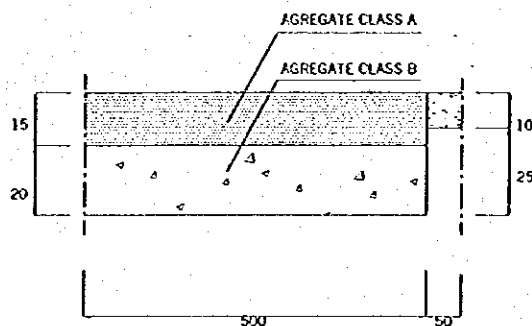


Length of Road = 571.25 m

Volume AC =  $5.0 \times 571.25 = 2856.25 \text{ m}^2$

4. Compacted sand =  $0.06 \times 5 \times 571.25 = 171.38 \text{ cu.m}$

5. Aggregate Class A



Length of Road = 571.25 m

Volume Class A =  $0.15 \times 5.0 \times 571.25 = 428.438 \text{ cu.m}$

6. Aggregate Class B

Wide Class B =  $0.20 \times 5.0 + 2 \times 0.5 \times 0.10 = 1.10 \text{ m}^2$

Volume Class B =  $1.10 \times 571.25 = 628.375 \text{ m}^3$

7. Concrete curb

$2 \times 0.2 \times 0.3 \times 571.25 = 68.55 \text{ cu.m}$

8. Sand Bedding

$0.06 \times 5.0 \times 571.25 = 171.375 \text{ cu.m}$

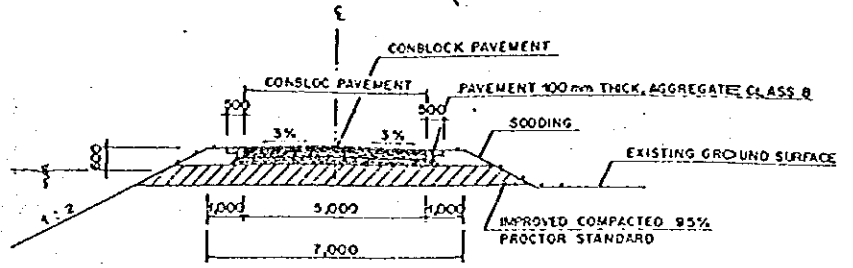
9. Concrete Block Pavement

$5.0 \times 571.25 = 2856.25 \text{ sq.m}$

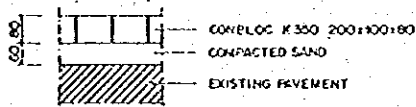
10. Cement Mortar

$2 \times 0.20 \times 0.03 \times 571.25 = 6.855 \text{ cu.m}$

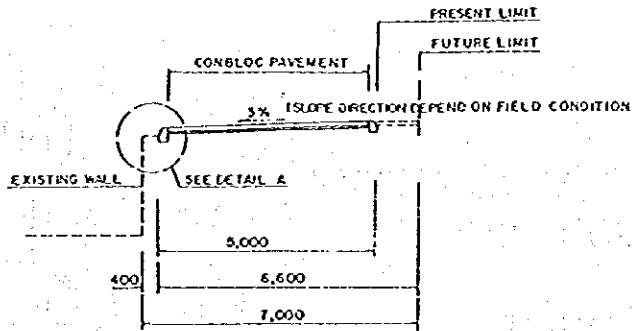
437.000



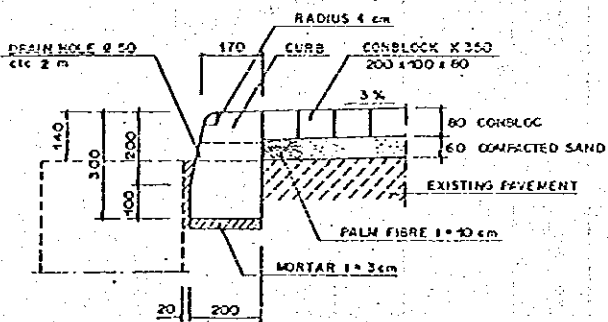
**TYPICAL CROSS SECTION**  
SCALE B  
NOT APPLIED IN PACKAGE 1



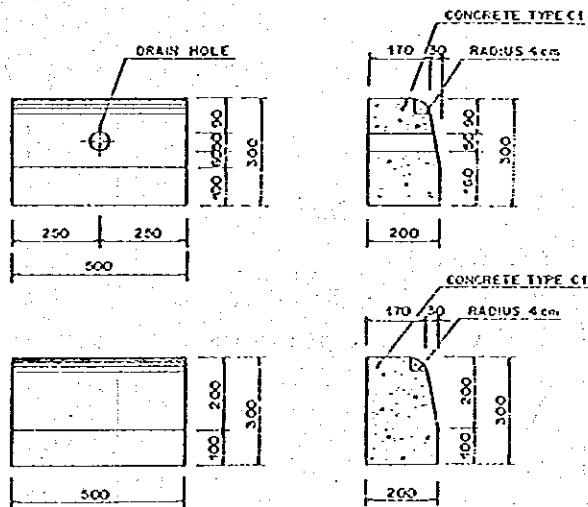
**CONBLOCK PAVEMENT ON THE EXISTING PAVEMENT**  
SCALE C



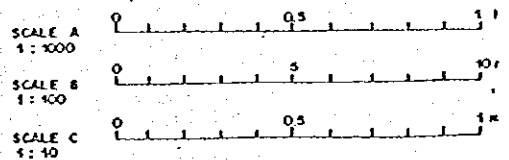
**TYPICAL CROSS SECTION**  
SCALE B  
APPLIED IN PACKAGE 1



**DETAIL A**  
SCALE C



**CURB**  
SCALE C

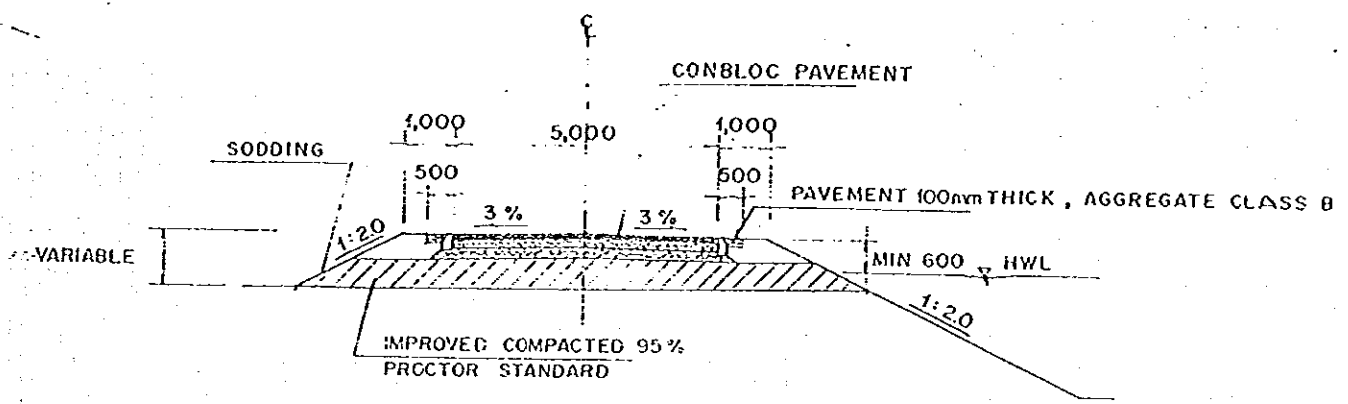


NO	DATE	REVISIONS	DESIGNATED	DESIGNED	APPROVED

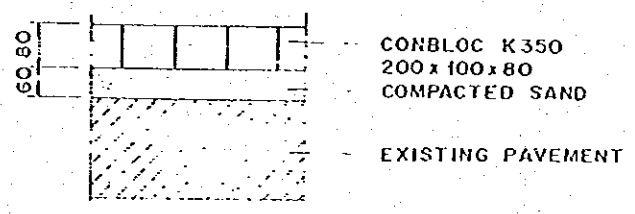
<p>THE REPUBLIC OF INDONESIA MINISTRY OF PUBLIC WORKS DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT AND DIRECTORATE GENERAL OF URBAN SETTLEMENT</p>		<p>PROVINCIAL CENTRAL</p>
<p>DEKORATIF PACIFIC CONSULTANTS INTERNATIONAL INC. KUALA LUMPUR, MALAYSIA</p>		<p>PROJECT NAME FLOOD CONTROL OF WATER RESOURCES DEVELOPMENT IN THE SEMARANG</p>
<p>3 - 193</p>		<p>DRAWING NO. 01 SHEET NO. 09</p>
<p>DATE</p>	<p>CONTR.</p>	<p>DATE</p>
<p>APPROVED</p>	<p>CHIEF OF PLANNING AND DESIGN</p>	<p>PROJECT MANAGER</p>



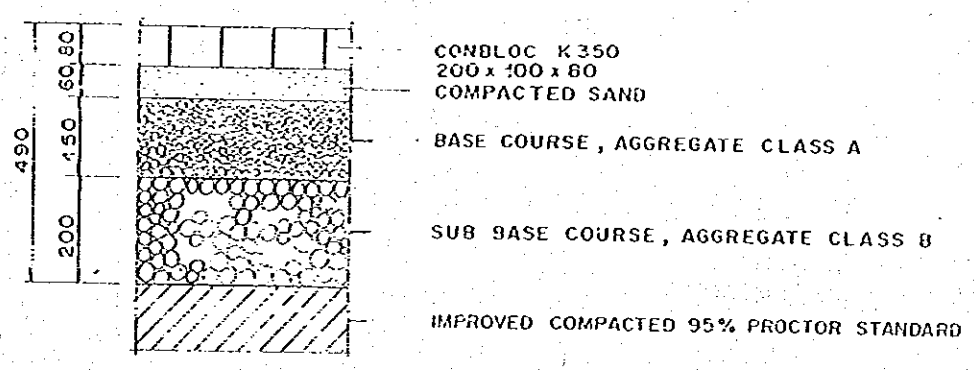




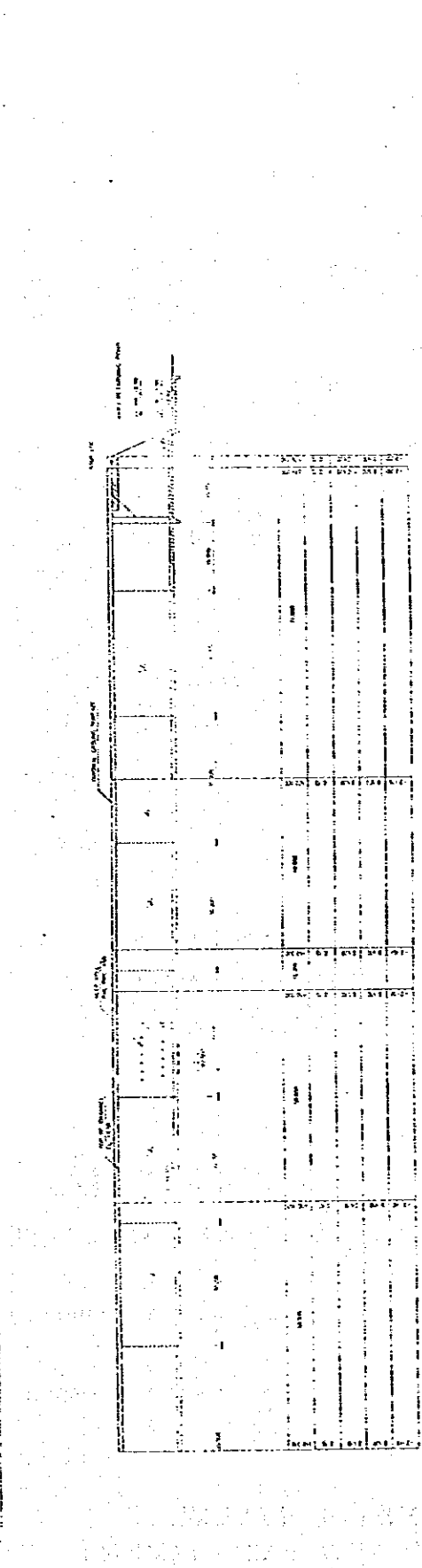
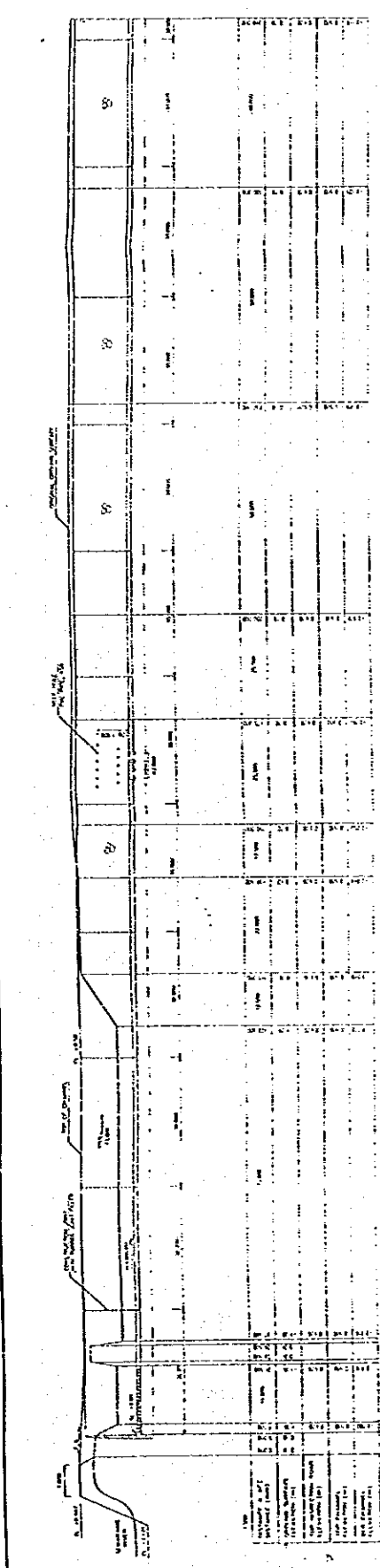
STANDARD CROSS SECTION  
FOR INSPECTION ROAD  
SCALE B



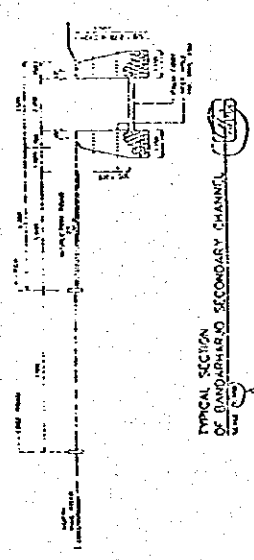
CONBLOC PAVEMENT  
ON THE EXISTING PAVEMENT  
SCALE C



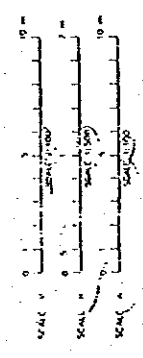
CONBLOC PAVEMENT  
ON THE NEW EMBANKMENT  
SCALE C



LONGITUDINAL SECTION  
OF BANDARHARJO WEST SECONDARY CHANNEL



TYPICAL SECTION  
OF BANDARHARJO WEST SECONDARY CHANNEL

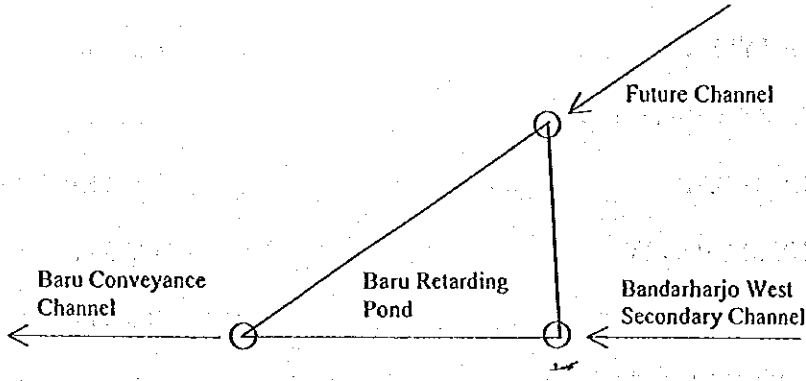


THE REPUBLIC OF INDONESIA  
 DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS  
 DISTRICT OFFICE OF BANDARHARJO WEST SECONDARY CHANNEL  
 PROJECT NO. ...  
 DRAWING NO. ...  
 DATE ...

NO.	REVISION	DATE	BY	CHECKED

Name of Structure	Category Calculation	VOLUME CALCULATION	Page	1/11
<i>OUTLET OF BANDARHARIO WEST SECONDARY CHANNEL</i>				
1. CONCRETE TYPE C1		= 36.332 m <sup>3</sup>		✓
2. LEVELING CONCRETE TYPE E		= 4.77 m <sup>3</sup>		✓
3. REINFORCING BAR		= 2,292 Kg		✓
4. WET STONE MASONRY		= 258.23 m <sup>3</sup>		✓
5. BACK FILLING GRAVEL		= 30.85 m <sup>3</sup>		✓
6. STRUCTURE EXCAVATION		= 1,119.6 m <sup>3</sup>		✓
7. BACK FILLING		= 270.58 m <sup>3</sup>		✓
8. LOG PILE Ø 15 cm, L=2.0 m		= 144 m <sup>1</sup>		✓
9. WEEP HOLE PVC Ø 15 cm		= 48 nos.		✓
10. FORM WORK FOR TYPE C1		= 93.225 m <sup>2</sup>		✓
11. FORM WORK FOR TYPE E		= 18 m <sup>2</sup>		
12. COBBLE STONE		= 12 m <sup>3</sup>		✓
13. POINTING		= 140.29 m <sup>2</sup>		✓

Name of Structure		Category Calculation	VOLUME CALCULATION	Page	2/11
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Name of Structure	BARU RETARDING POND INLET STRUCTURE 1	Category Calculation	CONCRETE VOLUME	Page	3/11
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**BARU RETARDING POND INLET NO. 1**

**I. CONCRETE VOLUME**

- Concrete K 225

**Slab**

- Area of Slab =  $15.75 \times 2.80$  = 44.10 m<sup>2</sup>

- Thickness of Slab = 0.40 m

- Volume of Slab =  $44.10 \times 0.40$  = 17.64 m<sup>3</sup>

**Parapet / Wall**

- Length of Wall = 2.80 m

- Height of Wall = 0.80 m

- Thickness of Wall = 0.40 m

- Volume of Wall =  $2.8 \times 0.8 \times 0.40 \times 2$  = 1.792 m<sup>3</sup>

**Stop Lock**

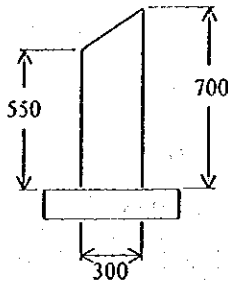
$(0.6 \times 0.40 - 0.2 \times 0.2) \times 2.70$  = 0.54 m<sup>3</sup>

**Total Concrete K 225 for Slab and Stop Lock**

$17.64 + 1.792 + 0.54$  = 19.972 m<sup>3</sup>

## CONCRETE K 225 FOR REVETMENT

## - Top Concrete

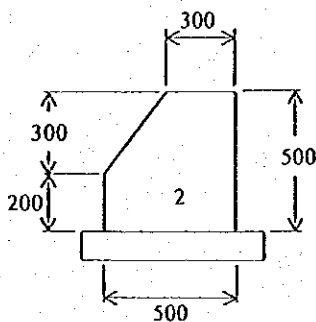


$$A = \frac{0.55 + 0.70}{2} \times 0.30 = 0.188 \text{ m}^2$$

$$L = 24 \times 2 = 48 \text{ m}$$

$$\text{Volume} = 0.188 \times 48 = 9.024 \text{ m}^3$$

## - Base Concrete



$$A1 = \frac{0.50 + 0.30}{2} \times 0.30 = 0.12 \text{ m}^2$$

$$A2 = 0.2 \times 0.50 = 0.10 \text{ m}^2$$

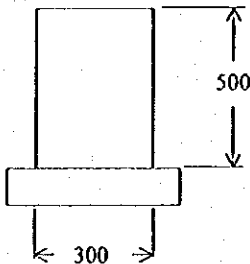
$$\text{Total} = 0.12 + 0.10 = 0.22 \text{ m}^2$$

$$L = 10.5 \times 2 = 21 \text{ m}$$

$$\text{Volume} = 0.22 \times 21 = 4.62 \text{ m}^3$$

$$\text{Form work} = 2 \times 0.1 \times (48 + 21 + 18) = 17.4 \text{ m}^2$$

## - Partition Wall



$$A = 0.50 \times 0.30 = 0.15 \text{ m}^2$$

$$L = 4.5 \times 4 = 18 \text{ m}$$

$$\text{Volume} = 0.15 \times 18 = 2.7 \text{ m}^3$$

## Total Concrete K 225 for Revetment

$$9.024 + 4.62 + 2.70 = 16.36 \text{ m}^3$$

## Total Concrete K 225

$$19.972 + 16.36 = 36.332 \text{ m}^3$$

## Concrete

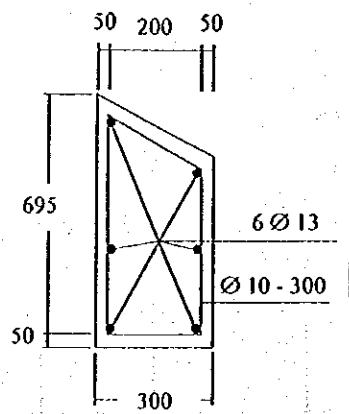
$$0.1 \times 0.50 \times 87 = 4.35 \text{ m}^3$$

$$0.1 \times 0.7 \times 0.5 \times 66 = 4.77 \text{ m}^3$$

LEVELING

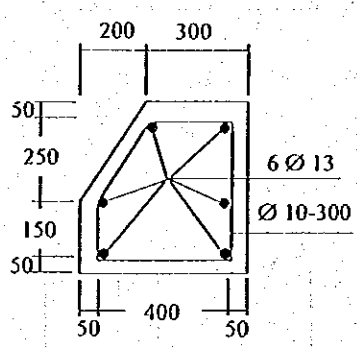
**CONCRETE FOR REVETMENT BARU RETARDING POND**

**1. Top Concrete**



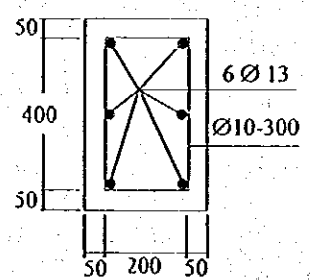
Type	Dia (mm)	Length (m)	No.	Weight Per m	Weight Per Bar	Total (kg)
1	13	24	6 x 2	1.040	24.96	299.52
2	10	1.56	81x2	0.617	0.96	155.52
<b>Total</b>						<b>455.04</b>

**2. Base Concrete**



Type	Dia (mm)	Length (m)	No.	Weight Per m	Weight Per Bar	Total (kg)
1	13	10.5	6 x 2	1.040	10.92	131.04
2	10	1.51	36x2	0.617	0.932	67.104
<b>Total</b>						<b>198.144</b>

**3. Partition Wall**



Type	Dia (mm)	Length (m)	No.	Weight Per m	Weight Per Bar	Total (kg)
1	13	4.5	6 x 4	1.040	4.68	112.32
2	10	1.26	16x4	0.617	0.777	49.73
<b>Total</b>						<b>162.05</b>

**Total 1 + 2 + 3**

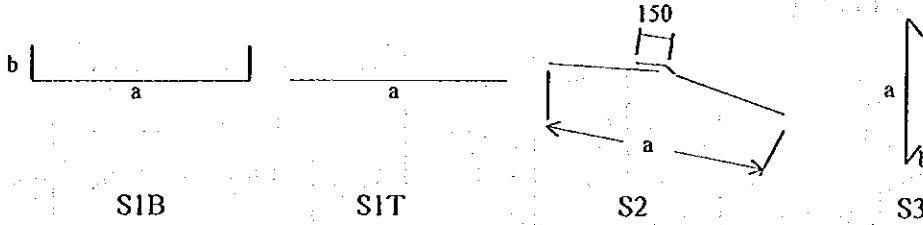
$$455.04 + 198.144 + 162.05 = 815.232 \text{ kg}$$

**Total Reinforcing Bar**

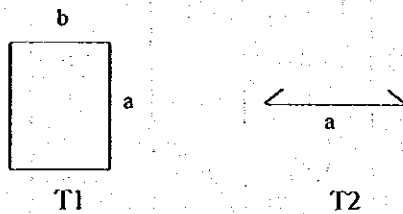
$$1,476.72 + 815.232 = 2,291.95 \text{ kg} \quad \checkmark$$

## REINFORCING BAR

## SLAB

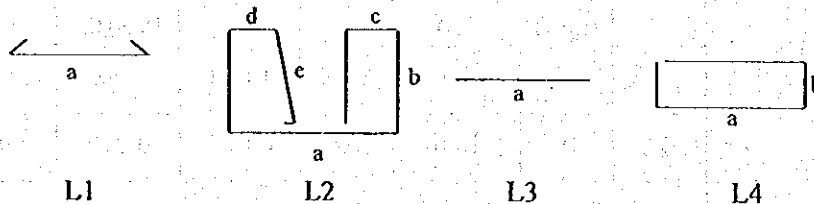


Type	Dia	Length (mm)	Number	Weight/m kg/m	Weight/bar (kg)	Weight (kg)	Shape
S1B	13	2,804	80	1.040	2.916	233	
S1T	13	2,740	80	1.040	2.849	226	
S2	13	17,190	30	1.040	17.877	537	
S3	13	398	75	1.040	0.414	31	
TOTAL = 1,029 kg							



Type	Dia	Length (mm)	Number	Weight/m kg/m	Weight/bar (kg)	Weight (kg)	Shape
T1	10	1,240	94	0.617	0.765	72	
T2	13	14,000	4	1.040	14.560	87.36	
TOTAL = 159.36 x 2 = 318.72 kg							

## STOP LOCK GROOVE



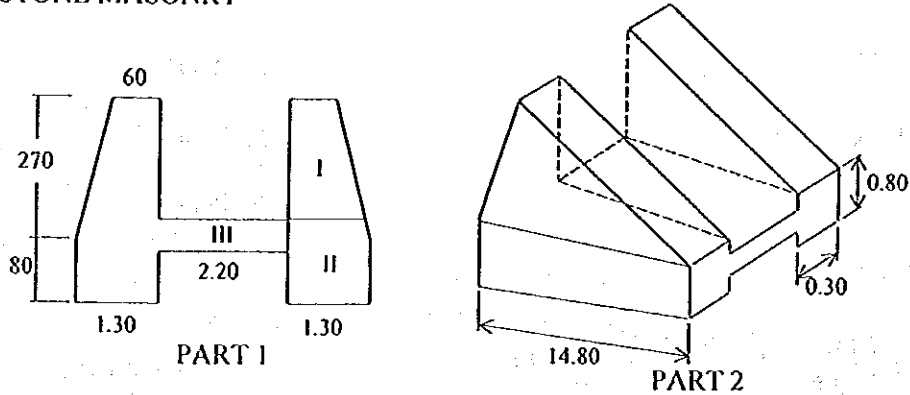
Type	Dia	Length (mm)	Number	Weight/m kg/m	Weight/bar (kg)	Weight (kg)	Shape
L1	13	2,840	24	1.040	2.953	71	
L2	13	1,230	30	1.040	1.279	38	
L3	13	520	30	1.040	0.541	16	
L4	13	860	4	1.040	0.894	4	
TOTAL = 129 kg							

Total Reinforcing Bar = 1,029 + 318.72 + 129 = 1,476.72 kg



Name of Structure	Category Calculation	STONE MASONRY VOLUME	Page	7/11
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**STONE MASONRY**



- Part 1

$$\text{Area I} = (0.65 + 1.30) / 2 \times 2.70 \times 2 = 5.265 \text{ m}^2$$

$$\text{Area II} = 0.80 \times 1.30 \times 2 = 2.080 \text{ m}^2$$

$$\text{Area III} = 0.30 \times 2.20 = 0.66 \text{ m}^2$$

$$\text{Total Area} = 8.005 \text{ m}^2$$

$$\text{Length of Part 1} = 15.75 \text{ m}$$

$$\text{Volume in Part 1} = 15.75 \times 8.005 = 126.08 \text{ m}^3$$

- Part 2

$$\text{Area of End} = 0.80 \times 0.3 \times 2 + 0.3 \times 2.20 = 1.14 \text{ m}^2$$

$$\text{Volume Part 2} = \frac{1.14 + 8.005}{2} \times 14.80 = 67.500 \text{ m}^3$$

$$\text{Sub Total Volume Part 1 \& Part 2} = 193.58 \text{ m}^3 \quad \checkmark$$

- REVETMENT:

$$1. \frac{1.51 + 0.5}{2} \times 3 \times 2 \times 0.3 = 1.81 \text{ m}^3$$

$$2. 1.51 \times 4.5 \times 2 \times 0.30 = 4.08 \text{ m}^3$$

$$3. \frac{1.51 + 4.6}{2} \times 7 \times 2 \times 0.30 = 12.83 \text{ m}^3$$

$$4. 4.6 \times 10 \times 2 \times 0.30 = 27.60 \text{ m}^3$$

$$5. \frac{2.20 + 10}{2} \times 10 \times 0.30 = 18.30 \text{ m}^3$$

$$\text{Sub Total} = 64.62 \text{ m}^3$$

$$\text{Total} = 193.61 + 64.62 = 258.23 \text{ m}^3$$

- BACK FILL GRAVEL:

$$1. \frac{1.51 + 0.5}{2} \times 3 \times 2 \times 0.25 = 1.51 \text{ m}^3$$

Name of Structure		Category Calculation	STONE MASONRY VOLUME	Page	8/11
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$$2. \quad 1.51 \times 4.5 \times 2 \times 0.25 = 3.40 \text{ m}^3$$

$$3. \quad \frac{1.51 + 4.6}{2} \times 7 \times 2 \times 0.25 = 10.69 \text{ m}^3$$

$$4. \quad 4.6 \times 10 \times 2 \times 0.25 = 15.25 \text{ m}^3$$

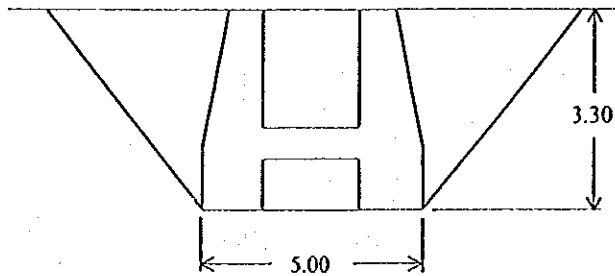
$$\text{Total} = 30.85 \text{ m}^3$$

- WEEP HOLE:

$$2 \times 2 \times \left( \frac{15.75}{2.0} + 1 \right) + \frac{2 \times 2}{2} \times \left( \frac{14.8}{2.0} + 1 \right) = 48 \text{ nos}$$

Name of Structure		Category Calculation	EXCAVATION VOLUME	Page	9/11
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**- EXCAVATION**



Area =  $(5.0 + 2 \times 3.3 + 5) / 2 \times 3.30 = 27.39 \text{ m}^2$

Length of Excavation Part 1 = 15.75 m

Volume =  $15.75 \times 27.39 = 431.4 \text{ m}^3$

**Excavation for Part 2 (transition)**

Area 1 =  $27.39 \text{ m}^2$

Area 2 =  $(5 + 3.7 \times 2 \times 2 + 5) / 2 \times 3.70 = 45.88 \text{ m}^2$

Length of Excavation = 15 m

Volume Exc. =  $15 \times 45.88 = 688.20 \text{ m}^3$

Total Volume =  $431.4 + 688.20 = 1,119.6 \text{ m}^3$

**- BACK FILLING**

$1,119.6 \text{ m}^3 - 4.8 \times 3.3 \times 15.75 = 870.12 \text{ m}^3$

$V = 2 \times \frac{0.5 + 4.0}{2} \times 3.5 \times 15.75 = 248.06 \text{ m}^3$

$\frac{0.7 + 2.7}{2} \times 15.75 = 14.88 \text{ m}^3$

$2 \times \frac{0.5 \times 0.5}{2} \times (15.75 + 14.80) = 7.64 \text{ m}^3$

Total V = 270.58 m<sup>3</sup>

Name of Structure	/	Category Calculation	EXCAVATION VOLUME	Page	10/11
- Log Pile		$= 2 \times 2 \times 3.0 \times \left( \frac{15.75}{2} + 1 \right) + 2$ $\times 3.0 \times \left( \frac{14.8}{2} + 1 \right)$	= 144 m		
- COBBLE STONE					
		$2 \times (13.0 + 2.75) \times 1.5 \times 0.15$	= 7.09 m <sup>3</sup>		
		$2 \times 14.8 \times \frac{1.5 + 0.55}{2} \times 0.15$	= 4.551 m <sup>3</sup>		
Total			= 11.641 m <sup>3</sup>	✓	
- POINTING					
Part 1					
		$2 \times 2.3 \times 15.75$	= 72.45 m <sup>2</sup>		
Part 2					
		$\frac{\sqrt{2.05^2 + 4.1^2} \times 2 \times 14.8}{2}$	= 67.84 m <sup>2</sup>		
Total			= 140.29 m <sup>2</sup>	✓	

Name of Structure		Category Calculation	FORM WORK VOLUME	Page	11/11
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**- FORM WORK**

- Slab = 15.75 m x 2.80 m = 44.10 m<sup>2</sup>

- Concrete For Revetment:

Top Concrete = (0.55 + 0.70) x 24 x 2 = 60 m<sup>2</sup>

0.10 x 2 x 24 x 2 = 9.60 m<sup>2</sup>

Sub Total = 69.60 m<sup>2</sup>

Base Concrete = 0.55 x 10.5 + 0.5 x 10.5 = 11.025 m<sup>2</sup>

0.10 x 2 x 10.5 = 2.10 m<sup>2</sup>

0.50 x 2 x 10.5 = 10.50 m<sup>2</sup>

Sub Total = 23.625 m<sup>2</sup>

Total = 69.60 + 23.625 = 93.225 m<sup>2</sup>

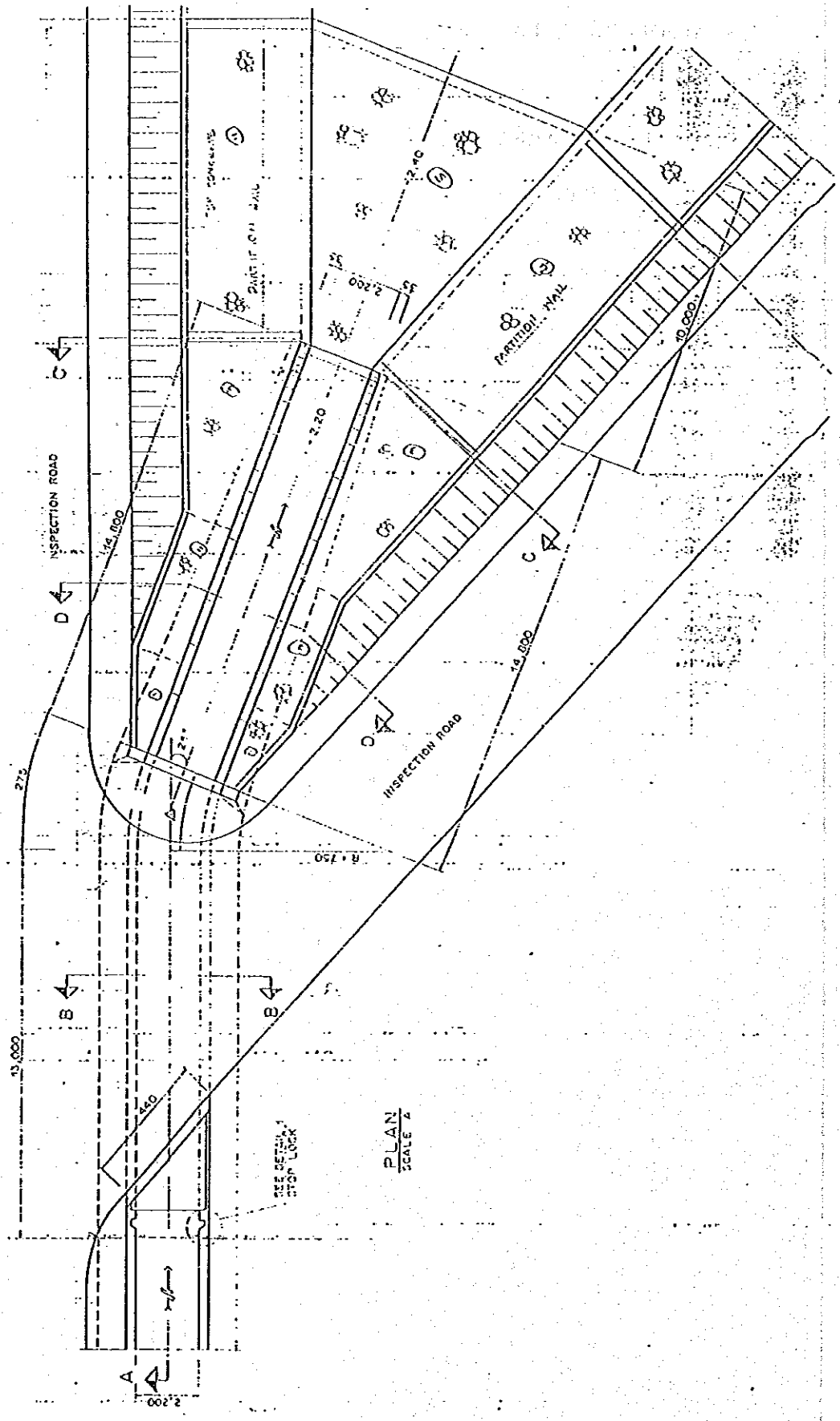
Name of Structure	SCAFOLDING AND FORM SUPPORT, FOR BANDARHARJO DRAINAGE SYSTEM	Category Calculation	WORK VOLUME	Page	1/1
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**SUMMARY OF SCAFFOLDING AND FORM SUPPORT VOLUME,  
FOR BANDARHARJO DRAINAGE SYSTEM**

No.	STRUCTURE	VOLUME	SCAFFOLDING (m <sup>2</sup> )	FORM SUPPORT (m <sup>3</sup> )
1	BARU PUMPING STATION		1049	549
2	BARU PUMPING STA. GATE		350	120
3	BARU CONVEYANCE CHANNEL		6574	2768
4	BARU CONVEYANCE CHANNEL INLET STRUCTURE		150	35
5	BARU CONVEYANCE CHANNEL OUTLET STRUCTURE		106	20
6	BANDARHARJO EAST SECONDARY CHANNEL		1166	491
7	BANDARHARJO EAST SECONDARY CHANNEL OUTLET STR.		90	31
8	BARU RETARDING POND INLET STRUCTURE NO. 1		-	77
9	BARU RETARDING POND INLET STRUCTURE NO. 2		-	42
10	FUEL TANK BOX FOR BARU PUMPING STATION		133	62
<b>TOTAL</b>			<b>9618</b>	<b>4195</b>

Name of Structure	BARU RETARDING POND INLET STRUCTURE NO.1 FOR SCAFFOLDING AND FORM SUPPORT	Category Calculation	FORM WORK VOLUME	Page	1/1
<p data-bbox="347 349 663 383">1. SCAFFOLDING AREA</p> <hr data-bbox="443 443 603 454"/> <p data-bbox="347 488 679 521">2. FORM SUPPORT AREA</p> <p data-bbox="424 551 807 584"><math>15.20 \times 2.20 \times 2.30 = 76.91 \text{ m}^3</math></p>					

Name of Structure	Baru Stading Land Inlet no 1	Category of calculation	Volume calculation	Page	2/10
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Name of Structure	BANDARHARJO WEST SECONDARY CHANNEL (OPEN CHANNEL)	Category of calculation	SUMMARY CHANNEL WORK VOLUME	Page	1 / 8
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**SUMMARY OF CHANNEL WORK AND INSPECTION ROAD VOLUME CALCULATION**

**I. PONDS WORKS**

1. Dewatering	=	LS	
2. Channel Excavation	=	11,239.65	cu.m
3. Structure Excavation	=	1,967.96	cu.m
4. Back Fill with Sandy Soil	=	7,848.98	cu.m
5. Wet masonry (c : s = 1 : 4)	=	3,753.11	cu.m
6. Cement Mortar Plestering	=	15.42	cu.m
7. Pointing	=	2,399.25	sq.m
8. Water Stop with Rubber Filler	=	198	m'
9. Weep hole, PVC Pipe $\phi$ 50	=	1,433	nos
10. Cobble Stone	=	231.36	cu.m
11. Log pile $\phi$ 150, L = 3.0 cm	=	6,864	m'

**II. INSPECTION ROAD**

1. Land Striping	=	3,513.19	sq.m
2. Road Embankment	=	1,670.906	cu.m
3. Compacted Sand	=	171.38	cu.m
4. Aggregate Class A	=	428.44	cu.m
5. Aggregate Class B	=	628.38	cu.m
6. Concrete Kerb	=	68.55	cu.m
7. Sand bedding	=	171.38	cu.m
8. Concrete block pavement	=	2,856.25	sq.m
9. Cement mortar	=	6.856	cu.m

Name of Structure	BARU CONVEYANCE CHANNEL INLET	Category Calculation	RESUME VOLUME	Page	1 / 17
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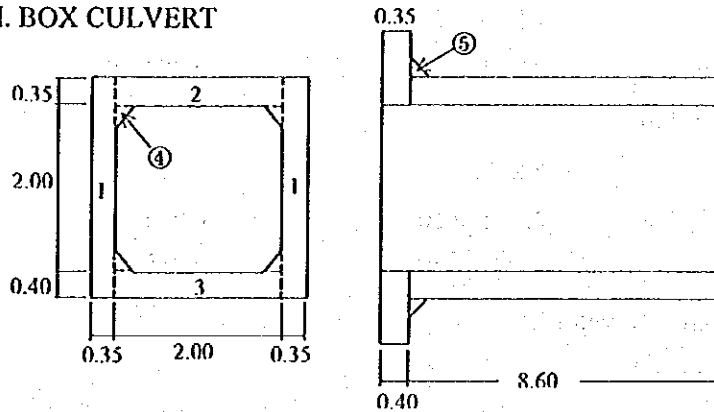
**BARU CONVEYANCE CHANNEL INLET**

1.	CONCRETE K 225	=	55.63 m <sup>3</sup>
2.	CONCRETE K 125 (LEVELING CONCRETE)	=	5.170 m <sup>3</sup>
3.	REINFORCING BAR	=	3,618 Kg
4.	STONE MASONRY	=	92.50 m <sup>3</sup>
5.	BACK FILLING GRAVEL	=	42.13 m <sup>3</sup>
6.	EXCAVATION	=	328.17 m <sup>3</sup>
7.	BACK FILLING	=	220.38 m <sup>3</sup>
8.	LOG PILE Ø 15 cm, L=3.00	=	90 m'
9.	PVC WEEP HOLE Ø 50 mm	=	140 nos.
10.	FORM WORK	=	226.675 m <sup>2</sup>
11.	COBBLE STONE	=	5.87 m <sup>3</sup>
12.	POINTING	=	112 m <sup>2</sup>

Name of Structure	BARU CONVEYANCE CHANNEL INLET	Category Calculation	CONCRETE VOLUME	Page	2 / 17
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**BARU CONVEYANCE CHANNEL INLET**

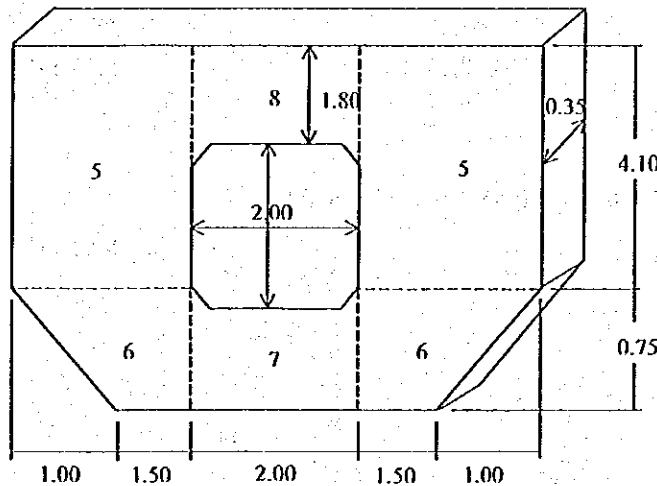
**I. BOX CULVERT**



**1. Concrete K 225**

(1) Side Wall	=	$0.35 \times 2.75 \times 8.60 \times 2$	=	$16.55 \text{ m}^3$
(2) Top Slab	=	$0.35 \times 2.70 \times 8.60$	=	$8.13 \text{ m}^3$
(3) Bottom Slab	=	$0.40 \times 2.70 \times 8.60$	=	$2.408 \text{ m}^3$
(4) Footing	=	$0.15 \times 0.15/2 \times 4 \times 8.60$	=	$9.288 \text{ m}^3$
<b>Total</b>			=	<b><math>36.376 \text{ m}^3</math></b>

**II. WING WALL**



(5) Wing Wall	=	$2.50 \times 4.10 \times 0.35 \times 2$	=	$7.18 \text{ m}^3$
(6) Wing Wall	=	$x 0.75 \times 0.35 \times 2$	=	$1.050 \text{ m}^3$
(7) Wing Wall	=	$0.40 \times 0.75 \times 2$	=	$0.60 \text{ m}^3$
(8) Wing Wall	=	$0.35 \times 1.80 \times 2$	=	$1.260 \text{ m}^3$
<b>Total</b>			=	<b><math>10.086 \text{ m}^3</math></b>
<b>Total Volume of Concrete K 225</b>			=	<b><math>36.376 + 10.086 = 46.462 \text{ m}^3</math></b>

Name of Structure	BARU CONVEYANCE CHANNEL INLET	Category Calculation	CONCRETE VOLUME	Page	3 / 17
<b>2. Plain Concrete K 125</b>					
- At Bottom of Culvert, t = 10 cm					
	Area of Bottom	= 2.90 x 8.60	= 24.94 m <sup>2</sup>		
	Vol. of Plain Concrete	= 24.94 x 0.10	= 2.494 m <sup>3</sup>		
- At Bottom of Wing Wall					
	Area of Bottom	= 5 x 0.55	= 2.75 m <sup>2</sup>		
	Vol. of Plain Concrete	= 2.75 x 0.10	= 0.275 m <sup>3</sup>		
	<b>Total</b>		= 2.769 m <sup>3</sup>		
- At Bottom of Concrete Revetment					
Bottom of Top Concrete					
	Area of Bottom	= 0.50 x 2 x 7.5	= 7.50 m <sup>2</sup>		
	Vol. of Plain Concrete	= 7.50 x 0.10	= 0.75 m <sup>3</sup>		
Bottom of Base Concrete					
	Area of Bottom	= 0.50 x 2 x 10	= 10 m <sup>2</sup>		
	Vol. of Plain Concrete	= 10 x 0.10	= 1.0 m <sup>3</sup>		
Bottom of Partition Concrete					
	Area of Bottom	= 0.50 x 2 x 6.5	= 6.50 m <sup>2</sup>		
	Vol. of Plain Concrete	= 6.50 x 0.10	= 0.65 m <sup>3</sup>		
	<b>Total</b>		= 2.40 m <sup>3</sup>		
	<b>Total Plain Concrete</b>	= 2.77 + 2.40	= 5.17 m <sup>3</sup>		
- Form Work Type E					
	2 x 0.1 x (2.9 + 8.6 + 5 + 0.55 + 0.5 + 7.5 + 0.5				
	+ 10 + 0.5 + 6.5		= 8.51 m <sup>2</sup>		