

BILL OF QUANTITIES

BOX CULVERTS

VEHICLE BOX CULVERTS ——— 1

WATER BOX CULVERTS ——— 47

PEDESTRIAN BOX CULVERTS ——— 84-100

NO1 BOX FOR ROAD

(B1) BOX Length=16.150m(mean) skew angle=80°10'56"~90°.00'
 $\alpha = 1/\sin 80^\circ 10' 56'' = 1.0149$

1) concrete(grade:25)

bottom slab	$V = 11.80 \times 1.00 \times 16.150$	=171.513m ³
top slab	$V = \text{ " } \times 0.90 \times \text{ " }$	=190.570 "
side slab	$V = 5.80 \times 0.90 \times \text{ " } \times 2$	=168.606 "
wing wall	$V = (29.976 \times 7.361 - 6.00 \times 9.00 - 7.090 \times 11.976) \times 0.60$ $= (81.743) \times 0.60$	=49.046m ³

total V= =579.735m³

2) formwork

Section	$A = (11.80 \times 7.70 - 10.0 \times 5.80) (1.0 + 1.0149)$	=66.209m ²	=493.017
Out side	$A = 7.70 (16.150 - 0.60 \times 1.0149) \times 2$	=239.332 "	
" (wing)	$A = 7.70 \times 0.60 \times 1.0149 \times 2$	=9.377 "	
wing:side	$A = \text{※} 81.743 \times 2$	=163.486 "	
:section	$A = 0.60 (1.361 + \sqrt{6.0^2 + 9.0^2}) \times 2$	=14.613 "	
in side	$A = 5.80 \times 16.150 \times 2$	=187.340 "	
top slab	$A = 10.00 \times \text{ " }$	=161.500 "	

total A= =841.857 "

(B2) BOX length=16.150m(mean) skew angle =90°00'~76°.00'
 $\alpha = 1/\sin 76^\circ = 1.0307$

1) concrete(grade:25)

bottom slab	V=	=171.513m ³
top slab	V=	=190.570 "
side slab	V=	=168.606 "
wing wall	$V = (29.976 \times 7.361 - 6.0 \times 9.0 - 7.090 \times 12.162) \times 0.60$ $= (80.425) \times 0.60$	=48.255 "

total V= =578.944 "

2) formwork

section	$A = (11.80 \times 7.7 - 10.0 \times 5.80) \times 1.0307$	=33.868m ²	=458.040
out side	$A = 7.70 (16.150 - 0.60 \times 1.0307) \times 2$	=239.186 "	
" (wing)	$A = 7.70 \times 0.60 \times 1.0307 \times 2$	=9.523 "	
wing:side	$A = \text{※} 80.425 \times 2$	=160.850 "	
:section	A=	=14.613 "	
in side	A=	=187.340 "	
top slab	A=	=161.500 "	

total A= =806.880 "

3) excavation (earth)

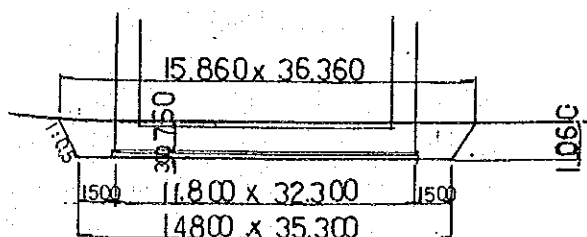
$V = 1.060/6 \{ (14.80 \times 35.30 + 15.860 \times 36.360) + (14.80 + 15.86) (35.30 + 36.360) \}$ =582.329m³/box

remain

$V = 39.005 + 78.010 + 0.76 \times 11.80 \times 32.30 = 406.681\text{m}^3/\text{box}$

back fill

$V = 582.329 - 406.681 = 175.648\text{m}^3/\text{box}$



NO1 BOX FOR ROAD

4) base concrete (grade:15)

concrete $V = 0.10 \times 12.00 \times \{32.30 + 0.10(1.0149 + 1.0307)\} = 39.005 \text{ m}^3/\text{box}$

form work $A = 0.10 \{32.30 \times 2 + 12.00(1.0149 + 1.0307)\} = 8.914 \text{ m}^2/\text{box}$

5) joint filler $A = 11.80 \times 7.70 - 10.0 \times 5.80 = 32.860 \text{ m}^2/\text{box}$

6) water stop $L = (10.90 + 6.75) \times 2 = 35.300 \text{ m}/\text{box}$

7) base(crucherran)

$V = 0.20 \times 12.00 \{32.30 + 0.10(1.0149 + 1.0307)\} = 78.010 \text{ m}^3/\text{box}$

8) support: top slab (B1) $V = 10.0 \times (5.80 - 0.10) \times 16.150 = 920.550 \text{ m}^3$ (B2) $V =$ $= 920.550 \text{ m}^3$

:wing " $V = 9.0(6.0 - 0.10) \times 0.60 = 31.860$ " " $V =$ $= 31.860$ "

total $V_{B1} = 952.410 \text{ m}^3$ $V_{B2} = 952.410 \text{ m}^3$

9) scaffold: main " $V = 1.20 \times 7.70 \times 16.150 \times 2 = 298.452 \text{ m}^3$ $V =$ $= 298.452$ "

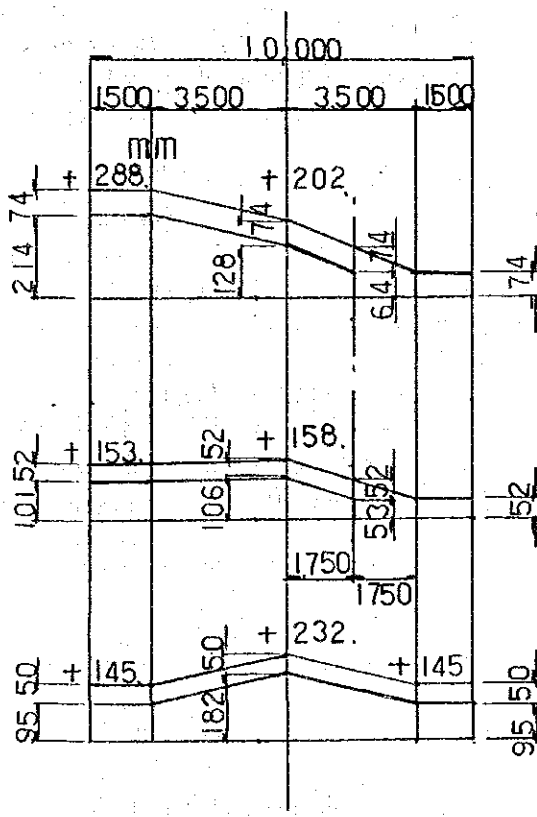
:wing " $V = 1.20 \times 7.70 \times 9.00 \times 2 \times 2 = 332.640$ " " $V =$ $= 332.640$ "

total $V_{B1} = 631.092$ " $V_{B2} = 631.092$ "

10) Pavement --- into Box -----

Asphalt $\left\{ \begin{array}{l} A1 = 0.074 \times 10.0 + 1/2 \times 0.064 \times 1.75 = 0.796 \text{ m}^2 \\ A2 = 0.052 \times 10.0 + 1/2 \times 0.053 \times 1.75 = 0.566 \text{ m}^2 \\ A3 = 0.050 \times 10.0 = 0.500 \text{ m}^2 \end{array} \right.$

$\therefore V = 1/2 \{ (0.796 + 0.566) \times 16.10 + (0.566 + 0.500) \times 16.2 \} = 19.598 \text{ m}^3/\text{box}$



base: $\left\{ \begin{array}{l} A1 = 0.214 \times 1.50 + 1/2(0.214 + 0.128) \times 3.50 \\ \quad + 1/2(0.128 + 0.064) \times 1.750 = 1.087 \text{ m}^2 \\ A2 = 0.101 \times 1.50 + 1/2(0.101 + 0.106) \times 3.50 \\ \quad + 1/2(0.106 + 0.053) \times 1.75 = 0.653 \text{ m}^2 \\ A3 = 0.095 \times 1.50 \times 2 + (0.095 + 0.182) \times 3.50 = 1.254 \text{ m}^2 \end{array} \right.$

$\therefore V = 1/2 \{ (1.087 + 0.653) \times 16.10 + (0.653 + 1.254) \times 16.20 \} = 29.453 \text{ m}^3/\text{box}$

NO 2 BOX ROAD

(B1) = (B2) BOX

1) concrete(grade:25) l=13.750m $\theta=90^\circ$

bottom slab	$V=9.40 \times 0.70 \times 13.750$	=90.475m ³
top slab	$V= " \times 0.80 \times "$	=103.400 "
side wall	$V=5.60 \times 0.70 \times " \times 2$	=107.800 "
wing wall	$V= \{27.0(7.464-0.267)-1/2(5.733 \times 8.60+6.00 \times 9.0)-9.40 \times (7.10-0.267)\} \times 0.6$ $= \{78.437\} \times 0.60$	=47.062

total V= =348.737

2) form-section A=(9.40×7.10-8.0×5.60)×2
work = (21.940)×2

out side	$A=7.10(13.750-0.60) \times 2$	=186.730 "	(388.352) 410.292
" (wing)	$A=7.10 \times 0.60 \times 2$	=8.520 "	
wing:side	$A=78.437 \times 2$	=156.874 "	
:section	$A=0.60(1.464+1.197+\sqrt{5.733^2+8.60^2}+\sqrt{6.0^2+9.0^2})$	=14.288 "	
in side	$A=5.60 \times 13.750 \times 2$	=154.000 "	
top slab	$A=8.0 \times 13.750 \times 2$	=110.000 "	

total V= =674.292 " (652.352)
(B1) (B2)

3) base concrete(grade:15)

concrete	$V=9.60 \times 27.70 \times 0.10$	=26.592m ³ /box
formwork	$A=(9.60+27.70) \times 0.10 \times 2$	=7.460m ² /box

4) base V=9.60×27.70×0.20 =53.184m³/box
(crusherran)

5) suport:topslab V=8.0(5.60-0.10)×13.75 =605.000m³
:wing V=1/2 {(5.733-0.10)×8.60+(6.0-0.10)×9.0} ×0.60=30.463m³] =635.463

6) scaffold:main V=1.20×7.10×13.750×2 =234.300m³
:wing V=1.20(8.60+9.00)×7.10×2 =299.904m³] =534.204

7) joint filler A=9.40×7.10-8.0×5.60 =21.940m²/box

8) water stop L=(6.350+8.70)×2 =30.100m/box

9) pavement V= {0.05×1.00×2+(0.05+0.095)×3.00} ×27.50 =14.712m³/box

asphalt

10) ecavation(earth)

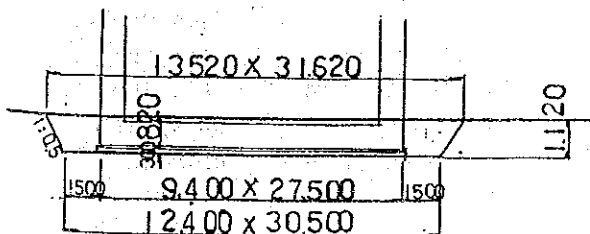
$$V= 1.120/6 \{12.40 \times 30.50 + 13.520 \times 31.620 + (12.40+13.520)(30.50+31.620)\} =450.959m^3/\text{box}$$

remain

$$V=9.60 \times 27.70 \times 0.30 + 9.40 \times 27.50 \times 0.020 =84.946m^3/\text{box}$$

back fill

$$V=450.959-84.946 =366.013m^3/\text{box}$$



NO 3 BOX FOR ROAD

(B1) L=16.420m (mean) skew angle = 60° ~ 90°
 $\alpha = 1/\sin 60^\circ = 1.1547$

1) concrete

bottom slab	V=16.420×12.40×1.30	=264.690m ³
top "	V= " × " × 1.20	=244.329 "
side wall	V= " × 6.00 × 1.20 × 2	=236.448 "
wing "	V= {8.30×8.496-1/2×8.30(1.714+5.533)+14.318×0.30} × 0.60 = {44.737} × 0.60	=26.842 "

total	V=	=772.309 "
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2) formwork

section	A=(12.40×8.50-10.00×6.00)×1.1547	=52.423m ²] = 427.978
out side	A=8.50×16.420×2-0.693×8.20	=273.457 "	
" wing	A=0.693×8.20	=5.682m "	
wing side	A=※44.737×2	=89.474 "	
section	A=0.60×1.1547×0.30+0.60(1.249+√{5.533 ² +8.30 ² })	=6.942 "] = 197.040 "
in side	A=6.00×16.420×2	=197.040 "	
top slab	A=10.0×16.420	=164.200 "	

total	A=	=789.218m ²
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3) support:topslab	V=(6.00-0.10)×10.00×16.420	=968.780m ³] = 982.308
:wing	V=1/2(5.533-0.10)×8.30×0.60	=13.528 "	
4) scaffold:main	V=1.20×8.50×16.420×2	=334.968 "] = 504.288
:wing	V=1.20×8.50×8.30×2	=169.320 "	

NO 3 BOX FOR ROAD

(B2) L=18.224m $\theta = 90^\circ$

1) concrete

bottom slab	V=18.224×12.40×1.30	=293.770m ³
top slab	V= " × " × 1.20	=271.173 "
side wall	V= " × 6.00 × 1.20 × 2	=262.425 "

total	V=	=827.368 "
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2) form work

section	A=(12.40×8.50-10.00×6.00)×2	=90.800m ²] = 400.608
out sid	A=8.50×18.224×2	=309.808 "	
in side	A=6.00× " × 2	=218.688 "	
top slab	A=10.00× "	=182.240 "	

total	A=	=801.536 "
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3) support:topslab	V=(6.00-0.10)×10.00×18.224	=1075.216m ³
4) scaffold:main	V=1.20×8.50×18.224×2	=371.769m ³

NO 3 BOX FOR ROAD

⑧ L=15.856m(mean) skew angle = 90° ~ 56°

1) concrete

bottom slab	$V = 15.856 \times 12.40 \times 1.30$	$= 255.598 \text{ m}^3$
top	$V = \text{ " } \times \text{ " } \times 1.20$	$= 235.937 \text{ "}$
side wall	$V = \text{ " } \times 6.00 \times 1.20 \times 2$	$= 228.326 \text{ "}$
wing	$V = 0.70 \{ (14.966 \times 0.30) + 1/2 (1.405 + 8.50) \times 9.90 + 1/2 (1.416 + 8.50) \times 11.50 \}$ $= 0.70 (110.536)$	$= 77.375 \text{ "}$

total $V =$ $= 797.236 \text{ "}$

2) formwork

section	$A = (12.40 \times 8.50 - 10.00 \times 6.00) \times 1.2063$	$= 54.766 \text{ m}^2$] = 565.367
out side	$A = 8.50 \times 15.856 \times 2 - 0.70 \times 1.2063 \times 8.20$	$= 262.627 \text{ "}$	
" (wing)	$A = 0.70 \times 1.2063 \times 8.20$	$= 6.924 \text{ "}$	
wing side	$A = \text{※} 110.536 \times 2$	$= 221.072 \text{ "}$	
section	$A = 0.70 \{ 1.405 + 1.416 + \sqrt{6.60^2 + 9.90^2} + \sqrt{7.667^2 + 11.50^2} \}$	$= 19.978 \text{ "}$	
in side	$A = 6.00 \times 15.856 \times 2$	$= 190.272 \text{ "}$	
top slab	$A = 10.0 \times \text{ "}$	$= 158.560 \text{ "}$	

total $= 914.199 \text{ "}$

3) support: top slab $V = (6.00 - 0.10) \times 10.60 \times 15.856$ $= 935.504 \text{ m}^3$
wing $V = 1/2 \{ (6.60 - 0.10) \times 9.90 + (7.667 - 0.10) \times 11.50 \} \times 0.70 = 52.979 \text{ "}$] = 988.483

4) scaffold: main $V = 1.20 \times 8.50 \times 15.856 \times 2$ $= 323.462 \text{ "}$
wing $V = 1.20 \times 8.50 (9.90 + 11.50) \times 2$ $= 436.560 \text{ "}$] = 760.022

5) joint filler $A = (12.40 \times 8.50 - 10.00 \times 6.00) \times 2$ $= 90.800 \text{ m}^2/\text{box}$
(t=20mm)

6) water stop $L = (11.20 + 7.25) \times 2 \times 2$ $= 73.800 \text{ m}/\text{box}$

7) base concrete (grade: 15)

concrete $V = \{ 50.50 + 0.10 (1.1547 + 1.2063) \} \times 12.60 \times 0.10$
 $= \{ 50.736 \} \times 12.60 \times 0.10$ $= 63.927 \text{ m}^3/\text{box}$

formwork $A = \text{※} \{ 50.736 \times 2 + 14.318 + 14.966 \} \times 0.10$ $= 13.075 \text{ m}^2/\text{box}$

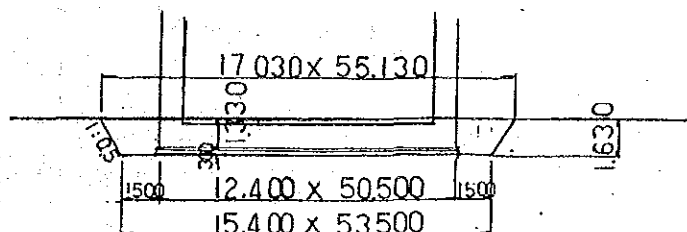
8) base (crusherran) $V = \text{※} 50.736 \times 12.60 \times 0.20$ $= 127.854 \text{ m}^3/\text{box}$

9) excavation (earth)

$V = 1.630/6 \{ 15.40 \times 53.50 + 17.030 \times 55.130 + (15.40 + 17.030) (53.50 + 55.130) \}$ $= 1435.930 \text{ m}^3/\text{box}$

remain: $V = \text{※} 50.736 \times 12.60 \times 0.30 + 12.40 \times 50.50 \times 1.330$ $= 1024.628 \text{ m}^3/\text{box}$

backfill: $V = 1435.930 - 1024.628$ $= 411.302 \text{ m}^3/\text{box}$



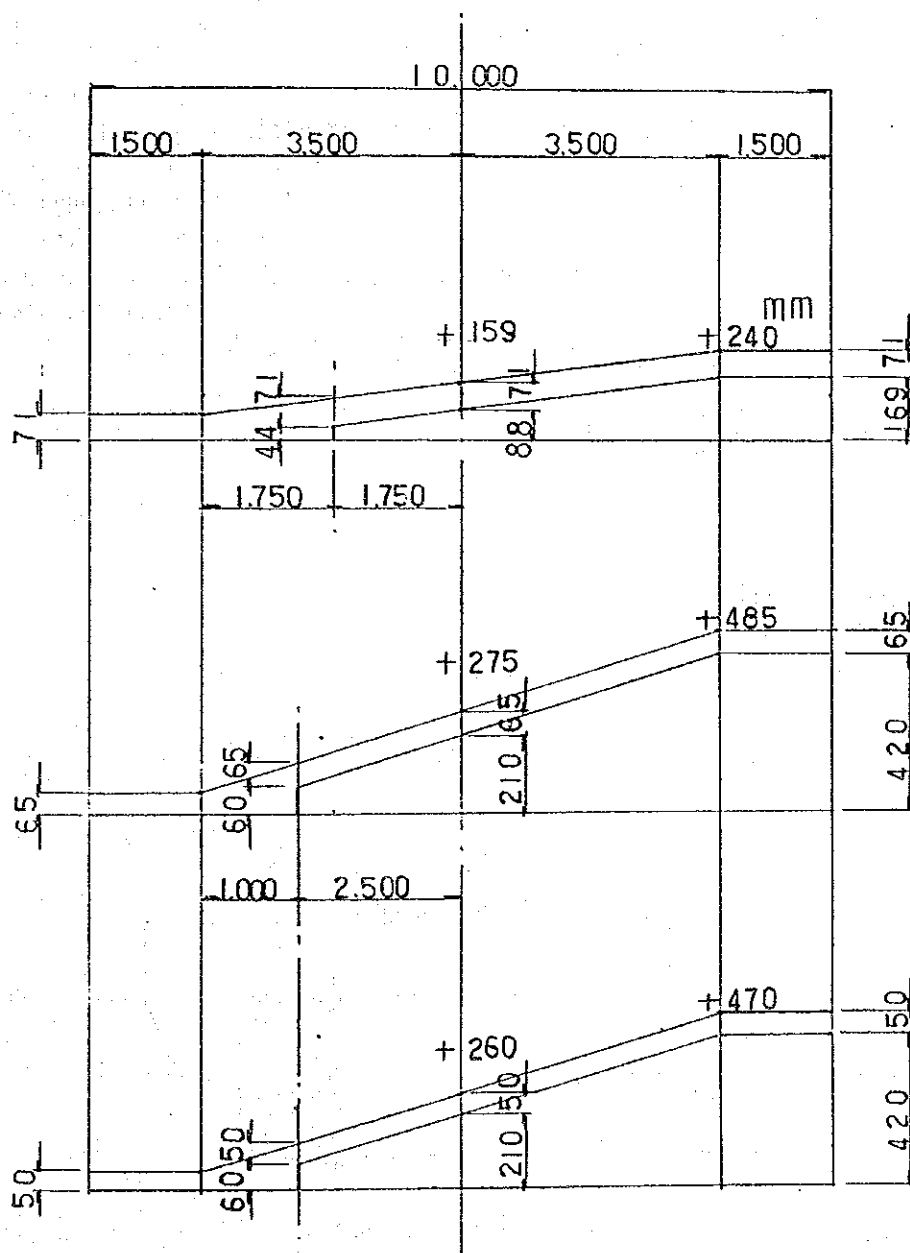
NO 3 BOX FOR ROAD

10) pavement
Asphalt

$$\begin{aligned} A1 &= 0.071 \times 10.0 + 1/2 \times 0.044 \times 1.75 &= 0.748 \text{ m}^2 \\ A2 &= 0.065 \times \text{"} + 1/2 \times 0.060 \times 1.00 &= 0.680 \text{ " } \\ A3 &= 0.050 \times \text{"} + \text{"} &= 0.530 \text{ " } \\ \therefore V &= 1/2 \{ (0.748 + 0.680) \times 25.690 + (0.680 + 0.530) \times 24.810 \} &= 33.352 \text{ m}^3 \end{aligned}$$

base (crusherran)

$$\begin{aligned} A1 &= 1/2 (0.044 + 0.169) \times 5.25 + 0.169 \times 1.50 &= 0.812 \text{ m}^2 \\ A2 &= 1/2 (0.060 + 0.420) \times 6.00 + 0.420 \times 1.50 &= 2.070 \text{ " } \\ A3 &= \text{"} + \text{"} &= \text{" " " } \\ \therefore V &= \{ 1/2 (0.812 + 2.070) \times 25.690 + 2.070 \times 24.810 \} &= 88.375 \text{ m}^3 \end{aligned}$$



NO 3 BOX FOR ROAD

WALL $\alpha = 1/\sin 60^\circ = 1.1547$

1) concrete(grade:25)

vertical wall $V = 1/2(6.90+0.40) \times 16.00 \times 0.60 = 35.040 \text{ m}^3$
 footing slab $V = 1/2(3.50+1.00) \times " \times " + 0.50^2 \times 8.00 = 23.600 "$

total $V = 58.640 "$

2) form work

vertical wall $A = 1/2(6.90+0.40) \times 16.00 = 58.400 \text{ m}^2$
 " " $A = 1/2(6.90+0.40) \times 0.60 + 1/2(6.90+0.40) \times 16.00 = 60.590 "$
 footing slab $A = 0.60(3.50+1.00+16.00 \times 2) = 21.900 "$] = 82.490 m²

total $V = 140.890 "$

3) scaffold $V = 1.20(6.90+1.00) \times 14.50 = 137.460 \text{ m}^3$

4) joint filler $A = 6.90 \times 0.60 \times 1.1547 = 4.780 \text{ m}^3$

5) water stop $L = (6.90-0.30) = 6.600 \text{ m}$

6) base concrete

concrete $V = 1/2(3.70+1.20) \times 16.10 \times 2 \times 0.10 = 3.944 \text{ m}^3$

formwork $A = (3.70+1.20+16.10 \times 2) \times 0.10 = 3.710 "$

7) base(crucherran)

$V = 1/2(3.70+1.20) \times 16.10 \times 0.20 = 7.889 \text{ m}^3$

8)excavation.

excavation (earth)

$V = 1.040/6 \{2.45 \times 16.10 + 3.490 \times 16.620 + (2.45+3.49)(16.10+16.620)\} + 0.50^2 \times 8.00 = 52.579 \text{ m}^3$

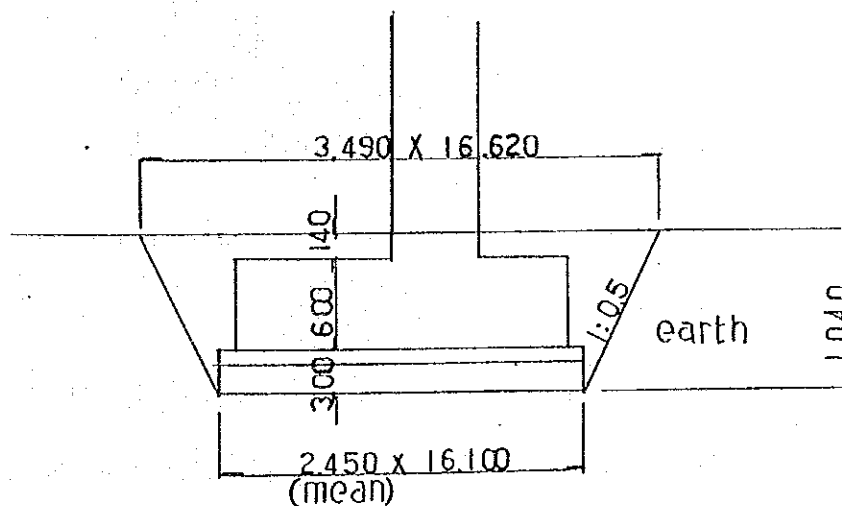
remain

$V = 1/2(3.70+1.20) \times 16.10 \times 0.30 + 1/2(3.50+1.00) \times 16.0 \times 0.60 + 0.60 \times 16.0 \times 0.14 + 0.50^2 \times 8.00 = 36.777 \text{ m}^3$

backfill

$V = 52.579 - 36.777$

$= 15.802 \text{ m}^3$



NO 4 BOX FOR ROAD

Ⓑ1-Ⓑ2 BOX length=13.350m(mean) skew angle = $84^{\circ} 22' 16''$
 $\alpha = 1/\sin 84^{\circ} 22' 16'' = 1.0048$

1) concrete(grade:25)

bottom slab	$V = 9.90 \times 0.70 \times 13.350$	= 92.515m ³
top slab	$V = " \times 0.80 \times "$	= 105.732 "
side slab	$V = 5.75 \times 0.70 \times " \times 2$	= 153.525 "
wing wall	$V = \{27.848 \times 7.330 - 1/2(8.60 \times 5.733 + 9.30 \times 7.60) - 9.948 \times 6.98\} \times 0.60$ $= \{74.697\} \times 0.60$	= 44.818 "

total	V =	= 396.590m ³
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2) fomwork

section	$A = (9.90 \times 7.25 - 8.50 \times 5.75) (1 + 1.0048)$	= 45.909m ² (23.009)
out side	$A = (13.350 - 0.60 \times 1.0048) \times 7.25 \times 2$	= 184.833 "
" (wing)	$A = 0.60 \times 1.0048 \times 7.25 \times 2$	= 8.741 "
wing side	$A = 74.697 \times 2$	= 149.394 "
section	$A = 0.60 (1.597 + 1.130 + \sqrt{8.60^2 + 5.733^2} + \sqrt{9.30^2 + 6.20^2})$	= 14.544 "
in side	$A = 13.350 \times 5.75 \times 2$	= 153.525 "
top slab	$A = " \times 8.50$	= 113.475 "

total	A =	= 670.421 " (647.521)
		(B ₁) (B ₂)

3) excavation (earth)

excavation

$V = 1.250/6 \{12.90 \times 29.70 + 14.15 \times 30.95 + (12.90 + 14.15)(29.70 + 30.95)\} = 512.844m^3/\text{box}$

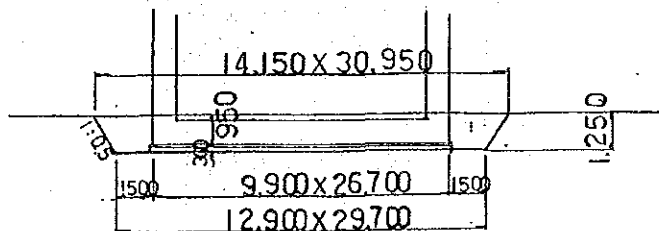
remain

$V = 0.30 \times 10.10 \times (26.70 + 0.20 \times 1.0048) + 0.95 \times 9.90 \times 26.70 = 332.623m^3/\text{box}$

backfill

$V = 512.844 - 332.623$

= 180.221m³/box



NO 4 BOX FOR ROAD

4) base concrete(grade:15)

$$\begin{aligned} \text{concrete } V &= 0.10 \times 10.10 \times \{26.70 + 0.10 \times 1.0048 \times 2\} = 27.169 \text{ m}^3/\text{box} \\ \text{formwork } A &= 0.10 \{ (26.70 + 0.20 \times 1.0048) + 10.10 \times 1.0048 \} \times 2 = 7.409 \text{ m}^2/\text{box} \end{aligned}$$

5) base(crucherran)

$$V = 0.20 \times 10.10 \{26.70 + 0.10 \times 1.0048 \times 2\} = 54.339 \text{ m}^3/\text{box}$$

6) support B1=B2

$$\text{:top slab } V = 8.50 \times (5.75 - 0.10) \times 13.350 = 641.133 \text{ m}^3$$

$$\text{:wing } V = 1/2 \{8.60(5.733 - 0.10) + 9.30(6.20 - 0.10)\} \times 0.60 = 31.552 \text{ m}^3$$

7) scaffold:main $V = 1.20 \times 7.25 \times 13.35 \times 2 = 232.290 \text{ m}^3$

$$\text{:wing } V = 1.20 \times 7.25(8.60 + 9.30) \times 2 = 311.460 \text{ m}^3$$

8) joint filler $A = 9.90 \times 7.25 - 8.50 \times 5.750 = 22.900 \text{ m}^2/\text{box}$

9) water stop $L = (9.20 + 6.50) \times 2 = 31.400 \text{ m}/\text{box}$

10) pavement

$$\text{Asphalt: } A1 = 0.05 \times 8.50 + 1/2 \times 0.049 \times 1.50 = 0.461 \text{ m}^2$$

$$A2 = 0.059 \times " + 1/2 \times 0.045 \times " = 0.535 "$$

$$\begin{aligned} A3 &= 0.05 \times 1.25 + 1/2(0.05 + 0.07) \times 3.0 \\ &\quad + 0.07 \times 4.25 + 1/2 \times 0.039 \times 1.50 = 0.569 " \end{aligned}$$

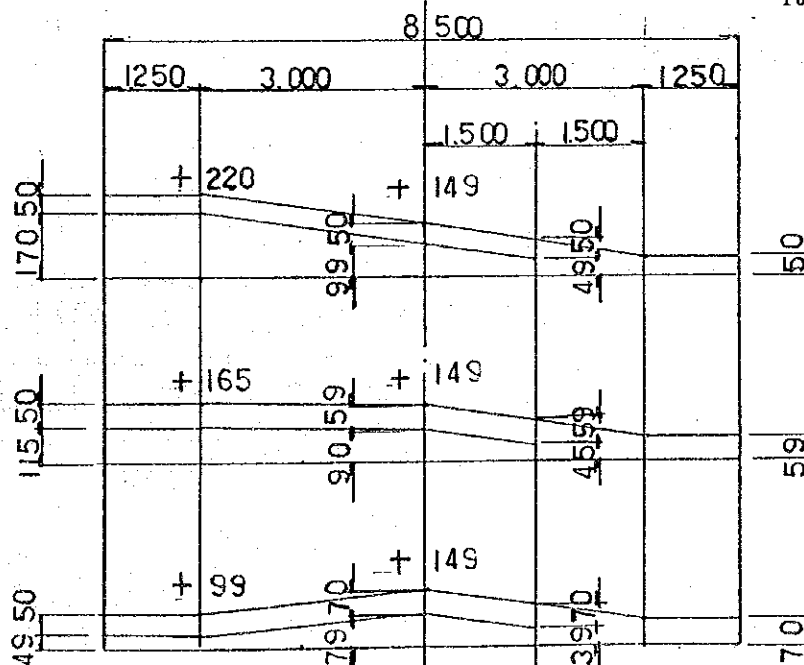
$$\therefore V = 1/2 \{ (0.461 + 0.535) \times 12.00 + (0.535 + 0.569) \times 14.70 \} = 14.090 \text{ m}^3$$

$$\begin{aligned} \text{base: } A1 &= 0.170 \times 1.25 + 1/2(0.170 + 0.099) \times 3.0 \\ &\quad + 1/2(0.099 + 0.049) \times 1.50 = 0.727 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} A2 &= 0.106 \times 1.25 + 1/2(0.106 + 0.09) \times 3.0 \\ &\quad + 1/2(0.09 + 0.045) \times 1.50 = 0.528 " \end{aligned}$$

$$\begin{aligned} A3 &= 0.049 \times 1.25 + 1/2(0.049 + 0.079) \times 3.0 \\ &\quad + 1/2(0.079 + 0.039) \times 1.50 = 0.341 " \end{aligned}$$

$$\therefore V = 1/2 \{ (0.727 + 0.528) \times 12.00 + (0.528 + 0.341) \times 14.70 \} = 13.917 \text{ m}^3$$



NO 5 BOX FOR ROAD

(B1) (B2) BOX

1) concrete (grade:25)

bottom slab	$V = 9.90 \times 0.70 \times 13.350$	$= 92.515 \text{ m}^3$
top	$V = \text{ " } \times 0.80 \times \text{ " }$	$= 105.732 \text{ "}$
side wall	$V = 5.60 \times 0.70 \times \text{ " } \times 2$	$= 104.664 \text{ "}$
wing	$V = \{ 27.30 \times 7.158 - 1/2 (5.60 \times 8.40 + 6.00 \times 9.0) - 9.90 \times (7.10 - 0.267) \} \times 0.60$ $= \{ 77.247 \} \times 0.60$	$= 46.348 \text{ "}$

total $V =$ $= 349.259 \text{ m}^3$

2) form.

section	$A = (9.90 \times 7.10 - 8.50 \times 5.60) \times 2 (22.690 \times 2)$	$= 45.380 \text{ m}^2 (22.690)$	$\left. \begin{array}{l} \\ \\ \\ \\ \end{array} \right\} \begin{array}{l} (380.930) \\ \\ \\ \\ = 403.620 \end{array}$
out side	$A = 7.10 (13.350 - 0.60) \times 2$	$= 181.050 \text{ "}$	
" (wing)	$A = 7.10 \times 0.60 \times 2$	$= 8.520 \text{ "}$	
wing side	$A = \text{ " } 77.247 \times 2$	$= 154.494 \text{ "}$	
:section	$A = 0.60 (1.158 + 1.558 + \sqrt{9.00^2 + 6.00^2} + \sqrt{8.40^2 + 5.60^2})$	$= 14.176 \text{ "}$	
in side	$A = 5.60 \times 13.350 \times 2$	$= 149.520 \text{ "}$	
top slab	$A = 8.5 \times 13.350$	$= 113.475 \text{ "}$	

total $A =$ $= 666.615 \text{ " } (643.925 \text{ "})$

3) base concrete (grade:15)

concrete	$V = 10.10 \times 26.90 \times 0.10$	$= 27.169 \text{ m}^3/\text{box}$
form	$A = (10.10 + 26.90) \times 0.10 \times 2$	$= 7.400 \text{ m}^2/\text{box}$

4) base (crusherran)

$V = 10.10 \times 26.90 \times 0.20 = 54.338 \text{ m}^3/\text{box}$

5) suport:topslab $V = 8.50 (5.60 - 0.10) \times 13.35$

$= 624.112 \text{ m}^3$

:wing $V = 1/2 \{ (5.60 - 0.10) \times 8.40 + (6.0 - 0.10) \times 9.0 \} \times 0.60$

$= 29.790 \text{ "}$

6) scaffold:main $V = 1.20 \times 7.10 \times 13.350 \times 2$

$= 227.484 \text{ m}^3$

:wing $V = 1.20 (8.40 + 9.00) \times 7.10 \times 2$

$= 296.496 \text{ m}^3$

7) joint filler $A = 9.90 \times 7.10 - 8.50 \times 5.60$

$= 22.690 \text{ m}^2/\text{box}$

8) water stop $L = (6.350 + 9.20) \times 2$

$= 31.100 \text{ m}/\text{box}$

9) pavement $V = \{ 0.05 \times 1.25 \times 2 + (0.05 + 0.095) \times 3.00 \} \times 26.70$

$= 14.952 \text{ m}^3/\text{box}$

asphalt

10) excavation

excavation (earth)

$V = 1.10/6 \{ 12.90 \times 29.70 + 14.00 \times 30.80 \}$
 $+ (12.90 + 14.00) (29.70 + 30.80) = 447.659 \text{ m}^3/\text{box}$

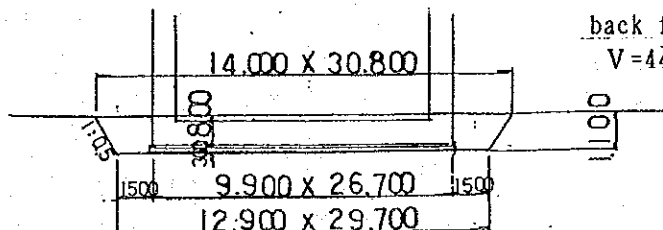
remain

$V = 10.10 \times 26.90 \times 0.30 + 9.90 \times 26.70 \times 0.80$
 $= 292.971 \text{ m}^3/\text{box}$

back fill

$V = 447.659 - 292.971$

$= 154.688 \text{ m}^3/\text{box}$



NO 6 BOX FOR ROAD

(B1)-(B2)

1) concrete(grade:25)

bottom slab	$V=9.90 \times 0.70 \times 12.750$	$=88.357m^3$
top	$V=" \times 0.80 \times "$	$=100.980 "$
side wall	$V=5.60 \times 0.70 \times " \times 2$	$=99.960 "$
wing	$V= \{27.20 \times 7.139 - 1/2(5.467 \times 8.20 + 6.067 \times 9.10) - 9.90 \times (7.10 - 0.267)\} \times 0.60$ $= \{76.514\} \times 0.60$	$=45.908 "$

total $V=$ $=335.205m^3$

2) form

section	$A=(9.90 \times 7.10 - 8.50 \times 5.60) \times 2$ $= (22.690) \times 2$	$=45.380m^2 (22.690)$	(370.889) $=393.579$
out side	$A=7.10(12.750 - 0.60) \times 2$	$=172.530 "$	
" (wing)	$A=7.10 \times 0.60 \times 2$	$=8.520 "$	
wing side	$A=76.514 \times 2$	$=153.028 "$	
section	$A=0.60(1.672 + 1.072 + \sqrt{5.467^2 + 8.20^2} + \sqrt{6.067^2 + 9.10^2})$	$=14.121 "$	
in side	$A=5.60 \times 12.750 \times 2$	$=142.800m^2$	
top slab	$A=8.50 \times "$	$=108.375 "$	

total $A=$ $=644.754m^2 (622.064m^2)$
(B1) (B2)

3) base concrete (grade:15)

concrete	$V=10.10 \times 25.70 \times 0.10 = 25.957m^3/\text{box}$
form	$A=(10.10 + 25.70) \times 0.10 \times 2 = 7.160m^2/\text{box}$

4) base (crusherran)

$V=10.10 \times 25.70 \times 0.20 = 51.914m^3/\text{box}$

5) suport

top slab	$V=8.50(5.60 - 0.10) \times 12.750$	$=596.062m^3$
wing	$V=1/2 \{ (5.467 - 0.10) \times 8.20 + (6.067 - 0.10) \times 9.10 \} \times 0.60 = 29.492m^3$	

6) scaffold:main

$V=1.20 \times 7.10 \times 12.75 \times 2 = 217.260m^3$

:wing $V=1.20(8.20 + 9.10) \times 7.10 \times 2 = 294.792 "$

7) joint filler

$A=9.90 \times 7.10 - 8.50 \times 5.60 = 22.690m^2/\text{box}$

8) water stop

$L=(6.350 + 9.20) \times 2 = 31.100m/\text{box}$

9) pavement asphalt

$V= \{0.05 \times 1.25 \times 2 + (0.05 + 0.095) \times 3.00\} \times 25.50 = 14.280m^3/\text{box}$

10) excavation.

excavation(earth)

$V=1.460/6 \{12.90 \times 28.50 + 14.360 \times 29.960$
 $+ (12.90 + 14.360)(28.50 + 29.960)\}$

$=581.930m^3/\text{box}$

remain

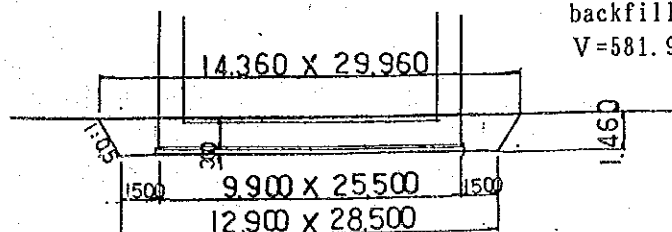
$V=10.10 \times 25.70 \times 0.30 + 9.90 \times 25.50 \times 1.160$

$=370.713m^3/\text{box}$

backfill

$V=581.930 - 370.713$

$=211.217m^3/\text{box}$



NO 7 BOX FOR ROAD

Ⓑ1-Ⓑ4 length=13.100m(mean) skew angle = $60^{\circ} \sim 90^{\circ}$
 $\alpha = 1/\sin 60^{\circ} = 1.1547$

1) concrete(grade:25)

bottom slab	$V = 9.90 \times 0.70 \times 13.10$	=90.783m ³
top "	$V = " \times 0.80 \times "$	=103.752 "
side wall	$V = 5.65 \times 0.70 \times " \times 2$	=103.621 "
wing wall	$V = \{8.70 \times 7.828 - 1/2(8.45 \times 5.633 + 8.70 \times 0.877)\} \times 0.60$ $(11.432 \times 0.685 + 1/2 \times 0.515 \times 7.828) \times 0.57$ $= (9.846) \times 0.57 + (40.489) \times 0.60$	=29.905m ³

total	V =	=328.061m ³
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2) formwork

section	$A = (9.90 \times 7.15 - 8.50 \times 5.65) \times 1.1547$	=26.280m ²
out side	$A = 7.15 \times 13.10 \times 2 - 0.659 \times 7.828$	=182.171 "
" (wing)	$A = 0.659 \times 7.828$	=5.158 "
wing side	$A = \{ (9.846 + 40.489) \times 2$	=100.670 "
section	$A = 0.57 \times 0.685 + 0.60 (1.318 + \sqrt{5.633^2 + 8.45^2})$	=7.274 "
in side	$A = 5.65 \times 13.10 \times 2$	=148.030 "
top slab	$A = 8.50 \times 13.10$	=111.350 "

= 321.553

total	A =	=580.933 "
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3) support

main:	$V = (5.65 - 0.10) \times 8.50 \times 13.10$	=617.992m ³
wing:	$V = (5.633 - 0.10) \times 8.45/2 \times 0.60$	=14.026m ³

total	V =	=632.016 "
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4) scaffold

main:	$V = 1.20 \times 7.15 \times 13.10 \times 2$	=224.796m ³
wing:	$V = " \times " \times 8.70 \times 2$	=149.292 "

total	V =	=374.088m ³
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NO 7 BOX FOR ROAD

(B2)(B3)

length=12,000m

1) concrete

bottom slab	$V = 9.90 \times 0.70 \times 12.00$	=83.160m ³
top slab	$V = " \times 0.80 \times "$	=95.040m ³
side wall	$V = 5.65 \times 0.70 \times " \times 2$	=94.920 "

total $V =$ =273.120m³

2) formwork

section	$A = (9.90 \times 7.15 - 8.50 \times 5.65) \times 2 = 22.760 \times 2$	=45.520m ² (22.760)	(194,360)
out side	$A = 7.150 \times 12.00 \times 2$	=171.600 "	=217.120
in side	$A = 5.650 \times " \times 2$	=135.600 "	
top slab	$A = 8.50 \times "$	=102.000 "	

total $A =$ =454.720m² (431.960 ")
(B2) (B3)

3) support

main: $V = (5.65 - 0.10) \times 8.50 \times 12.00$ =566.100m³

4) scaffold

main: $V = 1.20 \times 7.15 \times 12.00 \times 2$ =205.920m³

5) base concrete(grade:15)

concrete $V = 0.10 \times (50.20 + 0.20 \times 1.1547) \times 10.10$ =50.935m³/box
form $A = 0.10 \times \{ (50.20 + 0.20 \times 1.1547) + 10.10 \times 1.1547 \} \times 2 = 12.418m^2$ /box

6) base(crucherran)

$V = 0.20 \times (50.20 + 0.20 \times 1.1547) \times 10.10$ =101.870m³/box

7) joint filler $A = (9.90 \times 7.15 - 8.50 \times 5.65) \times 3$

(t=20mm)

=68.280m²/box

8) water stop $L = (9.20 + 6.40) \times 2 \times 3$

=93.600m/box

9) pavement

asphalt $V = (1.250 \times 0.05 \times 2 + (0.05 + 0.110) \times 3.00) \times 50.20$ =30.371m³/box

10) excavation, (earth)

excavation

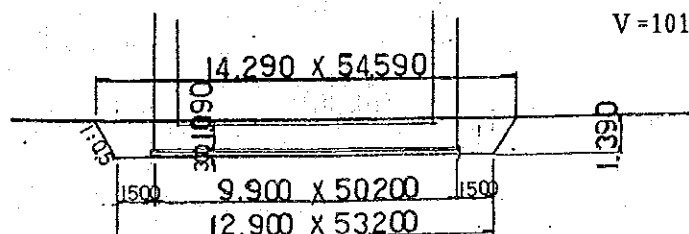
$V = 1.390/6 \{ 12.90 \times 53.20 + 14.290 \times 54.590 + (12.90 + 14.290) (53.20 + 54.590) \}$ =1018.680m³/box

remain

$V = 10.10 (50.20 + 0.20 \times 1.1547 \times 0.30 + 9.90 \times 50.20 \times 1.090$ =694.513m³/box

backfill

$V = 1018.680 - 694.513$ =324.167m³/box



NO 7 BOX FOR ROAD

wall $\alpha = 1/\sin 60^\circ = 1.1547$

① Retaining wall

1) concrete (grade: 25)

vertical wall $V = 1/2 (7.235 + 0.400) \times 0.60 \times 13.50 = 30.921 \text{ m}^3$

footing slab $V = 1/2 (3.50 + 1.00) \times 0.60 \times 13.50 + 0.50^2 \times 6.00 = 19.725 \text{ m}^3$

total $V = 50.646 \text{ m}^3$

2) formwork

vertical wall $A = 1/2 (7.235 + 0.40) \times 13.50 = 51.536 \text{ m}^2$

vertical wall $A = 0.60 \times 0.40 + 1/2 (7.235 + 0.40) \times 13.50 = 51.776 \text{ m}^2$

footing slab $A = (13.50 \times 2 + 3.50 + 1.00) \times 0.60 = 18.900 \text{ m}^2$

total $A = 122.212 \text{ m}^2$

3) scaffold $V = 1.20 \times (7.235 + 1.00) \times 12.30 = 121.548 \text{ m}^3$

4) joint filler $A = 7.235 \times 0.60 \times 1.1547 = 5.012 \text{ m}^2$

5) water stop $L = (7.235 - 0.300) = 6.935 \text{ m}$

6) base concrete

concrete $V = 1/2 (3.70 + 1.20) \times 0.10 \times 13.60 = 3.332 \text{ m}^3$

form $A = (3.70 + 1.20 + 13.60 \times 2) \times 0.10 = 3.210 \text{ m}^2$

7) base (crusherran)

$V = 1/2 (3.70 + 1.20) \times 0.20 \times 13.60 = 6.664 \text{ m}^3$

8) excavation (earth)

excavation

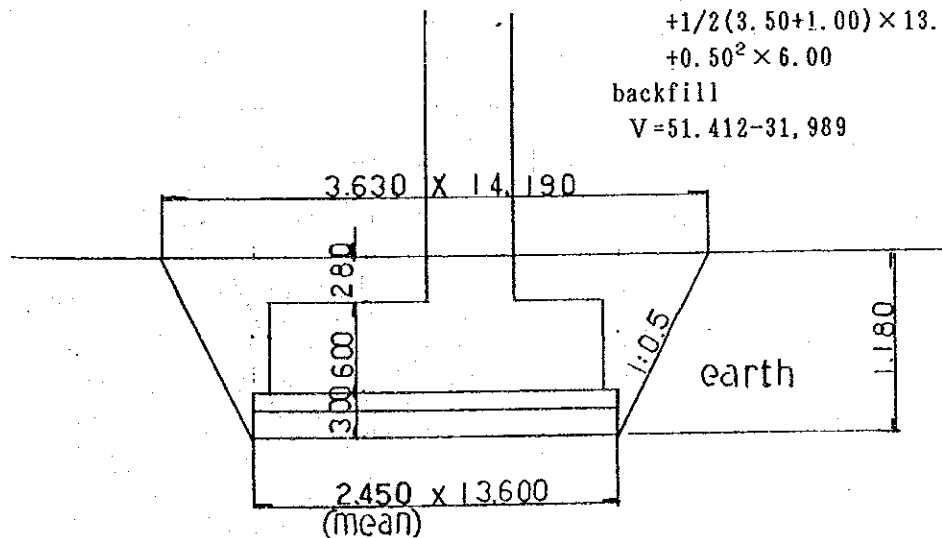
$V = 1.180/6 \{ 2.45 \times 13.60 + 3.63 \times 14.190 + (2.45 + 3.63) (13.60 + 14.190) + 0.50^2 \times 6.00 \} = 51.412 \text{ m}^3$

remain

$V = 1/2 (3.70 + 1.20) \times 13.60 \times 0.30 + 1/2 (3.50 + 1.00) \times 13.50 \times 0.60 + 0.60 \times 13.50 \times 0.280 + 0.50^2 \times 6.00 = 31.989 \text{ m}^3$

backfill

$V = 51.412 - 31.989 = 19.423 \text{ m}^3$



NO 7 BOX FOR ROAD

② Retaining wall

- 1) concrete (grade: 25)

$$\text{vertical wall } V = 1/2(6.85 + 0.400) \times 0.60 \times 9.50 = 20.662 \text{ m}^3$$

$$\text{footing slab } V = 1/2(3.50 + 1.00) \times 0.60 \times 9.50 + 0.50^2 \times 4.00 = 13.825 \text{ m}$$

total $V =$ $\quad \quad \quad = 34.487 \text{ m}^3$

- 2) foam work

$$\text{vertical wall A} = 1/2(6.85 + 0.40) \times 9.50 = 34.437 \text{ m}^3$$

$$A = 0.60 \times 0.40 + 1/2 \{ (6.85 + 0.40) \times 9.50 \} = 34.677$$

$$\text{footing slab A} = (9.50 \times 2 + 3.50 + 1.00) \times 0.60 = 14.100 "$$

total $A = 83.215$

- 3) scaffold $V=1.20 \times (6.85+1.00) \times 8.60$

$$= 81.012 \text{ m}^3$$

- 4) joint filler $A = 6.85 \times 0.60 \times 1.1547$

$$= 4.745 \text{ m}^2$$

- 5) water stop $L=(6.85-0.300)$

$$= 6.550 \text{ m}$$

- 6) base concrete

concrete $V=1/2(3.70+1.20) \times 0.10 \times 9.6 = 2.352\text{m}^3$

$$\text{form} \quad A = (3.7 + 1.20 + 9.60 \times 2) \times 0.10 = 2.410 \text{ m}^2$$

- 7) base (crusherran)

$$V = 1/2(3.70 + 1.20) \times 0.20 \times 9.6 = 4.704 \text{ m}^3$$

- 8) excavation (earth)

excavation

$$V = 1.180/6 \{ 2.45 \times 9.60 + 3.63 \times 10.190 + (2.45 + 3.63)(9.60 + 10.190) + 0.50^2 \times 4.00 \}$$

$$= 36.563 \text{ m}^3$$

remain

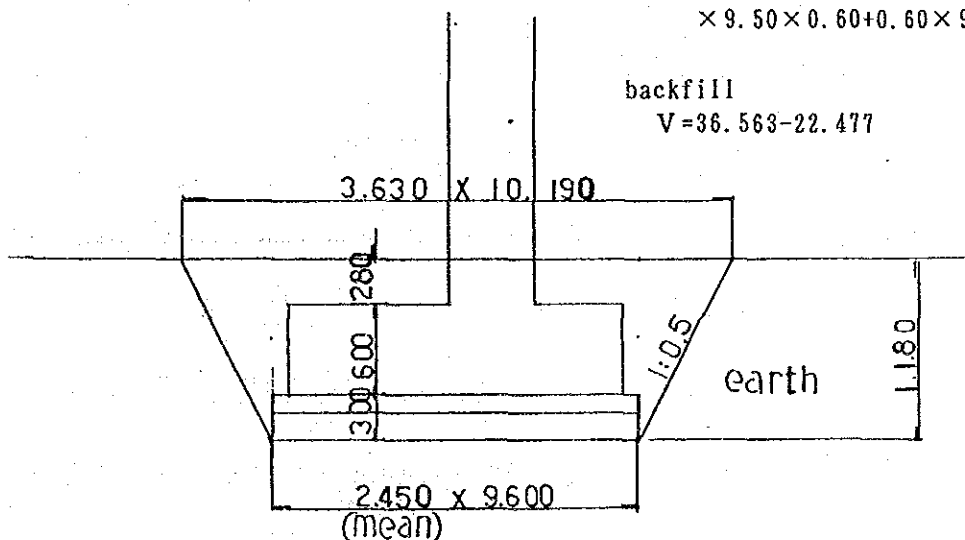
$$V = 1/2(3.70 + 1.20) \times 9.60 \times 0.30 + 1/2(3.50 + 1.00) \times 9.50 \times 0.60 + 0.60 \times 9.50 \times 0.280 + 0.50^2 \times 4.00$$

$$= 22.477 \text{ m}^3$$

backfill

$$V = 36.563 - 22.477$$

$$= 14.086 \pi^3$$



NO 7 BOX FOR ROAD

W3 Retaining wall

1) concrete(grade:25)

$$\begin{aligned} \text{vertical wall } V &= 1/2(6.85+0.400) \times 0.60 \times 16.50 &= 35.887\text{m}^3 \\ \text{footing slab } V &= 1/2(3.50+1.00) \times 0.60 \times 16.50 + 0.50^2 \times 8.00 &= 24.275\text{m}^3 \end{aligned}$$

$$\text{total } V = 60.162\text{m}^3$$

2) formwork

$$\begin{aligned} \text{vertical wall } A &= 1/2(6.85+0.40) \times 16.50 &= 59.812\text{m}^2 \\ \text{" " } A &= 0.60 \times 0.40 + 1/2(6.85+0.40) \times 16.50 &= 60.052\text{m}^2 \\ \text{footing slab } A &= (16.50 \times 2 + 3.50 + 1.00) \times 0.60 &= 22.500\text{m}^2 \end{aligned}$$

$$\text{total } A = 142.365\text{m}^2$$

$$3) \text{ scaffold } V = 1.20 \times (6.85+1.00) \times 16.00 = 141.300\text{m}^3$$

$$4) \text{ joint filler } A = 6.85 \times 0.60 \times 1.1547 = 4.745\text{m}^2$$

$$5) \text{ water stop } L = (6.85-0.300) = 6.550\text{m}$$

6) base concrete

$$\text{concrete } V = 1/2(3.70+1.20) \times 0.10 \times 16.60 = 4.067\text{m}^3$$

$$\text{form } A = (3.7+1.20+16.60 \times 2) \times 0.10 = 3.810\text{m}^2$$

7) base(crusherran)

$$V = 1/2(3.70+1.20) \times 0.20 \times 16.60 = 8.134\text{m}^3$$

8) excavation(earth)

excavation

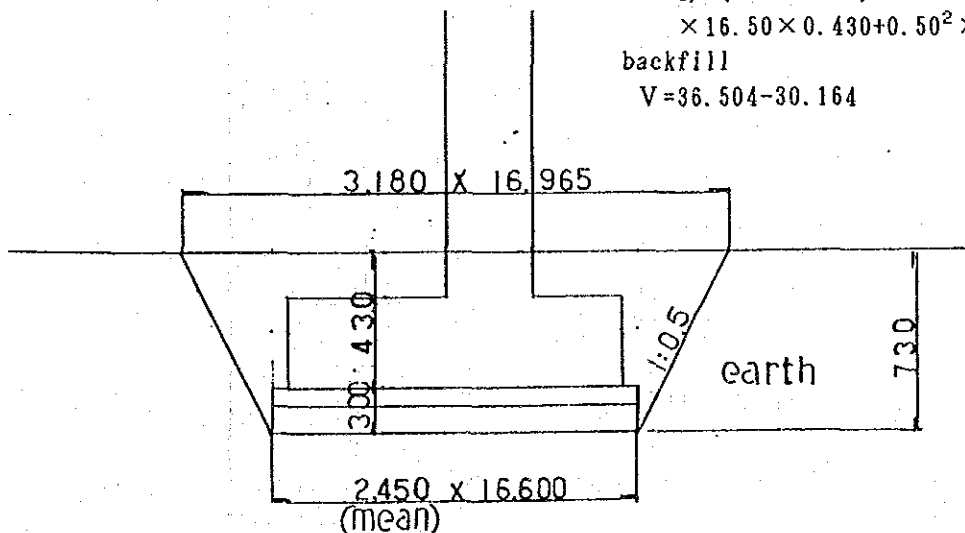
$$\begin{aligned} V &= 0.730/6 \{ 2.45 \times 16.60 + 3.18 \times 16.965 \\ &\quad + (2.45+3.180)(16.60+16.965) \} + 0.50^2 \times 8.00 \\ &= 36.503\text{m}^3 \end{aligned}$$

remain

$$\begin{aligned} V &= 1/2(3.70+1.20) \times 16.60 \times 0.30 + 1/2(3.50+1.00) \\ &\quad \times 16.50 \times 0.430 + 0.50^2 \times 8.00 \\ &= 30.164\text{m}^3 \end{aligned}$$

backfill

$$V = 36.504 - 30.164 = 6.339\text{m}^3$$



BOXCULVERT FOR ROAD--NO ①

LIST OF REINFORCED BAR--- B1

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1 Y25	21800	51	3.854	84.02	4285	
	2 "	12560	51	"	48.41	2469	
	3 Y32	12800	50	6.313	80.81	4040	
	4 "	6210	100	"	39.20	3920	
	5 Y20	16730	72	2.466	41.26	2971	
	6 Y32	2460	51	6.313	15.53	792	
	7 "	2460	51	"	"	792	
	8 Y12	2180	417	0.888	1.94	809	
	9 Y32	19000	7	6.313	119.95	840	
	10 "	17880	6	"	112.88	677	
	11 "	12970	13	"	81.88	1064	
	12 "	2480	7	"	15.66	110	
	13 Y12	2180	18	0.888	1.94	35	
22804 kg							
W	1 Y25	15890	19	3.854	61.24	1164	
	2 Y16	15710	19	1.579	24.91	471	
	3 "	17470	19	"	27.59	524	
	4 Y25	17920	19	3.854	69.06	1312	
	5 "	7570	51	"	29.17	1488	
	6 "	7570	51	"	"	1488	
	7 "	7570	7	"	"	204	
	8 "	7570	1	"	"	29	
	9 Y12	1030	221	0.888	0.91	201	
	10 "	1030	221	"	"	201	
	11 "	1040	23	"	0.92	21	
7103 kg							
F	1 Y32	21410	51	6.313	135.16	6893	
	2 "	12800	101	"	80.81	8162	
	3 "	6300	50	"	39.77	1988	
	4 "	6300	50	"	"	1988	
	5 Y25	16900	72	3.854	65.13	4689	
	6 Y32	2590	51	6.313	16.35	834	
	7 "	2590	51	"	"	834	
	8 Y12	2380	417	0.888	2.11	880	
	9 Y32	17970	7	6.313	113.44	794	
	10 "	19090	6	"	120.52	723	
	11 "	12970	13	"	81.88	1064	
	12 "	2600	7	"	16.41	115	
	13 Y12	2370	18	0.888	2.10	38	
29002 kg							
Y32				35630 kg			
Y25				17128 kg			
Y20				2971 kg			
Y16				995 kg			
Y12				2185 kg			
				58909 kg			

BOXCULVERT FOR ROAD - NO ①

LIST OF REINFORCED BAR---B2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y25	21800	50	3.854	84.02	4201
	2	"	12560	51	"	48.41	2469
	3	Y32	12800	50	6.313	80.81	4040
	4	"	6210	98	"	39.20	3842
	5	Y20	16730	72	2.466	41.26	2971
	6	Y32	2460	50	6.313	15.53	776
	7	"	2460	50	"	"	776
	8	Y12	2180	400	0.888	1.94	776
	9	Y32	19190	10	6.313	121.15	1212
	10	"	18070	9	"	114.08	1027
	11	"	13160	19	"	83.08	1579
	12	"	2500	10	"	15.78	158
	13	Y12	2180	28	0.888	1.94	54
23881 kg							
W	1	Y25	18360	19	3.854	70.76	1344
	2	Y16	17850	19	1.579	28.19	536
	3	"	15330	19	"	24.21	460
	4	Y25	15450	19	3.854	59.54	1131
	5	"	7570	50	"	29.17	1459
	6	"	7570	50	"	"	1459
	7	"	7570	1	"	"	29
	8	"	7570	10	"	"	292
	9	Y12	1030	216	0.888	0.91	197
	10	"	1030	216	"	"	197
	11	"	1050	36	"	0.93	33
7137 kg							
F	1	Y32	22410	50	6.313	141.47	7074
	2	"	12800	99	"	80.81	8000
	3	"	6300	49	"	39.77	1949
	4	"	6300	49	"	"	1949
	5	Y25	16910	72	3.854	65.17	4692
	6	Y32	2590	50	6.313	16.35	817
	7	"	2590	50	"	"	817
	8	Y12	2380	400	0.888	2.11	844
	9	Y32	18160	10	6.313	114.64	1146
	10	"	19280	9	"	121.71	1095
	11	"	13160	19	"	83.08	1579
	12	"	2620	10	"	16.54	165
	13	Y12	2380	32	0.888	2.11	68
30195 kg							
Y32 38001 kg							
Y25 17076 kg							
Y20 2971 kg							
Y16 996 kg							
Y12 2169 kg							
61213 kg							

BOXCULVERT FOR ROAD - NO ①

LIST OF REINFORCED BAR ---WING₁₌₂

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y25	11190	3	3.854	43.13	129
	2	"	5670	21	"	21.85	459
	3	"	4000	17	"	15.42	262
	4	"	2990	5	"	11.52	58
	5	Y20	4370	30	2.466	10.78	323
	6	Y16	13490	1	1.579	21.30	21
	7	Y25	10920	3	3.854	42.09	126
	8	"	5400	21	"	20.81	437
	9	"	4000	17	"	15.42	262
	10	"	2720	5	"	10.48	52
	11	Y20	4270	29	2.466	10.53	305
	12	Y16	13450	1	1.579	21.24	21
	13	Y20	10850	3	2.466	26.76	80
	14	"	5510	20	"	13.59	272
	15	Y12	4370	30	0.888	3.88	116
	16	Y16	13640	1	1.579	21.54	22
	17	Y20	10820	3	2.466	26.68	80
	18	"	5480	20	"	13.51	270
	19	Y12	4270	29	0.888	3.79	110
	20	Y16	13600	1	1.579	21.47	21
	21	Y25	2840	21	3.854	10.95	230
	22	Y12	680	23	0.888	0.60	14
	23	Y25	2410	21	3.854	9.29	195
	24	Y12	680	23	0.888	0.60	14
	25	"	650	30	"	0.58	17
	26	"	650	29	"	"	17
	27	"	2550	41	"	2.26	93
	28	"	31300	2	"	27.79	56
	29	"	31300	2	"	"	56
	30	"	680	2	"	0.60	1
	31	"	680	2	"	"	1
	32	Y25	3380	21	3.854	13.03	274
	33	"	3380	21	"	"	274
	34	Y12	720	46	0.888	0.64	29
	35	"	720	41	"	"	26
4723 kg							
Y25							2758 kg
Y20							1330 kg
Y16							85 kg
Y12							550 kg
4723 kg							

BOXCULVERT FOR ROAD - NO ②

LIST OF REINFORCED BAR --- B₁ = B₂

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y32	18110	47	6.313	114.33	5374
	2	"	9280	46	"	58.58	2695
	3	Y25	9280	47	3.854	35.77	1681
	4	Y32	5230	92	6.313	33.02	3038
	5	Y25	14510	60	3.854	55.92	3355
	6	Y32	1890	47	6.313	11.93	561
	7	"	1890	47	"	"	561
	8	Y12	1800	286	0.888	1.60	458
						17723 kg	
W	1	Y25	14510	19	3.854	55.92	1062
	2	Y16	14190	19	1.579	22.41	426
	3	"	14190	19	"	"	426
	4	Y25	14510	19	3.854	55.92	1062
	5	"	6970	47	"	26.86	1262
	6	"	6970	47	"	"	1262
	7	Y12	820	203	0.888	0.73	148
	8	"	820	203	"	"	148
						5796 kg	
F	1	Y32	18290	47	6.313	115.46	5427
	2	"	9280	93	"	58.58	5448
	3	"	5320	46	"	33.59	1545
	4	"	5320	46	"	"	1545
	5	Y25	14510	60	3.854	55.92	3355
	6	Y32	2020	47	6.313	12.75	599
	7	"	2020	47	"	"	599
	8	Y12	1980	286	0.888	1.76	503
						19021 kg	
Y32				27392 kg			
Y25				13039 kg			
Y16				852 kg			
Y12				1257 kg			
						42540 kg	

BOXCULVERT FOR ROAD - NO ②

LIST OF REINFORCED BAR ---WING 1=2

WINO 1-2							
MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y25	9560	4	3.854	36.84	147
	2	"	4940	19	"	19.04	362
	3	"	4000	16	"	15.42	247
	4	"	2610	6	"	10.06	60
	5	Y20	4270	28	2.466	10.53	295
	6	Y16	12760	2	1.579	20.15	40
	7	Y25	9960	4	3.854	38.39	154
	8	"	5540	20	"	21.35	427
	9	"	4000	16	"	15.42	247
	10	"	2610	6	"	10.06	60
	11	Y20	4110	29	2.466	10.14	294
	12	Y16	13050	2	1.579	20.61	41
	13	Y20	9480	4	2.466	23.38	94
	14	"	5240	19	"	12.92	245
	15	Y12	4270	28	0.888	3.79	106
	16	Y20	9880	4	2.466	24.36	97
	17	"	5460	20	"	13.46	269
	18	Y12	4110	29	0.888	3.65	106
	19	Y25	2300	20	3.854	8.86	177
	20	Y12	680	24	0.888	0.60	14
	21	Y25	2300	20	3.854	8.86	177
	22	Y12	680	24	0.888	0.60	14
	23	"	650	28	"	0.58	16
	24	"	650	29	"	"	17
	25	"	2330	32	"	2.07	66
	26	"	27720	2	"	24.62	49
	27	Y25	3380	20	3.854	13.03	261
	28	"	3380	20	"	"	261
	29	Y12	720	39	0.888	0.64	25
	30	"	720	42	"	"	27
						4395 kg	
Y25				2580 kg			
Y20				1294 kg			
Y16				81 kg			
Y12				440 kg			
						4395 kg	

BOXCULVERT FOR ROAD--NO ③

LIST OF REINFORCED BAR---B1

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y32	23630	52	6.313	149.18	7757
	2	"	13400	52	"	84.59	4399
	3	Y25	13160	51	3.854	50.72	2587
	4	Y32	6900	102	6.313	43.56	4443
	5	Y25	16810	85	3.854	64.79	5507
	6	"	21270	3	"	81.97	246
	7	Y32	3300	52	6.313	20.83	1083
	8	"	3300	52	"	"	1083
	9	Y12	2750	475	0.888	2.44	1159
	10	Y32	22850	29	6.313	144.25	4183
	11	"	21730	28	"	137.18	3841
	12	"	15300	29	"	96.59	2801
	13	Y25	15060	28	3.854	58.04	1625
	14	Y32	3550	26	6.313	22.41	583
	15	Y12	2750	121	0.888	2.44	295
						41592 kg	
W	1	Y25	13620	25	3.854	52.49	1312
	2	Y16	13790	25	1.579	21.77	544
	3	"	19630	25	"	31.00	775
	4	Y25	21590	25	3.854	83.21	2080
	5	"	8370	52	"	32.26	1678
	6	"	8370	52	"	"	1678
	7	"	8370	26	"	"	839
	8	"	8370	1	"	"	32
	9	Y12	1320	12	0.888	1.17	14
	10	"	1320	275	"	"	322
	11	"	1490	132	"	1.32	174
						9448 kg	
F	1	Y32	23810	52	6.313	150.31	7816
	2	"	13400	52	"	84.59	4399
	3	Y25	13160	51	3.854	50.72	2587
	4	Y32	6990	102	6.313	44.13	4501
	5	Y25	16810	85	3.854	64.79	5507
	6	"	21270	3	"	81.97	246
	7	Y32	3430	52	6.313	21.65	1126
	8	"	3430	52	"	"	1126
	9	Y12	2930	475	0.888	2.60	1235
	10	Y32	21820	29	6.313	137.75	3995
	11	"	22940	28	"	144.82	4055
	12	"	15300	29	"	96.59	2801
	13	Y25	15060	28	3.854	58.04	1625
	14	Y32	3680	26	6.313	23.23	604
	15	Y12	2930	121	0.888	2.60	315
						41938 kg	
Y32				60596 kg			
Y25				27549 kg			
Y16				1319 kg			
Y12				3514 kg			
				92978 kg			

BOXCULVERT FOR ROAD - NO ③

LIST OF REINFORCED BAR --- B₂

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y32	23630	76	6.313	149.18	11338
	2	"	13400	76	"	84.59	6429
	3	Y25	13160	75	3.854	50.72	3804
	4	Y32	6900	150	6.313	43.56	6534
	5	Y25	13980	88	3.854	53.88	4741
	6	Y32	3300	76	6.313	20.83	1583
	7	"	3300	76	"	"	1583
	8	Y12	2750	693	0.888	2.44	1691
						37703 kg	
W	1	Y25	20920	25	3.854	80.63	2016
	2	Y16	19280	25	1.579	30.44	761
	3	"	18050	25	"	28.50	713
	4	Y25	18540	25	3.854	71.45	1786
	5	"	8370	76	"	32.26	2452
	6	"	8370	76	"	"	2452
	7	Y12	1320	407	0.888	1.17	476
	8	"	1320	407	"	"	476
						11132 kg	
F	1	Y32	23810	76	6.313	150.31	11424
	2	"	13400	76	"	84.59	6429
	3	Y25	13160	75	3.854	50.72	3804
	4	Y32	6990	150	6.313	44.13	6620
	5	Y25	18980	88	3.854	73.15	6437
	6	Y32	3430	76	6.313	21.65	1645
	7	"	3430	76	"	"	1645
	8	Y12	2930	693	0.888	2.60	1802
						39806 kg	
Y32				55230 kg			
Y25				27492 kg			
Y16				1474 kg			
Y12				4445 kg			
				88641 kg			

BOXCULVERT FOR ROAD - NO ③

LIST OF REINFORCED BAR --- B3

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y32	23630	47	6.313	149.18	7011
	2	"	13400	47	"	84.59	3976
	3	Y25	13160	46	3.854	50.72	2333
	4	Y32	6900	92	6.313	43.56	4008
	5	Y25	16180	85	3.854	62.36	5301
	6	"	21250	3	"	81.90	246
	7	Y32	3300	47	6.313	20.83	979
	8	"	3300	47	"	"	979
	9	Y12	2750	418	0.888	2.44	1020
	10	Y32	23480	34	6.313	148.23	5040
	11	"	22360	33	"	141.16	4658
	12	"	15930	34	"	100.57	3419
	13	Y25	15690	33	3.854	60.47	1996
	14	Y32	3640	31	6.313	22.98	712
	15	Y12	2750	141	0.888	2.44	344
						42022 kg	
W	1	Y25	22180	25	3.854	85.48	2137
	2	Y16	19700	25	1.579	31.11	778
	3	"	12870	25	"	20.32	508
	4	Y25	12460	25	3.854	48.02	1201
	5	"	8370	47	"	32.26	1516
	6	"	8370	47	"	"	1516
	7	"	8370	1	"	"	32
	8	"	8370	31	"	"	1000
	9	Y12	1320	242	0.888	1.17	283
	10	"	1320	242	"	"	283
	11	"	1540	159	"	1.37	218
						9472 kg	
F	1	Y32	23810	47	6.313	150.31	7065
	2	"	13400	47	"	84.59	3976
	3	Y25	13160	46	3.854	50.72	2333
	4	Y32	6990	92	6.313	44.13	4060
	5	Y25	16180	85	3.854	62.36	5301
	6	"	21250	3	"	81.90	246
	7	Y32	3430	47	6.313	21.65	1018
	8	"	3430	47	"	"	1018
	9	Y12	2930	418	0.888	2.60	1087
	10	Y32	22450	34	6.313	141.73	4819
	11	"	23570	33	"	148.80	4910
	12	"	15930	34	"	100.57	3419
	13	Y25	15690	33	3.854	60.47	1996
	14	Y32	3760	31	6.313	23.74	736
	15	Y12	2930	144	0.888	2.60	374
	16	Y 8	1	1	0.395	0.00	0
						42368 kg	
Y32				61803 kg			
Y25				27154 kg			
Y16				1286 kg			
Y12				3609 kg			
				93852 kg			

LIST OF REINFORCED BAR---WINGI

25

BOXCULVERT FOR ROAD - NO ③

LIST OF REINFORCED BAR---WING2

MARK	DIAMETER	LENGTH	NUMBER	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y25	12500	6	3.854	48.18	289
	2	"	11610	3	"	44.74	134
	3	"	6010	18	"	23.16	417
	4	"	4680	19	"	18.04	343
	5	"	3530	6	"	13.60	82
	6	Y32	14500	1	6.313	91.54	92
	7	"	14360	3	"	90.65	272
	8	"	12410	8	"	78.34	627
	9	"	5710	17	"	36.05	613
	10	"	6000	17	"	37.88	644
	11	"	4420	8	"	27.90	223
	12	Y20	12630	6	2.466	31.15	187
	13	"	10770	4	"	26.56	106
	14	"	5840	18	"	14.40	259
	15	Y25	14000	1	3.854	53.96	54
	16	"	14220	3	"	54.80	164
	17	"	11960	7	"	46.09	323
	18	"	5660	17	"	21.81	371
	19	Y20	4860	32	2.466	11.98	383
	20	Y25	4840	37	3.854	18.65	690
	21	Y16	5070	34	1.579	8.01	272
	22	"	4750	36	"	7.50	270
	23	"	15650	1	"	24.73	25
	24	"	15160	1	"	23.94	24
	25	"	17030	1	"	26.89	27
	26	"	16550	1	"	26.13	26
	27	Y12	37500	2	0.888	33.30	67
	28	Y25	2460	24	3.854	9.48	228
	29	Y32	4060	24	6.313	25.63	615
	30	Y12	730	34	0.888	0.65	22
	31	"	730	36	"	"	23
	32	"	3270	50	"	2.90	145
	33	Y16	770	27	1.579	1.22	33
	34	"	770	30	"	"	37
	35	Y12	810	59	0.888	0.72	42
	36	"	810	64	"	"	46
						8175 kg	
Y32				3086 kg			
Y25				3095 kg			
Y20				935 kg			
Y16				714 kg			
Y12				345 kg			
Σ				8175 kg			

BOXCULVERT FOR ROAD NO.③
LIST OF REINFORCED BAR ---WALL

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y20	4420	54	2.466	10.90	589
	2	"	3630	27	"	8.95	242
	3	Y16	4070	53	1.579	6.43	341
	4	"	16060	1	"	25.36	25
	5	"	13380	8	"	21.13	169
	6	"	4930	13	"	7.78	101
	7	Y12	16260	1	0.888	14.44	14
	8	"	13270	8	"	11.78	94
	9	"	5100	13	"	4.53	59
	10	Y16	17650	2	1.579	27.87	56
	11	"	960	49	"	1.52	74
	12	"	1030	4	"	1.63	7
	13	Y12	720	68	0.888	0.64	44
	14	Y16	860	1	1.579	1.36	1
	15	"	1040	22	"	1.64	36
						1852 kg	
F	1	Y20	1850	72	2.466	4.56	328
	2	Y16	1190	49	1.579	1.88	92
	3	Y20	1490	72	2.466	3.67	264
	4	Y16	1610	49	1.579	2.54	124
	5	Y20	3120	8	2.466	7.69	62
	6	Y16	2090	7	1.579	3.30	23
	7	Y20	2350	13	2.466	5.80	75
	8	Y16	2880	5	1.579	4.55	23
	9	"	16060	1	"	25.36	25
	10	"	7610	1	"	12.02	12
	11	"	15140	1	"	23.91	24
	12	"	16150	1	"	25.50	26
	13	"	8540	1	"	13.48	13
	14	"	17010	1	"	26.86	27
	15	Y12	15360	2	0.888	13.64	27
	16	"	8540	1	"	7.58	8
	17	"	17010	1	"	15.10	15
	18	"	14720	3	"	13.07	39
	19	"	7610	2	"	6.76	14
	20	"	15140	1	"	13.44	13
	21	"	1550	44	"	1.38	61
	22	Y16	960	6	1.579	1.52	9
						1304 kg	
K	1	Y12	2700	27	0.888	2.40	65
	2	"	7880	4	"	7.00	28
						93 kg	
Y20				1560 kg			
Y16				1208 kg			
Y12				481 kg			
計				3249 kg			

BOXCULVERT FOR ROAD --NO ④

LIST OF REINFORCED BAR ---B1 = B2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y32	18760	44	6.313	118.43	5211
	2	"	9780	44	"	61.74	2717
	3	Y25	9780	43	3.854	37.69	1621
	4	Y32	5430	86	6.313	34.28	2948
	5	Y25	14110	64	3.854	54.38	3480
	6	Y32	1890	44	6.313	11.93	525
	7	"	1890	44	"	"	525
	8	Y12	1800	307	0.888	1.60	491
	9	Y32	16750	3	6.313	105.74	317
	10	"	15630	3	"	98.67	296
	11	"	9830	3	"	62.06	186
	12	Y25	9830	3	3.854	37.88	114
	13	Y32	1890	4	6.313	11.93	48
18479 kg							
W	1	Y25	13620	19	3.854	52.49	997
	2	Y16	13370	19	1.579	21.11	401
	3	"	14220	19	"	22.45	427
	4	Y25	14590	19	3.854	56.23	1068
	5	"	7120	44	"	27.44	1207
	6	"	7120	44	"	"	1207
	7	"	7120	4	"	"	110
	8	"	7120	1	"	"	27
	9	Y12	820	189	0.888	0.73	138
	10	"	820	189	"	"	138
	11	"	820	9	"	"	7
5727 kg							
F	1	Y32	18940	44	6.313	119.57	5261
	2	"	9780	44	"	61.74	2717
	3	Y25	9780	43	3.854	37.69	1621
	4	Y32	5520	86	6.313	34.85	2997
	5	Y25	14110	64	3.854	54.38	3480
	6	Y32	2020	44	6.313	12.75	561
	7	"	2020	44	"	"	561
	8	Y12	1980	307	0.888	1.76	540
	9	Y32	15720	3	6.313	99.24	298
	10	"	15720	3	"	"	298
	11	"	9830	3	"	62.06	186
	12	Y25	9830	3	3.854	37.88	114
	13	Y32	2020	4	6.313	12.75	51
	14	Y12	1980	3	0.888	1.76	5
18690 kg							
Y32				25703 kg			
Y25				15046 kg			
Y16				828 kg			
Y12				1319 kg			
				42896 kg			

BOXCULVERT FOR ROAD - NO ④

LIST OF REINFORCED BAR ---WING1-2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y25	9610	5	3.854	37.04	185
	2	"	5510	18	"	21.24	382
	3	"	4380	16	"	16.88	270
	4	"	2420	7	"	9.33	65
	5	"	11080	3	"	42.70	128
	6	"	5630	20	"	21.70	434
	7	"	5380	13	"	20.73	269
	8	"	2990	10	"	11.52	115
	9	Y20	9490	5	2.466	23.40	117
	10	"	5390	18	"	13.29	239
	11	"	10880	3	"	26.83	80
	12	"	5600	20	"	13.81	276
	13	Y12	28570	2	0.888	25.37	51
	14	Y20	4410	28	2.466	10.88	305
	15	"	4140	30	"	10.21	306
	16	Y16	4410	28	1.579	6.96	195
	17	"	4140	30	"	6.54	196
	18	Y12	12850	1	0.888	11.41	11
	19	"	12850	1	"	"	11
	20	"	13220	1	"	11.74	12
	21	"	13220	1	"	"	12
	22	"	2310	34	"	2.05	70
	23	"	650	28	"	0.58	16
	24	"	650	30	"	"	17
	25	Y25	2380	21	3.854	9.17	193
	26	"	2240	21	"	8.63	181
	27	"	3380	21	"	13.03	274
	28	"	3380	21	"	"	274
	29	Y12	680	24	0.888	0.60	14
	30	"	680	24	"	"	14
	31	"	720	46	"	0.64	29
	32	"	720	46	"	"	29
4770 kg							
Y25							2770 kg
Y20							1323 kg
Y16							391 kg
Y12							286 kg
4770 kg							

BOXCULVERTFOR ROAD-NO ⑤

LIST OF REINFORCED BAR ---B1=B2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y32	18610	45	6.313	117.48	5287
	2	"	9780	45	"	61.74	2778
	3	Y25	9780	44	3.854	37.69	1658
	4	Y32	4170	88	6.313	26.33	2317
	5	Y25	14110	64	3.854	54.38	3480
	6	Y32	1890	45	6.313	11.93	537
	7	"	1890	45	"	"	537
	8	Y12	1800	315	0.888	1.60	504
						17098 kg	
W	1	Y25	14110	19	3.854	54.38	1033
	2	Y16	13790	19	1.579	21.77	414
	3	"	13790	19	"	"	414
	4	Y25	14110	19	3.854	54.38	1033
	5	"	6970	45	"	26.86	1209
	6	"	6970	45	"	"	1209
	7	Y12	820	194	0.888	0.73	142
	8	"	820	194	"	"	142
						5596 kg	
F	1	Y32	18790	45	6.313	118.62	5338
	2	"	9780	45	"	61.74	2778
	3	Y25	9780	44	3.854	37.69	1658
	4	Y32	5460	88	6.313	34.47	3033
	5	Y25	14110	64	3.854	54.38	3480
	6	Y32	2020	45	6.313	12.75	574
	7	"	2020	45	"	"	574
	8	Y12	1980	315	0.888	1.76	554
						17989 kg	
Y32				23753 kg			
Y25				14760 kg			
Y16				828 kg			
Y12				1342 kg			
				40683 kg			

BOXCULVERT FOR ROAD - NO. ⑤

LIST OF REINFORCED BAR --- WING₁₋₂

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y25	9960	3	3.854	38.39	115
	2	"	5480	20	"	21.12	422
	3	"	4380	15	"	16.88	253
	4	"	2560	7	"	9.87	69
	5	"	9360	4	"	36.07	144
	6	"	5250	19	"	20.23	384
	7	"	3880	16	"	14.95	239
	8	"	2330	6	"	8.98	54
	9	Y20	9880	3	2.466	24.36	73
	10	"	5400	20	"	13.32	266
	11	"	9280	4	"	22.88	92
	12	"	5180	19	"	12.77	243
	13	Y12	18020	2	0.888	16.00	32
	14	Y20	4070	29	2.466	10.04	291
	15	"	4270	27	"	10.53	284
	16	Y12	4070	29	0.888	3.61	105
	17	"	4270	27	"	3.79	102
	18	"	12930	1	"	11.48	11
	19	"	12930	1	"	"	11
	20	"	12610	1	"	11.20	11
	21	"	12670	1	"	11.25	11
	22	"	2260	34	"	2.01	68
	23	"	650	29	"	0.58	17
	24	"	650	27	"	"	16
	25	Y25	2300	20	3.854	8.86	177
	26	"	2300	20	"	"	177
	27	"	3380	20	"	13.03	261
	28	"	3380	20	"	"	261
	29	Y12	680	24	0.888	0.60	14
	30	"	680	24	"	"	14
	31	"	720	47	"	0.64	30
	32	"	720	45	"	"	39
						4276 kg	
Y25				2556 kg			
Y20				1249 kg			
Y12				471 kg			
						4276 kg	

BOXCULVERT FOR ROAD - NO ⑥

LIST OF REINFORCED BAR --- B₁ = B₂

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y32	18610	43	6.313	117.48	5052
	2	"	9780	43	"	61.74	2655
	3	Y25	9780	42	3.854	37.69	1583
	4	Y32	5370	84	6.313	33.90	2848
	5	Y25	13510	64	3.854	52.07	3332
	6	Y32	1890	43	6.313	11.93	513
	7	"	1890	43	"	"	513
	8	Y12	1800	300	0.888	1.60	480
16976 kg							
W	1	Y25	13510	19	3.854	52.07	989
	2	Y16	13190	19	1.579	20.83	396
	3	"	13190	19	"	"	396
	4	Y25	13510	19	3.854	52.07	989
	5	"	6970	43	"	26.86	1155
	6	"	6970	43	"	"	1155
	7	Y12	820	185	0.888	0.73	135
	8	"	820	185	"	"	135
5350 kg							
F	1	Y32	18790	43	6.313	118.62	5101
	2	"	9780	43	"	61.74	2655
	3	Y25	9780	42	3.854	37.69	1583
	4	Y32	5440	84	6.313	34.34	2885
	5	Y25	13510	64	3.854	52.07	3332
	6	Y32	2020	43	6.313	12.75	548
	7	"	2020	43	"	"	548
	8	Y12	1980	300	0.888	1.76	528
17180 kg							
Y32				23318 kg			
Y25				14118 kg			
Y16				792 kg			
Y12				1278 kg			
				39506 kg			

BOXCULVERT FOR ROAD - NO ⑥

LIST OF REINFORCED BAR ---WING1-2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W 1	Y25	9160	5	3.854	35.30	177	
2	"	5000	18	"	19.27	347	
3	"	3880	16	"	14.95	239	
4	"	2300	6	"	8.86	53	
5	"	10930	3	"	42.12	126	
6	"	5000	20	"	19.27	385	
7	"	4380	15	"	16.88	253	
8	"	2530	7	"	9.75	68	
9	Y20	9080	5	2.466	22.39	112	
10	"	4930	18	"	12.16	219	
11	"	9980	3	"	24.61	74	
12	"	5380	20	"	13.27	265	
13	Y12	27920	2	0.888	24.79	50	
14	Y20	4380	27	2.466	10.80	292	
15	"	4080	30	"	10.06	302	
16	Y16	4380	27	1.579	6.92	187	
17	"	4080	30	"	6.44	193	
18	Y12	12490	1	0.888	11.09	11	
19	"	12490	1	"	"	11	
20	"	12970	1	"	11.52	12	
21	"	12970	1	"	"	12	
22	"	2220	33	"	1.97	65	
23	"	650	27	"	0.58	16	
24	"	650	20	"	"	12	
25	Y25	2300	20	3.854	8.86	177	
26	"	2300	20	"	"	177	
27	"	3380	20	"	13.03	261	
28	"	3380	20	"	"	261	
29	Y12	680	24	0.888	0.60	14	
30	"	680	24	"	"	14	
31	"	720	40	"	0.64	26	
32	"	720	44	"	"	28	
						4439 kg	
				Y25	2524 kg		
				Y20	1264 kg		
				Y16	380 kg		
				Y12	271 kg		
						4439 kg	

BOXCULVERT FOR ROAD -- NO ⑦

LIST OF REINFORCED BAR --- B1 = B4

MARK	DIAMETER	LENGTH	NUMBER	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1 Y32	18660	35	6.313	117.80	4123	
	2 "	9780	34	"	61.74	2099	
	3 Y25	9780	35	3.854	37.69	1319	
	4 Y32	5390	68	6.313	34.03	2314	
	5 Y25	13850	64	3.854	53.38	3416	
	6 Y32	1890	35	6.313	11.93	418	
	7 "	1890	35	"	"	418	
	8 Y12	1800	247	0.888	1.60	395	
	9 Y32	18170	19	6.313	114.71	2179	
	10 "	17050	19	"	107.64	2045	
	11 "	12410	38	"	78.34	2977	
	12 "	2030	18	"	12.82	231	
	13 Y12	1800	59	0.888	1.60	94	
22028 kg							
W	1 Y25	11020	19	3.854	42.47	807	
	2 Y16	11040	19	1.579	17.43	331	
	3 "	16020	19	"	25.30	481	
	4 Y25	16670	19	3.854	64.25	1221	
	5 "	7020	35	"	27.06	947	
	6 "	7020	35	"	"	947	
	7 "	7020	18	"	"	487	
	8 "	7020	1	"	"	27	
	9 Y12	820	149	0.888	0.73	109	
	10 "	820	149	"	"	109	
	11 "	910	72	"	0.81	58	
5524 kg							
F	1 Y32	18840	35	6.313	118.94	4163	
	2 "	9780	34	"	61.74	2099	
	3 Y25	9780	35	3.854	37.69	1319	
	4 Y32	5480	38	6.313	34.60	1315	
	5 Y25	13850	64	3.854	53.38	3416	
	6 Y32	2020	35	6.313	12.75	446	
	7 "	2020	35	"	"	446	
	8 Y12	1980	247	0.888	1.76	435	
	9 Y32	17140	19	6.313	108.20	2056	
	10 "	18260	19	"	115.28	2190	
	11 "	12410	38	"	78.34	2977	
	12 "	2160	18	"	13.64	246	
	13 Y12	1980	59	0.888	1.76	104	
21212 kg							
Y32				32742 kg			
Y25				13906 kg			
Y16				812 kg			
Y12				1304 kg			
				48764 kg			

BOXCULVERT FOR ROAD - NO ⑦

LIST OF REINFORCED BAR --- B2 = B3

MARK		DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y32	18660	41	6.313	117.80	4830	
	2	"	9780	40	"	61.74	2470	
	3	Y25	9780	41	3.854	37.69	1545	
	4	Y32	5390	80	6.313	34.03	2722	
	5	Y25	12760	64	3.854	49.18	3148	
	6	Y32	1890	41	6.313	11.93	489	
	7	"	1890	41	"	"	489	
	8	Y12	1800	285	0.888	1.60	456	
							16149 kg	
W	1	Y25	12760	19	3.854	49.18	934	
	2	Y16	11880	19	1.579	18.76	356	
	3	"	11880	19	"	"	356	
	4	Y25	12760	19	3.854	49.18	934	
	5	"	7020	41	"	27.06	1109	
	6	"	7020	41	"	"	1109	
	7	Y12	820	176	0.888	0.73	128	
	8	"	820	176	"	"	128	
							5054 kg	
F	1	Y32	18840	41	6.313	118.94	4877	
	2	"	9780	40	"	61.74	2470	
	3	Y25	9780	41	3.854	37.69	1545	
	4	Y32	5480	80	6.313	34.60	2768	
	5	Y25	12760	64	3.854	49.18	3148	
	6	Y32	2020	41	6.313	12.75	523	
	7	"	2020	41	"	"	523	
	8	Y12	1980	285	0.888	1.76	502	
							16356 kg	
					Y32	22161 kg		
					Y25	13472 kg		
					Y16	712 kg		
					Y12	1214 kg		
						37559 kg		

BOXCULVERT FOR ROAD -- NO ⑦

LIST OF REINFORCED BAR -- WING

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y25	7120	3	3.854	27.44	82
	2	"	9770	3	"	37.65	113
	3	"	5870	18	"	22.62	407
	4	"	3750	16	"	14.45	231
	5	"	2930	4	"	11.29	45
	6	"	4000	2	"	15.42	31
	7	Y20	10820	4	2.466	26.68	107
	8	"	6200	18	"	15.29	275
	9	"	4500	28	"	11.10	311
	10	Y16	4710	30	1.579	7.44	223
	11	"	1500	77	"	2.37	182
	12	"	920	39	"	1.45	57
	13	"	990	1	"	1.56	2
	14	"	950	30	"	1.50	45
	15	"	13260	2	"	20.94	42
	16	"	11720	2	"	18.51	37
	17	"	11330	2	"	17.89	36
	18	"	9240	4	"	14.59	58
	19	"	7000	1	"	11.05	11
	20	"	950	23	"	1.50	35
	21	Y12	710	49	0.888	0.63	31
	22	Y25	3000	24	3.854	11.56	277
						2638 kg	
Y25				1186 kg			
Y20				693 kg			
Y16				728 kg			
Y12				31 kg			
計:				2638 kg			

BOXCULVERT FOR ROAD - NO ⑦

LIST OF REINFORCED BAR ---WALL 1

MARK	DIAMETER	LENGTH	NUMBER	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y20	4560	45	2.466	11.24	506
	2	"	4700	22	"	11.59	255
	3	Y16	4500	46	1.579	7.11	327
	4	"	860	45	"	1.36	61
	5	"	920	1	"	1.45	1
	6	"	15510	2	"	24.49	49
	7	"	13680	1	"	21.60	22
	8	"	12150	5	"	19.18	96
	9	"	5210	17	"	8.23	140
	10	Y12	13760	1	0.888	12.22	12
	11	"	11970	6	"	10.63	64
	12	"	5030	16	"	4.47	72
	13	Y16	840	1	1.579	1.33	1
	14	"	970	23	"	1.53	35
	15	Y12	720	56	0.888	0.64	36
1677 kg							
F	1	Y20	2050	59	2.466	5.06	299
	2	Y16	1270	41	1.579	2.01	82
	3	Y20	1590	59	2.466	3.92	231
	4	Y16	1680	41	1.579	2.65	109
	5	Y20	3020	7	2.466	7.45	52
	6	Y16	2110	6	1.579	3.33	20
	7	Y20	2350	12	2.466	5.80	70
	8	Y16	2780	4	1.579	4.39	18
	9	"	13640	4	"	21.54	86
	10	"	5080	4	"	8.02	32
	11	"	12660	1	"	19.99	20
	12	"	12960	1	"	20.46	20
	13	"	7340	1	"	11.59	12
	14	"	14520	1	"	22.93	23
	15	Y12	13640	3	0.888	12.11	36
	16	"	5080	4	"	4.51	18
	17	"	12660	1	"	11.24	11
	18	"	12960	1	"	11.51	12
	19	"	7340	1	"	6.52	7
	20	"	14520	1	"	12.89	13
	21	Y16	810	10	1.579	1.28	13
	22	Y12	1550	37	0.888	1.38	51
1235 kg							
K	1	Y12	2700	21	0.888	2.40	50
	2	"	5880	4	"	5.22	21
71 kg							
Y20				1413 kg			
Y16				1167 kg			
Y12				403 kg			
				2983 kg			

BOXCULVERT FOR ROAD - NO ⑦

LIST OF REINFORCED BAR ---WALL 2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y20	4290	55	2.466	10.58	582
	2	"	3400	26	"	8.38	218
	3	Y16	4230	66	1.579	6.68	374
	4	"	860	55	"	1.36	75
	5	"	920	1	"	1.45	1
	6	"	18100	2	"	28.58	57
	7	"	16570	1	"	26.16	26
	8	"	13400	8	"	21.16	169
	9	"	5160	12	"	8.15	98
	10	Y12	16760	1	0.888	14.88	15
	11	"	13650	8	"	12.12	97
	12	"	5170	13	"	4.59	60
	13	Y16	830	1	1.579	1.31	1
	14	"	1000	22	"	1.58	35
	15	Y12	790	68	0.888	0.70	48
	16	Y 8	1	1	0.395	0.00	0
						1856 kg	
F	1	Y20	2070	74	2.466	5.10	377
	2	Y16	1220	51	1.579	1.93	98
	3	Y20	1520	74	2.466	3.75	278
	4	Y16	1700	51	1.579	2.68	137
	5	Y20	3120	9	2.466	7.69	69
	6	Y16	2090	7	1.579	3.30	23
	7	Y20	2330	13	2.466	5.75	75
	8	Y16	2880	5	1.579	4.55	23
	9	"	16730	3	"	26.42	79
	10	"	13480	2	"	21.28	43
	11	"	6750	2	"	10.66	21
	12	"	16630	1	"	26.26	26
	13	"	15070	1	"	23.80	24
	14	"	8500	1	"	13.42	13
	15	"	17500	1	"	27.63	28
	16	Y12	16600	2	0.888	14.74	29
	17	"	14930	1	"	13.26	13
	18	"	8500	1	"	7.55	8
	19	"	17350	1	"	15.42	15
	20	"	13340	1	"	11.85	12
	21	"	6750	2	"	5.99	12
	22	"	16490	1	"	14.64	15
	23	Y16	930	9	1.579	1.47	13
	24	Y12	1510	45	0.888	1.34	60
	25	Y 8	1	1	0.395	0.00	0
						1491 kg	
K	1	Y12	2700	28	0.888	2.40	67
	2	"	7880	4	"	7.00	28
						95 kg	
Y20				1599 kg			
Y16				1364 kg			
Y12				479 kg			
				3442 kg			

BOXCULVERT FOR ROAD - NO ⑦

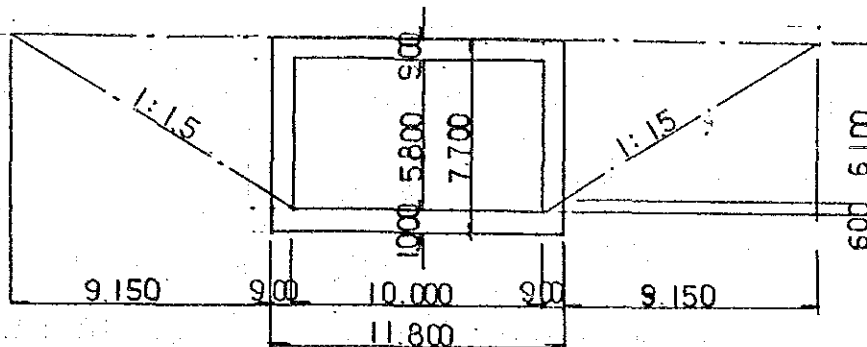
LIST OF REINFORCED BAR ---WALL 3

MARK	DIAMETER	LENGTH	NUMBER	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y20	4400	34	2.466	10.85	369
	2	"	7540	1	"	18.59	19
	3	"	3400	17	"	8.38	142
	4	Y16	4330	32	1.579	6.84	219
	5	"	860	29	"	1.36	39
	6	"	1390	3	"	2.19	7
	7	"	12360	1	"	19.52	20
	8	"	9740	1	"	15.38	15
	9	"	4790	21	"	7.56	159
	10	"	11930	1	"	18.84	19
	11	Y12	9410	1	0.888	8.36	8
	12	"	4710	22	"	4.18	92
	13	Y16	1000	22	1.579	1.58	35
	14	"	830	1	"	1.31	1
	15	Y12	770	48	0.888	0.68	33
							1177 kg
F	1	Y20	2080	45	2.466	5.13	231
	2	Y16	1220	30	1.579	1.93	58
	3	Y20	1520	44	2.466	3.75	165
	4	Y16	1710	30	1.579	2.70	81
	5	Y20	3540	12	2.466	8.73	105
	6	Y16	2040	3	1.579	3.22	10
	7	Y20	2300	6	2.466	5.67	34
	8	Y16	3300	7	1.579	5.21	36
	9	"	9570	3	"	15.11	45
	10	"	5100	6	"	8.05	48
	11	"	11680	1	"	18.44	18
	12	"	6630	2	"	10.47	21
	13	"	8890	1	"	14.04	14
	14	Y12	9570	2	0.888	8.50	17
	15	"	5100	6	"	4.53	27
	16	"	11540	1	"	10.25	10
	17	"	6630	2	"	5.89	12
	18	"	8890	1	"	7.89	8
	19	Y16	930	9	1.579	1.47	13
	20	Y12	550	32	0.888	0.49	16
							969 kg
K	1	Y12	2700	14	0.888	2.40	34
	2	"	3880	4	"	3.45	14
							48 kg
Y20				1065 kg			
Y16				858 kg			
Y12				271 kg			
				2194 kg			

NO ① BOX-CULVERT FOR ROAD

BACK-FILL

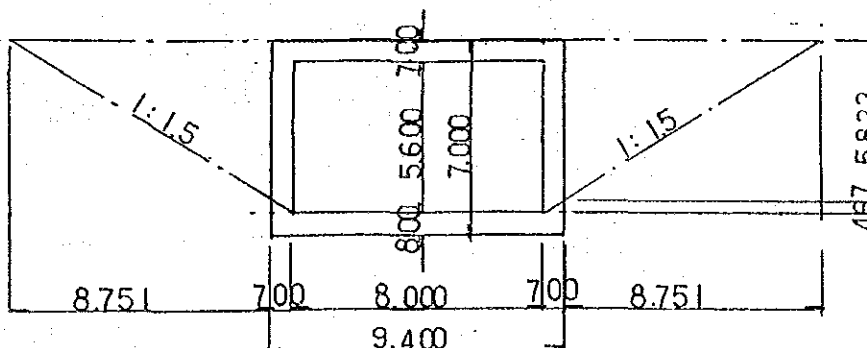
$$V = 6.10 \times 9.15 \times (32.30 - 0.609 - 0.619) = 1734.3 \text{ m}^3$$



NO ② BOX-CULVERT FOR ROAD

BACK-FILL

$$V = 5.833 \times 8.751 \times (27.50 - 0.60 \times 2) = 1342.5 \text{ m}^3$$

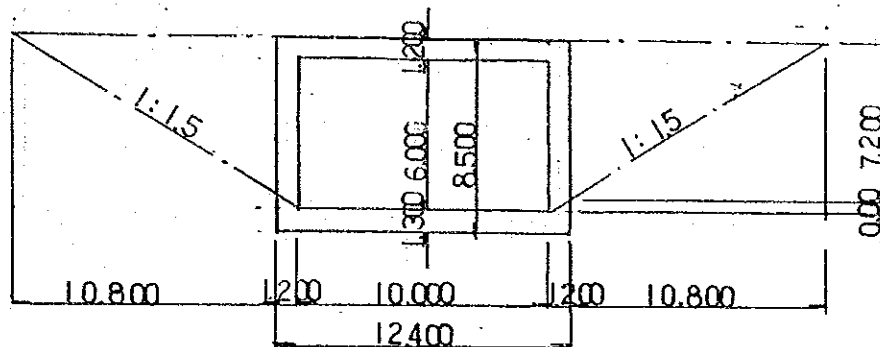


NO ③ BOX-CULVERT FOR ROAD

BACK-FILL --- include retaining wall.

$$V = 7.20 \times 10.80 \times 50.50$$

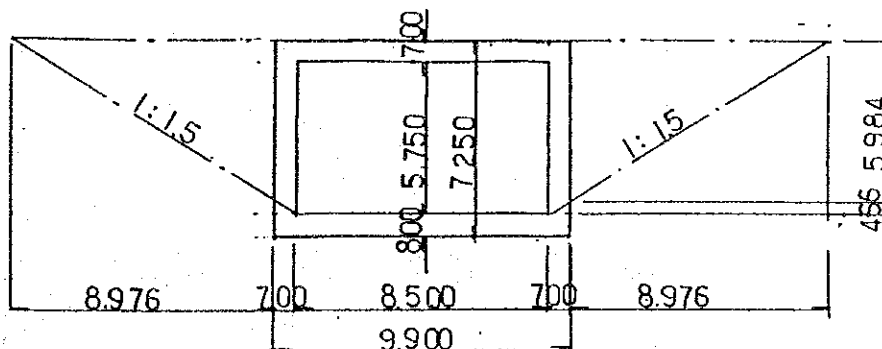
$$+ \frac{1}{2} \times 7.20 \times 10.80 \times 16.00 / 3 = 4142.0 \text{ m}^3$$



NO ④ BOX-CULVERT FOR ROAD

BACK-FILL

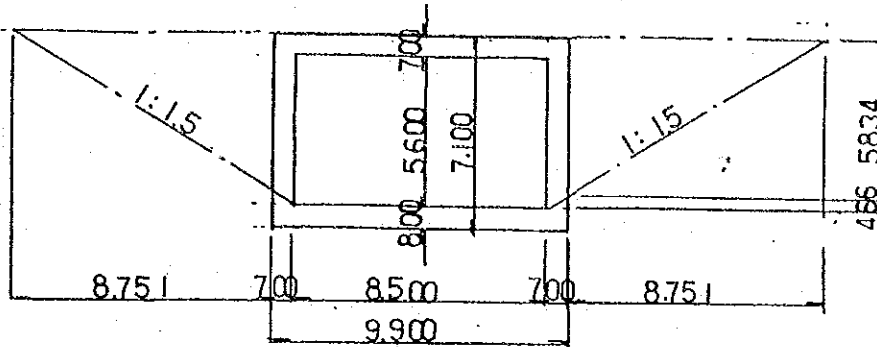
$$V = 5.984 \times 8.976 \times (26.70 - 0.603 \times 2) = 1369.3 \text{ m}^3$$



NO ⑤ BOX-CULVERT FOR ROAD

BACK-FILL

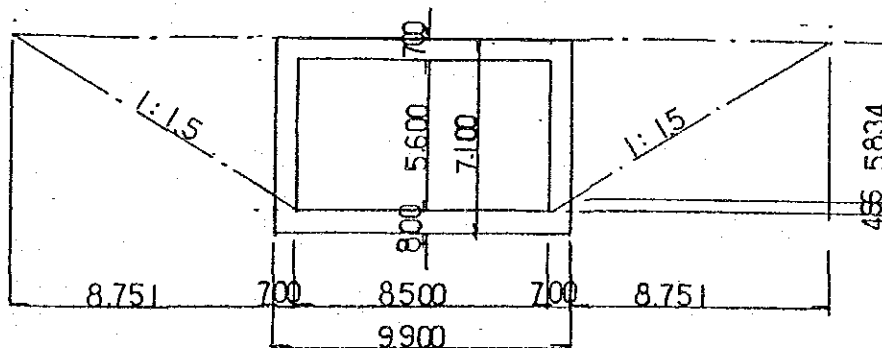
$$V = 5.834 \times 8.751 \times (26.70 - 0.60 \times 2) = 1301.8 \text{ m}^3$$



NO ⑥ BOX-CULVERT FOR ROAD

BACK-FILL

$$V = 5.834 \times 8.751 \times (25.50 - 0.60 \times 2) = 1240.6 \text{ m}^3$$

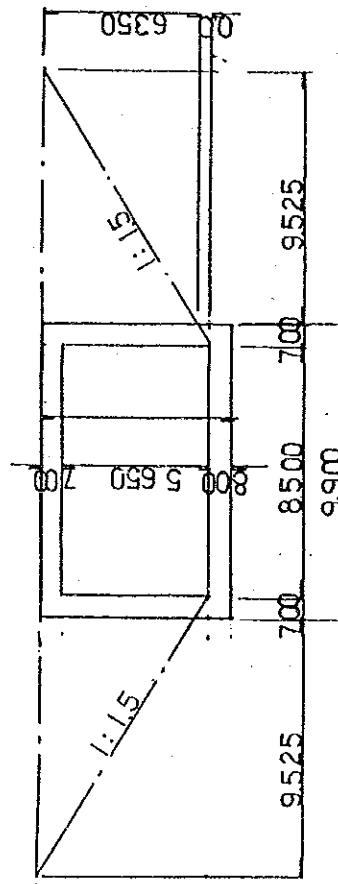


NO ⑦ BOX-CULVERT FOR ROAD

BACK-FILL --- include retaining wall

$$V = 635 \times 9.525 \times 50.20$$

$$+ \frac{1}{2} \times 635 \times 9.525 (13.50 + 9.50 + 16.50) / 3 = 3434.5 \text{ m}^3$$



BOX FOR ROAD

$$\text{NO①} \quad \text{UF2} \quad A = (11.80 + 10.00) \times 32.30 + 9.00 \times 0.60 \times 2 \times 2 = 725.740 \text{ m}^2$$

$$\text{NO②} \quad \text{"} \quad A = (9.40 + 8.00) \times 27.50 + (8.60 + 9.00) \times 0.60 \times 2 = 499.620 \text{ "}$$

$$\begin{aligned} \text{NO③} \quad \text{"} \quad A &= (12.40 + 10.00) \times 50.50 + (9.90 + 11.50) \times 0.70 + 8.30 \times 0.60 \\ &\quad + (3.50 + 10.00) \times 1/2 \times 16.00 = 1187.160 \text{ "} \end{aligned}$$

$$\text{NO④} \quad \text{"} \quad A = (9.90 + 8.50) \times 26.70 + (8.60 + 9.30) \times 0.60 \times 2 = 512.760 \text{ "}$$

$$\text{NO⑤} \quad \text{"} \quad A = (9.90 + 8.50) \times 26.70 + (9.00 + 8.40) \times 0.60 \times 2 = 512.160 \text{ "}$$

$$\text{NO⑥} \quad \text{"} \quad A = (9.90 + 8.50) \times 25.50 + (8.20 + 9.10) \times 0.60 \times 2 = 489.960 \text{ "}$$

$$\begin{aligned} \text{NO⑦} \quad \text{"} \quad A &= (9.90 + 8.50) \times 50.20 + 8.70 \times 0.60 \\ &\quad + (3.50 + 1.00) \times 1/2 \times (13.50 + 9.50 + 16.50) = 1017.775 \text{ "} \end{aligned}$$

NO① BOX FOR ROAD

porous drainage	$A = 6.70 \times 31.072 \times 2 (\times 0.300)$	$= 416.364 \text{ m}^2 \text{ } 124.909 \text{ m}^3$
perforated pipe	$L = 31.072 \times 2$	$= 62.144 \text{ m}$
drain pipe ($\phi 200 \text{ mm}$)	$N =$	$= 2 \text{ N}$

NO② BOX FOR ROAD

porous drainage	$A = 6.30 \times 26.30 \times 2 (\times 0.300)$	$= 331.380 \text{ m}^2 \text{ } 99.414 \text{ m}^3$
perforated pipe	$L = 26.30 \times 2$	$= 52.600 \text{ m}$
drain pipe ($\phi 200 \text{ mm}$)	$N =$	$= 2 \text{ N}$

NO③ BOX FOR ROAD

porous drainage	$A = \{7.20 \times 50.60 \times 2 + \frac{1}{2} \times 7.20 \times 16.0\} (\times 0.300)$	$= 786.240 \text{ m}^2 \text{ } 235.872 \text{ m}^3$
perforated pipe	$L = 50.60 \times 2 + 16.00$	$= 117.200 \text{ m}$
drain pipe ($\phi 200 \text{ mm}$)	$N =$	$= 4 \text{ N}$

NO④ BOX FOR ROAD

porous drainage	$A = 6.45 \times 25.494 \times 2 (\times 0.300)$	$= 328.872 \text{ m}^2 \text{ } 98.662 \text{ m}^3$
perforated pipe	$L = 25.494 \times 2$	$= 50.988 \text{ m}$
drain pipe ($\phi 200 \text{ mm}$)	$N =$	$= 2 \text{ N}$

NO⑤ BOX FOR ROAD

porous drainage	$A = 6.30 \times 25.50 \times 2 (\times 0.300)$	$= 321.300 \text{ m}^2 \text{ } 98.390 \text{ m}^3$
perforated pipe	$L = 25.50 \times 2$	$= 51.000 \text{ m}$
drain pipe ($\phi 200 \text{ mm}$)	$N =$	$= 2 \text{ N}$

NO⑥ BOX FOR ROAD

porous drainage	$A = 24.30 \times 6.30 \times 2 (\times 0.300)$	$= 306.180 \text{ m}^2 \text{ } 91.854 \text{ m}^3$
perforated pipe	$L = 24.30 \times 2$	$= 48.600 \text{ m}$
drain pipe ($\phi 200 \text{ mm}$)	$N =$	$= 4 \text{ N}$

NO⑦ BOX FOR ROAD

i) BOX

porous drainage	$A1 = 50.20 \times 6.35 \times 2$	$= 637.540 \text{ m}^2$
perforated pipe	$L1 = 50.20 \times 2$	$= 100.400 \text{ m}$
drain pipe ($\phi 200 \text{ mm}$)	$N1 =$	

ii) wall

porous drainage	$A2 = 6.35 (13.50 + 9.50 + 16.50) / 2$	$= 125.412 \text{ m}^2$
perforated pipe	$L2 = 13.50 + 9.50 + 16.50$	$= 39.50 \text{ m}$
drain pipe ($\phi 200 \text{ mm}$)		

total

$A = (637.540 + 125.412) \times 0.300$	$= 762.952 \text{ m}^2$
$L = 100.400 + 39.500$	$= 139.9 \text{ m}$
$N =$	$= 2 \text{ N}$

B. Q 21.01 Waterproofing materials

NO① BOX for Road

$$A = (32.30 - 0.618 - 0.609) \times (7.70 \times 2 + 11.80) + (9.00 \times 7.971 \times 2 - 9.00 \times 6.00) \times 2 = 1024.142 \text{ m}^2$$

NO② BOX for Road

$$A = (27.50 - 0.60 \times 2) \times (7.10 \times 2 + 9.40) + \left\{ (8.60 + 9.00) \times 7.464 - \frac{1}{2} \times (8.60 \times 5.733 + 9.00 \times 6.00) \right\} \times 2 = 780.109 \text{ m}^2$$

NO③ BOX for Road

$$A = (50.48 - 0.692 - 0.844) \times (8.10 \times 2 + 12.00) + \frac{1}{2} \times (1.249 \times 8.496) \times 8.30 + \frac{1}{2} \times (1.405 + 8.50) \times 9.90 + \frac{1}{2} \times (1.416 \times 8.708) \times 11.50 + \frac{1}{2} \times (6.90 + 0.40) \times 16.00 = 1586.305 \text{ m}^2$$

NO ④ BOX for Road

$$A = (26.70 - 0.603 \times 2) \times (7.25 \times 2 + 9.90) + \left\{ (8.60 + 9.30) \times 7.60 - \frac{1}{2} \times (8.60 \times 5.733 + 9.30 \times 6.20) \right\} \times 2 = 787.170 \text{ m}^2$$

NO ⑤ BOX for Road

$$A = (26.70 - 0.60 \times 2) \times (7.10 \times 2 + 9.90) + \left\{ (9.00 + 8.40) \times 7.425 - \frac{1}{2} \times (9.00 \times 6.00 + 8.40 \times 5.60) \right\} \times 2 = 771.900 \text{ m}^2$$

NO ⑥ BOX for Road

$$A = (25.50 - 0.60 \times 2) \times (7.10 \times 2 + 9.90) + \left\{ (8.20 + 9.10) \times 7.406 - \frac{1}{2} \times (8.20 \times 5.467 + 9.10 \times 6.067) \right\} \times 2 = 741.839 \text{ m}^2$$

NO ⑦ BOX for Road

$$A = (50.20 - 0.658 - 0.346) \times (7.15 \times 2 + 9.90) + \frac{1}{2} \times (1.26 + 7.828) \times 8.70 + \frac{1}{2} \times (7.235 + 0.40) \times 13.50 + \frac{1}{2} \times (6.85 + 0.40) \times 9.50 + \frac{1}{2} \times (6.85 + 0.40) \times 16.50 = 1375.862 \text{ m}^2$$

NO1 BOX FOR DRAINAGE

① skew angle = 60° ~ 90°
 $\alpha = 1/\sin 60^\circ = 1.1547$

1) concrete(grade:25) L=14.500

bottom slab	$V = 4.00 \times 0.50 \times 14.50$	=29.000m ³
top	$V = 4.00 \times 0.50 \times \text{"} + 0.30 \times 0.30 \times 4.00 \times 1.155$	=29.415 "
side wall	$V = 0.50 \times 3.00 \times \text{"} \times 2$	=43.500 "
middle wall	$V = 0.20 \times 0.50 \times 14.50$	=1.450 "

total V = =103.370 "

2) formwork

form:section	$A = (4.00^2 - 3.00^2) \times (1.155 + 1.0)$	=15.085m ²
:out side	$A = 4.00 \times 14.50 \times 2$	=116.000 "
:box in wall	$A = 0.50 \times \{14.50 \times 2 + 0.20 \times (1.155 + 1.0)\}$	=14.716 "
:in sade	$A = 3.00 \times 14.50 \times 2$	=87.000 "
:top slab	$A = 3.00 \times 14.50 + 0.30 \times (0.346 + 4.619) \times 2$	=46.479 "

total A = =279.280 "

3) base concrete(grade:15)

concrete	$V = 0.10 \times 4.20 \times 14.50$	=6.090m ³
form	$A = \{14.50 \times 2 + 4.00 \times (1.155 + 1.0)\} \times 0.10$	=3.762m ²

4) suport V = (3.00 - 0.10) × 3.00 × 14.50 =126.150m³

5) scaffold V = 1.20 × 4.00 × 14.50 × 2 =139.200m³

6)excavation(earth)

$$V = 0.60/6 \{ (7.00 \times 59.00 + 7.60 \times 59.00) \} + (7.00 + 7.60) (59.00 + 59.00) \} = 258.420\text{m}^3/\text{box}$$

remain:

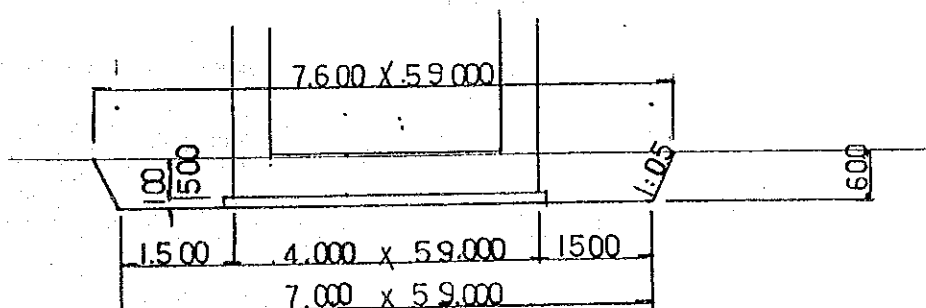
$$V = 4.20 \times 0.10 \times 59.00 + 4.00 \times 0.50 \times 59.00 = 142.780 "$$

fill:

$$V = 258.420 - 142.780 = 115.640 "$$

bank(earth):

$$V = 0.80 \times 0.50 \times 59.00 = 23.600 "$$



NO 1 BOX FOR DRAINAGE

(B2-B3)

1) concrete (grade:25) L=15.00m		
bottom slab $V=4.00 \times 0.50 \times 15.00$	=30.000m ³	
top $V=4.00 \times 0.50 \times "$	=30.000 "	
side wall $V=0.50 \times 3.00 \times " \times 2$	=45.000 "	
middle wall $V=0.20 \times 0.50 \times 15.00$	=1.500 "	
total $V=$	=106.500 "	
2) formwork.		
form:section $A=(4.00^2-3.00^2) \times 1$	=7.00m ² (0.000)	(135.200) 142.200
:out side $A=4.00 \times 15.00 \times 2$	=120.000 "	
middle wall $A=0.50 \times (0.20+15.00) \times 2$	=15.200 "	
:in side $A=3.00 \times 15.00 \times 2$	=90.000 "	
:top slab $A=3.00 \times 15.00$	=45.000 "	
total $A=$	=277.200 " (270.200)	
	(B2) (B3)	
3) base concrete(grade:15)		
concrete $V=0.10 \times 4.20 \times 15.00$	=6.300m ³	
form $A=0.10 \times 15.00 \times 2$	=3.000m ²	
4) joint filler $A=(4.00^2-3.00^2) \times 3$	=21.000m ² /box	
5) water stop $L=3.50 \times 4 \times 3$	=42.000m/box	
6) suport $V=(3.00-0.10) \times 3.00 \times 15.00$	=130.500m ³	
7) scaffold $V=1.20 \times 4.00 \times 15.00 \times 2$	=144.0m ³	

NO1 BOX FOR DRAINAGE

W1-W2 Retaining wall

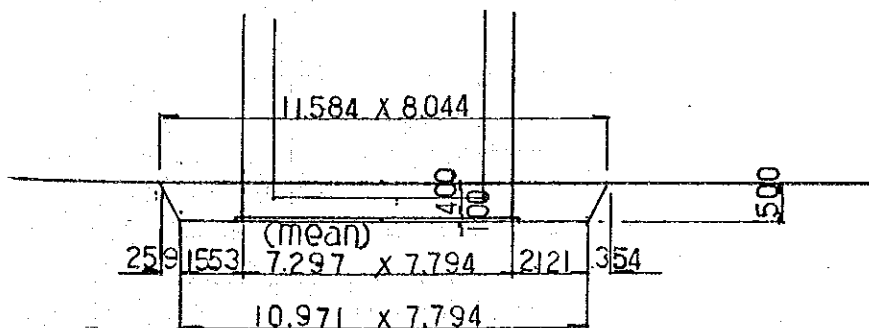
- 1) concrete(grade:25)

side wall	$V = (3.80 + 0.30) \times 1/2 \times (9.00 + 12.247) \times 0.40$	
	$+ 1.00 \times 0.40 \times 0.40 \times 2$	$= 17.743 \text{ m}^3$
bottom slab	$V = (4.444 + 10.150) \times 1/2 \times 7.794 \times 0.40 +$	
	$0.30 \times 1.00 \times 10.15$	$= 25.794 \text{ m}^3$
total	$V =$	$= 43.537 \text{ m}^3$
- 2) formwork

form:out side	$A = (4.20 + 0.70) \times 1/2 \times (9.000 + 12.247)$	$= 52.055 \text{ m}^2$
:bottom slab	$A = (0.311 + 0.424 + 10.15 \times 2) \times 1.00$	
	$+ (0.897 + 1.225 + 0.414 + 0.566) \times 0.40$	$= 22.276 \text{ m}^2$
:in side	$A = (3.80 + 0.30) \times 1/2 \times (9.00 + 12.247)$	$= 43.556 \text{ m}^2$
total	$A =$	$= 117.887 \text{ m}^2$
- 3) scaffold $V = 1.2 \times (3.80 + 1.0) (7.20 + 9.80) = 97.920 \text{ m}^3$
- 4) base concrete(grade:15)

concrete:main	$V = 0.10 \times (4.689 + 10.395) \times 1/2 \times 7.494 + 0.60 \times (0.986 + 1.100) \times 0.10$	$= 5.777 \text{ m}^3$
and wing		
form:main	$A = 0.10 \times \{7.759 + 10.599 + (1.00 + 1.366) \times 2 + 0.621 + 0.848\}$	$= 2.450 \text{ m}^2$
and wing		
- 5) gabion: $A = 5.00 \times 10.0 = 50.00 \text{ m}^2$
t=500
- 6) joint filler $A = (0.414 + 0.566) \times 3.80 + 4.444 \times 0.40 = 5.502 \text{ m}^2$
- 7) water stop $L = 4.00 \times 2 + 3.954 = 11.954 \text{ m}$
- 8) excavation

excavation(earth and gabion include)		
	$V = 0.50/6 \{10.971 \times 7.794 + 11.584 \times 8.044$	
	$+ (10.971 + 11.584) \times (7.794 + 8.044)\}$	
	$+ 0.30 \times 1.00 \times 10.15 + 5.00 \times 10.00 \times 0.500$	$= 72.705 \text{ m}^3$
remain:	$V = 25.794 + 5.777 + 0.30 \times 1.00 \times 10.15 + 5.00 \times 10.00$	
	$\times 0.50$	$= 59.616 \text{ m}^3$
fill:	$V = 72.705 - 59.616$	$= 13.089 \text{ m}^3$



notice

This size is consider skew angle.

NO 2 BOX FOR DRAINAGE

(B1-B2)

1) concrete(grade:25) L=17.10

bottom slab	$V = 2.80 \times 0.40 \times 17.10$	=19.152m ³
top	$V = 2.80 \times 0.40 \times "$	=19.152 "
side wall	$V = 3.00 \times 0.40 \times " \times 2$	=41.040 "
middle wall	$V = 0.20 \times 0.50 \times 17.10$	=17.100 "

total V = =96.444 "

2) formwork

form:section	$A = (2.80 \times 3.80 - 2.00 \times 3.00) \times (1.0353 + 1.000)$	=9.444m ² (4.804)	(151.864)
:out side	$A = 3.80 \times 17.10 \times 2$	=129.960m ²	
:middle wall	$A = 0.50 \times 0.20 \times 17.10$	=17.100 "	=156.504
:in side	$A = 3.00 \times 17.10 \times 2$	=102.600 "	
:top slab	$A = 2.00 \times 17.10$	=34.200 "	

total A = =293.304 " (288.664)
(B1) (B2)

3) base concrete(grade:15)

concrete	$V = 0.10 \times 3.00 \times 17.10$	=5.130m ³
form	$A = \{17.10 \times 2 + 3.00 \times (1.0353 + 1.0)\} \times 0.10$	=4.031m ²

4) joint filler $A = (2.80 \times 3.80 - 2.00 \times 3.00)$ =4.640m²/box
5) water stop $L = (2.40 + 3.40) \times 2$ =11.600m/box

6) suport : $V = (3.00 - 0.1) \times 2.00 \times 17.10$ =99.180m³
7) scaffold: $V = 1.2 \times 3.80 \times 17.1 \times 2$ =155.952m³

8) excavation

excavation(earth)

$$V = 0.40/6 \{ (5.80 \times 34.20 + 6.20 \times 34.20) + (5.80 + 6.20)(34.20 + 34.20) \} = 82.080\text{m}^3/\text{box}$$

remain:

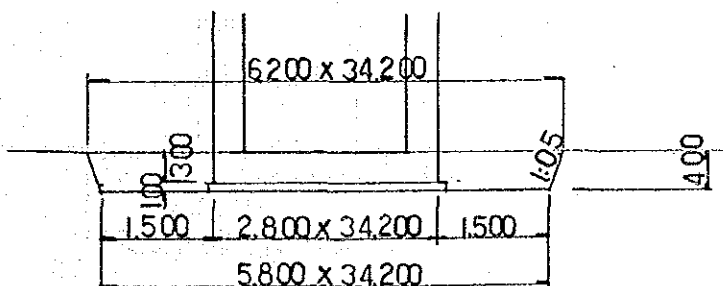
$$V = (3.00 \times 0.10 - 2.80 \times 0.30) \times 34.20 = 38.988\text{m}^3/\text{box}$$

fill:

$$V = 82.080 - 38.988 = 43.092\text{m}^3/\text{box}$$

bank(earth):

$$V = 0.80 \times 0.50 \times 34.20 = 13.680 "$$



NO2 BOX FOR DRAINAGE

W1-W2 Retaining wall

1) concrete(grade:25)

$$\text{side wall } V = (3.70 + 0.80) \times 1/2 \times (5.019 + 6.147) \times 0.40 + (1.115 + 1.366) \times 0.40 \times 0.40 = 9.330 \text{ m}^3$$

$$\text{bottom slab } V = (3.098 + 8.432) \times 1/2 \times 3.881 \times 0.40 + 0.30 \times 1.00 \times 8.432 = 10.327 \text{ m}^3$$

$$\text{total } V = 19.657 \text{ m}^3$$

2) formwork

$$\text{form:outside } A = (4.10 + 0.70) \times 1/2 \times (5.019 + 6.147) = 26.798 \text{ m}^2$$

$$\text{:in side } A = (3.70 + 0.30) \times 1/2 \times (5.019 + 6.147) = 22.332 \text{ m}^2$$

$$\text{:bottom slab } A = (0.346 + 0.424 + 8.432 \times 2) \times 1.00 + (1.115 + 1.366 + 0.462 + 0.566) \times 0.4 = 19.038 \text{ m}^2$$

$$\text{total } A = 68.168 \text{ m}^2$$

$$3) \text{ scaffold } V = 1.2 \times (3.70 + 1.00) \times (4.00 + 4.90) = 50.196 \text{ m}^3$$

4) base concrete(grade:15)

$$\text{concrete:main } V = 0.10 \times \{ (3.305 + 8.639) \times 1/2 \times 3.081 + 0.60 \times 1.104 \times 2 \} = 1.972 \text{ m}^3$$

and wing

$$\text{form:main } A = 0.10 \times \{ (3.825 + 4.371) + (1.231 + 1.508) \times 2 + 0.693 + 0.848 \} = 1.522 \text{ m}^2$$

and wing

$$5) \text{ gabion: } A = 5.00 \times 9.00 = 45.000 \text{ m}^2$$

t=500

$$6) \text{ joint filler } A = 0.414 \times 2 \times 3.70 + 2.899 \times 0.40 = 4.223 \text{ m}^2$$

$$7) \text{ water stop } L = 3.90 \times 2 + 2.485 = 10.285 \text{ m}$$

8) excavation

excavation(earth and gabion include)

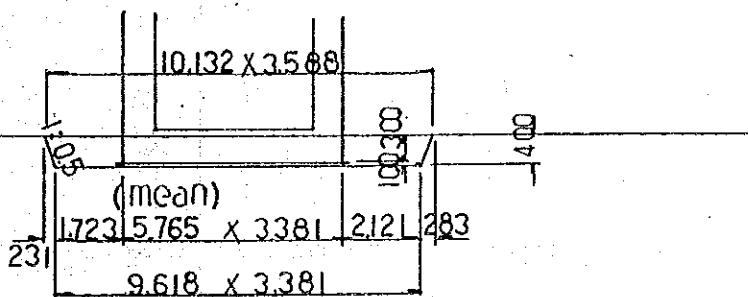
$$V = 0.40/6 \{ (9.618 \times 3.381 + 10.132 \times 3.588) + (9.618 + 10.132) (3.381 + 3.588) \} + 0.30 \times 1.00 \times 8.432 + 5.00 \times 9.00 \times 0.50 = 38.797 \text{ m}^3$$

remain:

$$V = 5.765 \times 0.30 \times 3.381 + 1.972 + 0.30 \times 1.00 \times 8.432 + 5.00 \times 9.00 \times 0.50 = 32.849 \text{ m}^3$$

fill:

$$V = 38.797 - 32.849 = 5.948 \text{ m}^3$$



notice

This size is consider skew angle .

NO3 BOX FOR DRAINAGE

B1-B4

1) concrete(grade:25)

bottom slab	$V=4.70 \times 0.70 \times 18.50$	=60.865m ³
top	$V=4.70 \times 0.60 \times "$	=52.170 "
side wall	$V=3.00 \times 0.60 \times " \times 2$	=66.600 "

total V= =179.635 "

2) formwork

form:section	$A=(4.70 \times 4.30 - 3.50 \times 3.00) \times (1.0785 + 1.0)$	=20.182m ²
:out side	$A=4.30 \times 18.50 \times 2$	=159.100 "
:in side	$A=3.00 \times 18.50 \times 2$	=111.000 "
:top slab	$A=3.50 \times 18.50$	=64.750 "

total A= =355.032 "

3) base concrete(grade:15)

concrete $V=0.10 \times 4.90 \times 18.50$ =9.065m³

form $A=(18.50 \times 2 + 4.90 \times (1.0785 + 1.0)) \times 0.10$ =4.718m²

4) joint:filler $A=(4.70 \times 4.30 - 3.50 \times 3.00) \times 3$ =29.130m²/box

5) water stop $L=(4.10 + 3.65) \times 2 \times 3$ =46.500m/box

6) suport $V=(3.00 - 0.10) \times 3.50 \times 18.50$ =187.775m³

7) scaffold $V=1.2 \times 4.30 \times 18.50 \times 2$ =190.920m³

8)excavation

excavation(earth)

$$V=4.30/6 \{ (7.70 \times 67.00 + 12.00 \times 67.00 + (7.70 + 12.00) (67.00 + 67.00)) \}$$

=2837.785m³/box

remain:

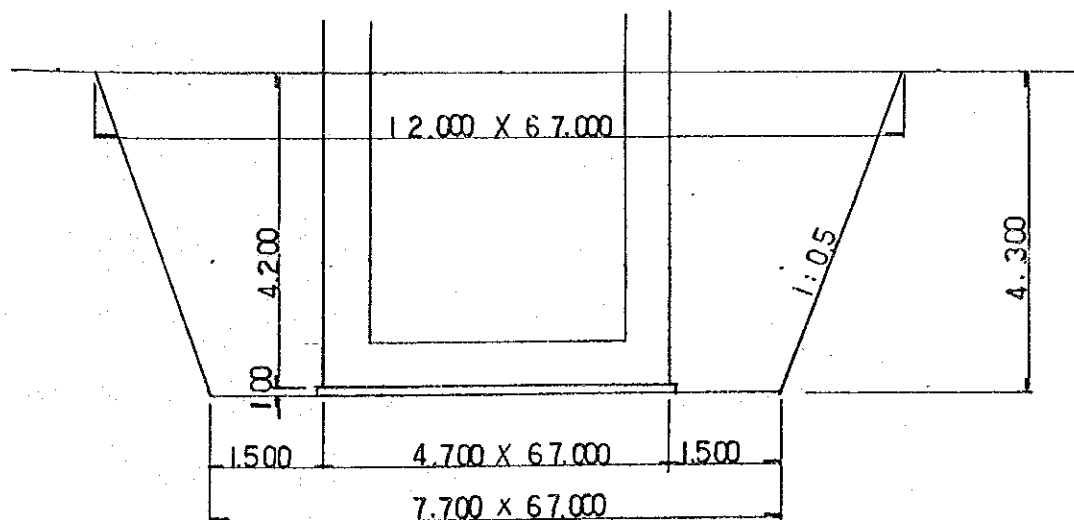
$$V=4.90 \times 0.10 \times 67.00 + 4.70 \times 4.20 \times 67.00$$

=1355.410m³/box

fill:

$$V=2837.785 - 1355.410$$

=1482.375m³/box



NO 3 BOX FOR DRAINAGE

(B2-B3)

1) concrete(grade:25)

bottom slab	$V=4.70 \times 0.70 \times 15.0$	=49.350m ³
top	$V=4.70 \times 0.60 \times "$	=42.300 "
side wall	$V=3.00 \times 0.60 \times " \times 2$	=54.000 "

total $V=$ =145.650 "

2) formwork (0)

form:section	$A=(4.70 \times 4.30 - 3.50 \times 3.00) \times 1$	=9.710 m ² (0.0) (129.000)
:out side	$A=4.30 \times 15.00 \times 2$	=129.000 "
:in side	$A=3.00 \times 15.00 \times 2$	=90.000 "
:top slab	$A=3.50 \times 15.00$	=52.500 "

total $A=$ =281.210 " (271.500)
(B2) (B3)

3) base concrete(grade:15)

concrete:main	$V=0.10 \times 4.90 \times 15.00$	=7.350 m ³
form:main	$A=(15.00 \times 2 + 4.70) \times 0.10$	=3.470 "

4) suport $V=(3.00-0.10) \times 3.50 \times 15.00$ =152.250m³

5) scaffold $V=1.2 \times 4.30 \times 15.00 \times 2$ =154.800 "

N03 BOX FOR DRAINAGE

W1-W2 Retaining wall

1) concrete(grade:25)

side wall $V = (3.90 + 0.30) \times 1/2 \times (7.473 + 9.288) \times 0.40 + (0.934 + 1.161) \times 0.40 \times 0.40 = 14.414 \text{ m}^3$
 bottom slab $V = (4.679 + 8.773) \times 1/2 \times 6.49 \times 0.40 + 0.30 \times 1.00 \times 8.773 = 20.093 \text{ m}^3$

total $V = 34.507 \text{ m}^3$

2) formwork

form:out side $A = (4.30 + 0.70) \times 1/2 \times (7.473 + 9.288) = 41.903 \text{ m}^2$
 :bottom slab $A = (0.302 + 0.376 + 8.773 \times 2) \times 1.00 + 0.40 \times (0.934 + 7.869 + 1.161 + 0.403 + 0.501) = 22.571 \text{ m}^2$
 :in side $A = (3.90 + 0.30) \times 1/2 \times (7.473 + 9.288) = 35.198 \text{ m}^2$

total $A = 99.672 \text{ m}^2$

3) scaffold $V = 1.2 \times (3.90 + 1.0) \times (6.00 + 7.50) = 79.380 \text{ m}^3$

4) base concrete(grade:15)

concrete:main $V = 0.10 \times \{(4.905 + 8.999) \times 1/2 \times 6.190 + 0.60 \times (1.032 + 1.286)\} = 4.442 \text{ m}^3$
 and wing

form:main $A = 0.10 \times (6.237 + 7.751 + 1.032 \times 2 + 1.286 \times 2 + 0.605 + 0.751) = 1.998 \text{ m}^2$
 and wing

5) gabion: $A = 5.00 \times 9.00 = 45.000 \text{ m}^2$
 $t = 500$

6) joint filler $A = (0.403 + 0.501) \times 3.90 + 4.679 \times 0.40 = 5.397 \text{ m}^2$

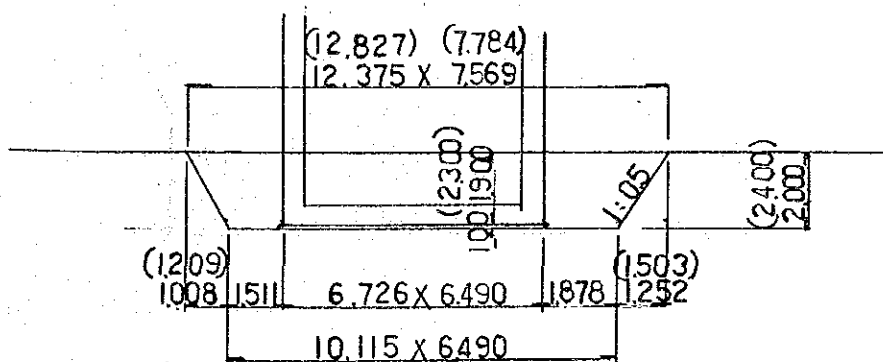
7) water stop $L = 4.10 \times 2 + 4.227 = 12.427 \text{ m}$

8) excavation(earth and gabion include)

(2.40) (12.827) (7.784) (12.827) (7.784)
 $V = 2.00/6 \{10.115 \times 6.49 + 12.375 \times 7.569 + (10.115 + 12.375) (6.49 + 7.569)\} + 0.30 \times 1.00 \times 8.773 + 5.00 \times 9.00 \times 0.50 = 183.632 \text{ m}^3$ (W1) (W2) (219.242)

remain: $V = 4.442 + 6.726 \times 6.490 \times 1.90 + 0.30 \times 1.00 \times 8.773 + 5.00 \times 9.00 \times 0.50 = 112.512 \text{ m}^3$ (129.973)

fill: $V = 183.632 - 112.512 = 71.120 \text{ m}^3$ (89.269)
 (219.242 - 129.973)



NO 4 BOX FOR DRAINAGE

(B1-B3)

1) concrete(grade:25)

bottom slab	$V=4.70 \times 0.70 \times 12.50$	=41.125m ³
top	$V=4.70 \times 0.60 \times "$	=35.250 "
side wall	$V=3.00 \times 0.60 \times " \times 2$	=45.000 "

total $V=$ =121.375 "

2) formwork

form:section	$A=(4.70 \times 4.30 - 3.50 \times 3.00) \times (1.1326 + 1.0)$	=20.708 m ²
:out side	$A=4.30 \times 12.50 \times 2$	=107.500 "
:in side	$A=3.00 \times 12.50 \times 2$	=75.000 "
:top slab	$A=3.50 \times 12.50$	=43.750 "

total $A=$ =246.958 "

3) base concrete(grade:15)

concrete	$V=0.10 \times 4.90 \times 12.50$	=6.125m ³
form	$A=\{12.50 \times 2 + 4.90 \times (1.1326 + 1.0)\} \times 0.10$	=3.535 m ²

4) joint filler $A=(4.70 \times 4.30 - 3.50 \times 3.00) \times 2$ =19.420 m²/box

5) water stop $L=(4.10 + 3.65) \times 2 \times 2$ =31.100m/box

6) support

$V=(3.00 - 0.10) \times 3.50 \times 12.50$ =126.875m³

7) scaffold

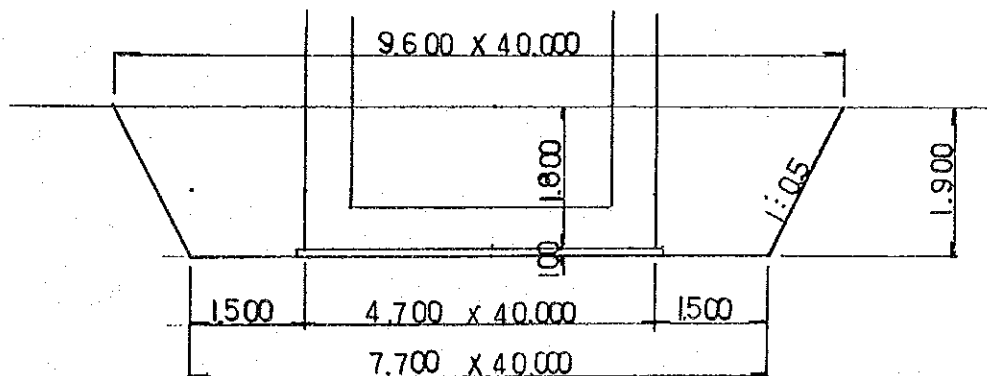
$V=1.2 \times 4.30 \times 12.50 \times 2$ =129.000 "

8) excavation(earth)

$V=1.90/6 \{ (7.70 \times 40.00 + 9.60 \times 40.00 + (7.70 + 9.60)(40.00 + 40.00)) \}$ =657.400m³/box

remain: $V=4.90 \times 0.10 \times 40.00 + 4.70 \times 1.80 \times 40.00$ =358.000m³/box

fill $V=657.400 - 358.000$ =299.400m³/box



NO 4 BOX FOR DRAINAGE

⑧2

1) concrete(grade:25)

bottom slab	$V = 4.70 \times 0.70 \times 15.00$	$= 49.350 \text{ m}^3$
top	$V = 4.70 \times 0.60 \times "$	$= 42.300 "$
side wall	$V = 3.00 \times 0.60 \times " \times 2$	$= 54.000 "$

total	$V =$	$= 145.650 "$
-------	-------	---------------

2) formwork

form:out side	$A = 4.30 \times 15.00 \times 2$	$= 129.000 \text{ m}^2$
:in side	$A = 3.00 \times 15.00 \times 2$	$= 90.000 "$
:top slab	$A = 3.50 \times 15.00$	$= 52.500 "$

total	$A =$	$= 271.500 "$
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3) base concrete(grade:15)

concrete:main	$V = 0.10 \times 4.90 \times 15.00$	$= 7.350 \text{ m}^3$
form::main	$A = 15.00 \times 2 \times 0.10$	$= 3.000 \text{ m}^2$

4) suport $V = (3.00 - 0.10) \times 3.50 \times 15.00 = 152.250 \text{ m}^3$

5) scaffold $V = 1.2 \times 4.30 \times 15.00 \times 2 = 154.800 \text{ m}^3$

NO 4 BOX FOR DRAINAGE

W1-W2 Retaining wall

1) concrete(grade:25)

$$\begin{aligned} \text{side wall } V &= (3.90+0.30) \times 1/2 \times (4.984+6.640) \times 0.40 + (0.906+1.207) \times 0.40 \times 0.40 = 10.102 \text{ m}^3 \\ \text{bottom slab } V &= (4.922+7.710) \times 1/2 \times 3.973 \times 0.40 + 0.30 \times 1.00 \times 7.710 = 12.350 \text{ m}^3 \end{aligned}$$

$$\text{total } V = 22.452 \text{ m}^3$$

2) formwork

$$\text{form:outside } A = (4.30+0.70) \times 1/2 \times (4.984+6.640) = 29.060 \text{ m}^2$$

$$\text{in side } A = (3.90+0.30) \times 1/2 \times (4.984+6.640) = 24.410 \text{ m}^2$$

$$\text{bottom slab } A = (0.308+0.410+7.710 \times 2) \times 1.00 + 0.40 \times (0.906+0.411+6.752+1.207+0.547) = 20.067 \text{ m}^2$$

$$\text{total } A = 73.537 \text{ m}^2$$

$$3) \text{ scaffold } V = 1.2 \times (3.90+1.0) \times (4.00+5.40) = 55.272 \text{ m}^3$$

4) base concrete(grade:15)

$$\text{concrete:main } V = 0.10 \times \{ (5.162+7.950) \times 1/2 \times 3.673 + 0.60 \times (1.009+1.344) \} \times 0.10 = 2.549 \text{ m}^3$$

and wing

$$\text{form:main } A = 0.10 \times (3.770+5.022+1.009 \times 2 + 1.344 \times 2 + 0.616+0.820) = 1.493 \text{ m}^2$$

and wing

$$5) \text{ gabion: } A = 5.00 \times 8.00 = 40.00 \text{ m}^2$$

T=500

$$6) \text{ joint filler } A = (0.411+0.547) \times 3.90 + 4.922 \times 0.40 = 5.705 \text{ m}^2$$

$$7) \text{ water sutop } L = 4.10 \times 2 + 4.443 = 12.643 \text{ m}$$

8) excavation

excavation(earth and gabion include)

$$V = 1.60/6 \{ (9.906 \times 3.973 + 11.821 \times 3.973) + (9.906+11.821) (3.973+3.973) \}$$

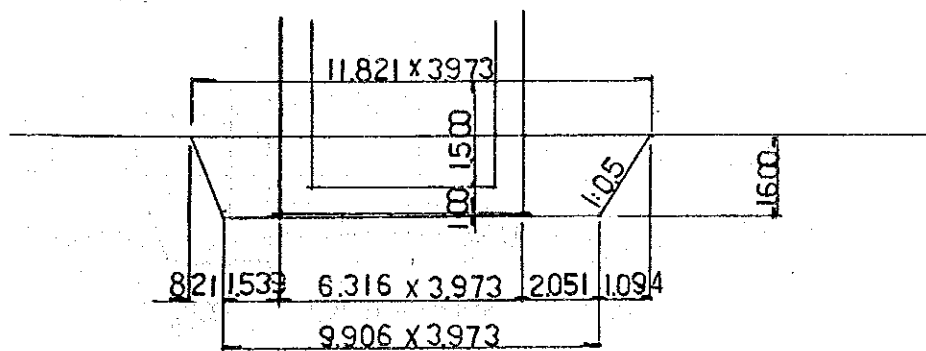
$$= 0.30 \times 1.00 \times 7.710 + 5.00 \times 8.00 \times 0.50 = 91.370 \text{ m}^3$$

remain:

$$V = 2.549 + 6.316 \times 3.973 \times 1.50 + 0.30 \times 1.00 \times 7.710 + 5.00 \times 8.00 \times 0.50 = 62.502 \text{ m}^3$$

fill:

$$V = 91.370 - 62.502 = 28.868 \text{ m}^3$$



NO 5 BOX FOR DRAINAGE

(B1-B9)

1) concrete(grade:25) L=13.500m(mean)

bottom slab	$V=9.60 \times 1.00 \times 13.50$	=129.600m ³
top	$V=9.60 \times 1.00 \times "$	=129.600 "
side wall	$V=3.50 \times 1.00 \times " \times 2$	=94.500 "
middle wall	$V=3.50 \times 0.60 \times 13.50$	=28.350 "

total V= =382.050 "

2) formwork

form:section	$A=(9.60 \times 5.50 - 3.50^2 \times 2) \times (1.1547 + 1.0)$	=60.978 m ²
out side	$A=5.50 \times 13.50 \times 2$	=148.500 "
middle wall	$A=3.50 \times 13.50 \times 2$	=94.500 "
in side	$A=3.50 \times 13.50 \times 2$	=94.500 "
top slab	$A=3.50 \times 13.50 \times 2$	=94.500 "

total A= =492.978 "

3) base concrete(grade:15)

concrete	$V=0.10 \times 9.80 \times 13.50$	=13.230m ³
form	$A=(13.50 \times 2 + 9.80 \times (1.1547 + 1.0)) \times 0.10$	=4.812 m ²

4) gravel(crusherran)

$V=(9.80 + 10.80) \times 1/2 \times 0.50 \times 13.50$	=69.525m ³
--	-----------------------

5) joint filler $A=(9.60 \times 5.50 - 3.50^2 \times 2) \times 4 + (10.00 \times 5.90 - 3.50^2 \times 2) \times 4 = 251.200 \text{ m}^2/\text{box}$

6) water stop $L=(8.60 \times 2 + 4.50 \times 3) \times 4 + (8.80 \times 2 + 4.70 \times 3) \times 4 = 249.600 \text{ m}/\text{box}$

7) suport $V=(3.50 - 0.10) \times 3.50 \times 13.50 \times 2 = 321.300 \text{ m}^3$

8) scaffold $V=1.2 \times 5.50 \times 13.50 \times 2 = 178.200 \text{ m}^3$

9) excavation

excavation(earth)

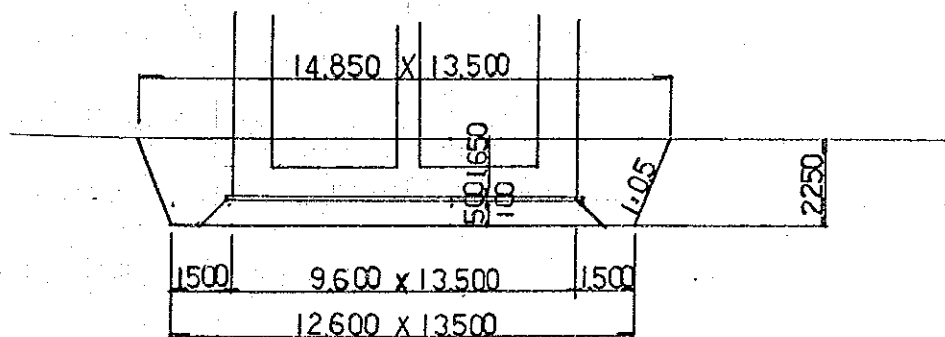
$$V=2.25/6 \{ (12.60 \times 13.50 + 14.85 \times 13.50 + (12.60 + 14.85)(13.50 + 13.50)) \} = 416.897 \text{ m}^3$$

remain:

$$V=69.525 + 13.230 + 9.60 \times 1.65 \times 13.50 = 296.595 \text{ m}^3$$

fill:

$$V=416.897 - 296.595 = 120.302 \text{ m}^3$$



NO5 BOX FOR DRAINAGE

Ⓑ2-Ⓑ8

L=15.000m

1) concrete(grade:25)

bottom slab	$V=9.60 \times 1.00 \times 15.00$	=144.000m ³
top	$V=9.60 \times 1.00 \times "$	=144.000 "
side wall	$V=3.50 \times 1.00 \times " \times 2$	=105.000 "
middle wall	$V=3.50 \times 0.60 \times 15.00$	=31.500 "

total V= =424.500 "

2) formwork

form:out side	$A=5.50 \times 15.00 \times 2$	=165.000 m ²
middle wall	$A=3.50 \times 15.00 \times 2$	=105.000 "
:in side	$A=3.50 \times 15.00 \times 2$	=105.000 "
:top slab	$A=3.50 \times 15.00 \times 2$	=105.000 "

total A= =480.000 "

3) base concrete(grade:15)

concrete	$V=0.10 \times 9.80 \times 15.00$	=14.700m ³
form	$A=15.00 \times 2 \times 0.10$	=3.000 m ²

4) gravel $V=(9.80+10.80) \times 1/2 \times 0.50 \times 15.00$ =77.250m³

5) suport $V=(3.50-0.10) \times 3.50 \times 15.00 \times 2$ =357.000m³

6) scaffold $V=1.2 \times 5.50 \times 15.00 \times 2$ =198.000m³

7) excavation

excavation(earth)

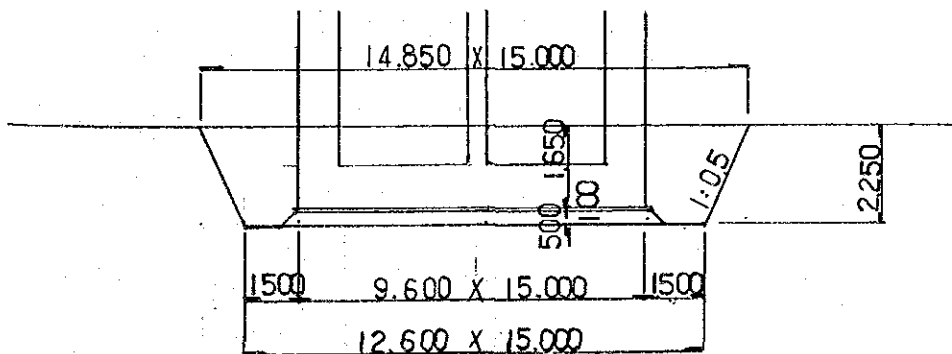
$$V=2.25/6 \{ (12.60 \times 15.00 + 14.85 \times 15.00) + (12.60 + 14.85) (15.00 + 15.00) \} =463.219m^3$$

remain:

$$V=77.250+14.700+9.60 \times 1.65 \times 15.00=329.550m^3$$

fill:

$$V=463.219-329.550 =133.669m^3$$



NO5 BOX FOR DRAINAGE

(B3) (B4) (B7) L=15.000m

concrete(grade:25)

bottom slab	$V=10.00 \times 1.20 \times 15.00$	=180.000m ³
top	$V=10.00 \times 1.20 \times "$	=180.000 "
side wall	$V=3.50 \times 1.20 \times " \times 2$	=126.000 "
middle wall	$V=3.50 \times 0.60 \times 15.00$	=31.500 "

total V= =517.500 "

formwork

(1)

form:section	$A=(10.00 \times 5.90 - 3.50^2 \times 2) \times 2$	=69.000 m ² (34.500)] (211.500) 246.000
:out side	$A=5.90 \times 15.00 \times 2$	=177.000 "	
middle wall	$A=3.50 \times 2 \times 15.00$	=105.000 "	
:in side	$A=3.50 \times 15.00 \times 2$	=105.000 "	
:top slab	$A=3.50 \times 2 \times 15.00$	=105.000 "	

total A= =561.000 " (526.500)
(B3) (B4~7)

base concrete(grade:15)

concrete:main V=0.10 × 10.20 × 15.00 =15.300m³

(1)

form:main A=(15.00 × 2 + 10.20 × 2) × 0.10 =5.040 m² (4.020)

gravel V=(10.20+10.80) × 1/2 × 0.30 × 15.00 =47.250m³

suport V=(3.50-0.10) × 3.50 × 15.00 × 2 =357.000m³

scaffold V=1.20 × 5.90 × 15.00 × 2 =212.400m³

excavation

excavation(earth)

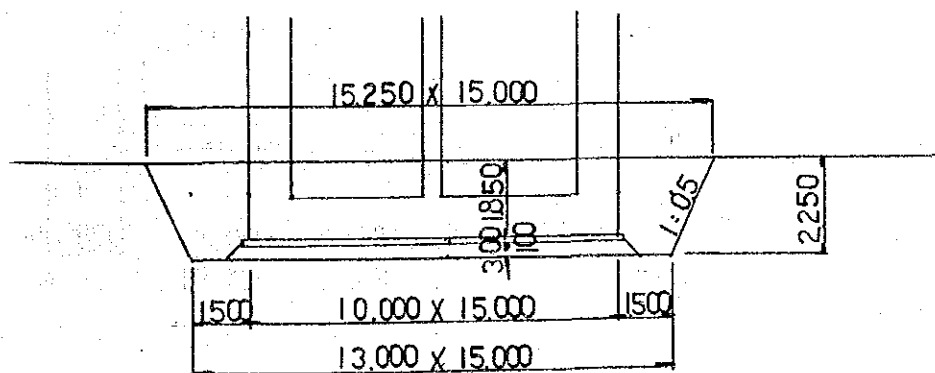
$V=2.25/6 \{ (13.00 \times 15.00 + 15.25 \times 15.00 + (13.00+15.25)(15.00+15.00)) \}$ =476.719m³

remain:

$V=47.250+15.300+10.00 \times 1.85 \times 15.00=340.050m^3$

fill:

$V=476.719-340.050$ =136.669m³



W1=W2 Retaining wall.

$$\begin{aligned} \text{sidewall } V &= (4.80 + 0.30) \times 1/2 \times (9.093 + 12.86) \times 0.50 \\ &\quad + (1.00 + 1.414) \times 0.50 \times 0.50 = 28.594 \text{ m}^3 \\ \text{bottom slab } V &= (9.983 + 18.21) \times 1/2 \times 8.227 \times 0.50 + 0.30 \times 1.00 \times 18.21 = 63.449 \text{ m}^3 \end{aligned}$$

2) formwork
form: out side $A = (5.30 + 0.80) \times 1/2 \times (9.093 + 12.86) = 66.957 \text{ m}^2$

bottom slab $A = (0.30 + 0.424 + 18.21 \times 2) \times 1.00$
 $+ 0.50 \times (0.866 + 0.50 + 16.997 + 1.225 + 0.707)$ = 47.292 "
in side $A = (4.80 + 0.30) \times 1/2 \times (9.093 + 12.86)$ = 55.980 "

4) base concrete(grade:15)
concrete:main $V=0.10 \times \{(10.224+18.451) \times 1/2 \times 7.927+0.60 \times (1.100+1.366)\} = 11.513$ m³
and wing
form:main $A=0.10 \times (7.927+11.022+1.10 \times 2+1.366 \times 2+0.70+0.99) = 2.557$ m²
and wing

9) excavation excavation(earth and gabion include)

$$V = 2.25/6 \{17.718 \times 9.227 + 20.434 \times 10.352$$

$$+ (17.718 + 20.434)(9.227 + 10.352)\}$$

$$+ 2.285 \times 19.00 \times 0.50 = 442.456 \text{ m}^3$$

fill:
 $V = 442.456 - 331.703 = 110.753 \text{ m}^3$

BOXCULVERT FOR DRAINAGE-NO①

LIST OF REINFORCED BAR --- B1=B4

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y12	8210	45	0.888	7.29	328
	2	Y16	3880	45	1.579	6.13	276
	3	Y12	3880	44	0.888	3.45	152
	4	Y16	2610	88	1.579	4.12	363
	5	Y12	14790	28	0.888	13.13	368
	6	"	1330	45	"	1.18	53
	7	"	1330	45	"	"	53
	8	"	1350	108	"	1.20	130
	9	Y16	7570	8	1.579	11.95	96
	10	"	7010	7	"	11.07	77
	11	"	4480	15	"	7.07	106
	12	Y12	1430	7	0.888	1.27	9
	13	"	1350	5	"	1.20	6
	14	"	1540	16	"	1.37	22
	15	"	4480	2	"	3.98	8
						2047 kg	
W	1	Y12	13670	11	0.888	12.14	134
	2	"	13890	11	"	12.33	136
	3	"	15690	11	"	13.93	153
	4	"	15910	11	"	14.13	155
	5	Y16	3870	45	1.579	6.11	275
	6	"	3870	45	"	"	275
	7	"	3870	7	"	"	43
	8	"	3870	1	"	"	6
	9	Y12	610	108	0.888	0.54	58
	10	"	610	108	"	"	58
	11	"	670	13	"	0.59	8
						1301 kg	
F	1	Y16	8160	45	1.579	12.88	580
	2	"	3880	89	"	6.13	546
	3	"	2610	44	"	4.12	181
	4	"	2610	44	"	"	181
	5	Y12	14790	28	0.888	13.13	368
	6	"	1310	45	"	1.16	52
	7	"	1310	45	"	"	52
	8	"	1330	108	"	1.18	127
	9	Y16	7000	8	1.579	11.05	88
	10	"	7560	7	"	11.94	84
	11	"	4480	15	"	7.07	106
	12	Y12	1410	7	0.888	1.25	9
	13	"	1330	5	"	1.18	6
						2380 kg	
Y16				3283 kg			
Y12				2445 kg			
				5728 kg			

BOXCULVERT FOR DRAINAGE-NO①

LIST OF REINFORCED BAR ---B2=B3

MARK		DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y12	8210	51	0.888	7.29	372	
	2	Y16	3880	51	1.579	6.13	313	
	3	Y12	3880	50	0.888	3.45	172	
	4	Y16	2610	100	1.579	4.12	412	
	5	Y12	15300	28	0.888	13.59	381	
	6	"	1330	51	"	1.18	60	
	7	"	1330	51	"	"	60	
	8	"	1350	120	"	1.20	144	
							1914 kg	
W	1	Y12	15300	11	0.888	13.59	149	
	2	"	15300	11	"	"	149	
	3	"	15300	11	"	"	149	
	4	"	15300	11	"	"	149	
	5	Y16	3880	51	1.579	6.13	313	
	6	"	3880	51	"	"	313	
	7	Y12	610	123	0.888	0.54	66	
	8	"	610	123	"	"	66	
							1354 kg	
F	1	Y16	8180	51	1.579	12.92	659	
	2	"	3880	101	"	6.13	619	
	3	"	2610	50	"	4.12	206	
	4	"	2610	50	"	"	206	
	5	Y12	15300	28	0.888	13.59	381	
	6	"	1330	51	"	1.18	60	
	7	"	1330	51	"	"	60	
	8	"	1350	120	"	1.20	144	
							2335 kg	
Y16					3041 kg			
Y12					2562 kg			
					5603 kg			

LIST OF REINFORCED BAR ---RETAINING WALL

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
NO-1 BOX FOR DRAINAGE							
W 1	Y16	6260	56	1.58	9.89	554	
2	Y12	2480	56	0.888	2.20	123	
3	Y16	3350	16	1.58	5.29	85	
4	"	2690	10	"	4.25	43	
5	Y12	700	6	0.888	0.62	4	
6	"	710	8	"	0.63	5	
7	"	5050	25	"	4.48	112	
8-1	"	10000	7	"	8.88	62	
8-2	"	2010	7	"	1.78	12	
9	"	5860	18	"	5.20	94	
10	"	9540	4	"	8.47	34	
11-1	"	10000	4	"	8.88	36	
11-2	"	2990	4	"	2.66	11	
12	"	2500	1	"	2.22	2	
13	"	2000	1	"	1.78	2	
W ⁰ 1	Y12	760	43	0.888	0.67	29	
2	"	630	38	"	0.56	21	
3	"	650	31	"	0.58	18	
4	"	520	41	"	0.46	19	
5	"	760	3	"	0.67	2	
6	"	650	3	"	0.58	2	
1270 kg							
K 1	Y12	2750	24	0.888	2.44	59	
2	"	2820	8	"	2.50	20	
3-1	"	7000	8	"	6.22	50	
3-2	"	3430	8	"	3.05	24	
K ⁰ 1	Y12	420	18	0.888	0.37	7	
2	"	490	6	"	0.44	3	
163 kg							
S 1	Y16	7150	28	1.58	11.30	316	
2	Y12	7950	26	0.888	7.06	184	
3	"	5680	22	"	5.04	111	
4	"	4500	12	"	4.00	48	
S ⁰ 1	Y12	1150	116	0.888	1.02	118	
777 kg							
Y16				998			
Y12				1212			
2210 kg							

BOXCULVERT FOR DRAINAGE-NO②

LIST OF REINFORCED BAR --- B1= B2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1 Y16	6780	57	1.579	10.71	610	
	2 Y12	2680	113	0.888	2.38	269	
	3 Y16	5020	56	1.579	7.93	444	
	4 Y12	17400	20	0.888	15.45	309	
	5 "	1050	57	"	0.93	53	
	6 "	1050	57	"	"	53	
	7 "	1150	81	"	1.02	83	
	8 Y16	5760	3	1.579	9.10	27	
	9 "	5200	2	"	8.21	16	
	10 Y12	2780	5	0.888	2.47	12	
	11 "	1060	3	"	0.94	3	
	12 "	1340	11	"	1.19	13	
	13 "	2770	2	"	2.46	5	
						1897 kg	
W	1 Y12	17040	11	0.888	15.13	166	
	2 "	17110	11	"	15.19	167	
	3 "	17680	11	"	15.70	173	
	4 "	17760	11	"	15.77	173	
	5 "	3680	57	"	3.27	186	
	6 "	3680	57	"	"	186	
	7 "	3680	3	"	"	10	
	8 "	3680	1	"	"	3	
	9 "	510	138	"	0.45	62	
	10 "	510	138	"	"	62	
	11 "	520	3	"	0.46	1	
						1189 kg	
F	1 Y16	6780	57	1.579	10.71	610	
	2 Y12	2680	113	0.888	2.38	269	
	3 Y16	5020	56	1.579	7.93	444	
	4 Y12	17400	20	0.888	15.45	309	
	5 "	1050	57	"	0.93	53	
	6 "	1050	57	"	"	53	
	7 "	1150	81	"	1.02	83	
	8 Y16	5200	3	1.579	8.21	25	
	9 "	5760	2	"	9.10	18	
	10 Y12	2780	5	0.888	2.47	12	
	11 "	1060	3	"	0.94	3	
						1879 kg	
Y16				2194 kg			
Y12				2771 kg			
				4965 kg			

LIST OF REINFORCED BAR ---RETAINING WALL

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
NO-2 BOX FOR DRAINAGE							
W 1	Y16	5660	28	1.58	8.94	250	
2	Y12	2650	28	0.888	2.35	66	
3	Y16	3280	9	1.58	5.18	47	
4	"	3020	2	"	4.77	10	
5	Y12	900	8	0.888	0.80	6	
6	"	940	8	"	0.83	7	
7	"	2920	23	"	2.59	60	
8	"	3620	23	"	3.21	74	
9	"	5900	4	"	5.24	21	
10	"	6860	4	"	6.09	24	
11	"	2200	1	"	1.95	2	
12	"	2500	1	"	2.22	2	
W ^o 1	Y12	760	18	0.888	0.67	12	
2	"	630	21	"	0.56	12	
3	"	690	18	"	0.61	11	
4	"	560	20	"	0.50	10	
5	"	760	3	"	0.67	2	
6	"	690	3	"	0.61	2	
							618 kg
K 1	Y12	2750	18	0.888	2.44	44	
2	"	2820	5	"	2.50	13	
3	"	2770	5	"	2.46	12	
4	"	8280	8	"	7.35	59	
k ^o 1	Y12	420	14	0.888	0.37	5	
2	"	490	3	"	0.44	1	
							134 kg
S 1	Y16	5610	14	1.58	8.86	124	
2	Y12	3380	20	0.888	3.00	60	
3	"	2540	10	"	2.26	23	
4	"	2670	6	"	2.37	14	
5	"	2500	12	"	2.22	27	
S0 1	Y12	1120	34	0.888	0.99	34	
							282 kg
				Y16	431		
				Y12	603		
							1034 kg

BOXCULVERT FOR DRAINAGE-NO③

LIST OF REINFORCED BAR ---B1-B4

MARK	DIAMETER	LENGTH	NUMBER	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y25	9280	69	3.854	35.77	2110
	2	"	4570	117	"	17.61	2060
	3	Y32	2880	58	6.313	18.18	1054
	4	"	2880	58	"	"	1054
	5	Y20	19070	32	2.466	47.03	1505
	6	Y12	1590	59	0.888	1.41	83
	7	"	1590	59	"	"	83
	8	"	1570	140	"	1.39	195
	9	Y32	9260	7	6.313	58.46	409
	10	"	8140	6	"	51.39	308
	11	Y25	4930	13	3.854	19.00	247
	12	Y12	1650	6	0.888	1.47	9
	13	"	1570	4	"	1.39	6
	14	"	1710	18	"	1.52	27
	15	"	4930	2	"	4.38	9
9159 kg							
W	1	Y20	18140	11	2.466	44.73	492
	2	Y12	18050	11	0.888	16.03	176
	3	"	19520	11	"	17.33	191
	4	Y20	19990	11	2.466	49.30	542
	5	"	4170	59	"	10.28	607
	6	"	4170	59	"	"	607
	7	"	4170	6	"	"	62
	8	"	4170	1	"	"	10
	9	Y12	710	143	0.888	0.63	90
	10	"	710	143	"	"	90
	11	"	750	10	"	0.67	7
2874 kg							
F	1	Y25	9480	59	3.854	36.54	2156
	2	"	4570	117	"	17.61	2060
	3	"	3020	58	"	11.64	675
	4	"	3020	58	"	"	675
	5	Y16	18930	31	1.579	29.89	927
	6	Y12	1730	59	0.888	1.54	91
	7	"	1730	59	"	"	91
	8	"	1770	140	"	1.57	220
	9	Y25	7980	7	3.854	30.75	215
	10	"	9100	6	"	35.07	210
	11	"	4930	13	"	19.00	247
	12	Y12	1790	6	0.888	1.59	10
	13	"	1770	4	"	1.57	6
7583 kg							
Y32 2825 kg							
Y25 10655 kg							
Y20 3825 kg							
Y16 927 kg							
Y12 1384 kg							
19616 kg							

BOXCULVERT FOR DRAINAGE-NO③

LIST OF REINFORCED BAR---B₂ = B₃

MARK	DIAMETER	LENGTH	NUMBER	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y25	9280	51	3.854	35.77	1824
	2	"	4570	101	"	17.61	1779
	3	Y32	2880	50	6.313	18.18	909
	4	"	2880	50	"	"	909
	5	Y20	15570	32	2.466	38.40	1229
	6	Y12	1590	51	0.888	1.41	72
	7	"	1590	51	"	"	72
	8	"	1570	120	"	1.39	167
6961 kg							
W	1	Y20	15570	11	2.466	38.40	422
	2	Y12	15290	11	0.888	13.58	149
	3	"	15290	11	"	"	149
	4	Y20	15570	11	2.466	38.40	422
	5	"	4170	51	"	10.28	524
	6	"	4170	51	"	"	524
	7	Y12	710	123	0.888	0.63	77
	8	"	710	123	"	"	77
2344 kg							
F	1	Y25	9480	51	3.854	36.54	1864
	2	"	4570	101	"	17.61	1779
	3	"	3020	50	"	11.64	582
	4	"	3020	50	"	"	582
	5	Y16	15430	32	1.579	24.36	780
	6	Y12	1730	51	0.888	1.54	79
	7	"	1730	51	"	"	79
	8	"	1770	120	"	1.57	188
5933 kg							
Y32							1818 kg
Y25							8410 kg
Y20							3121 kg
Y16							780 kg
Y12							1109 kg
15238 kg							

LIST OF REINFORCED BAR ---RETAINING WALL

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
NO-3 BOX FOR DRAINAGE							
W 1	Y16	6150	46	1.58	9.72	447	
2	Y12	2630	46	0.888	2.34	108	
3	Y16	3400	13	1.58	5.37	70	
4	"	2860	7	"	4.52	32	
5	Y12	760	6	0.888	0.67	4	
6	"	780	8	"	0.69	6	
7	"	4400	25	"	3.91	98	
8	"	5300	25	"	4.71	118	
9	"	8170	4	"	7.25	29	
10	"	9800	4	"	8.70	35	
11	"	2000	1	"	1.78	2	
12	"	2200	1	"	1.95	2	
W ^O 1	Y12	720	27	0.888	0.64	17	
2	"	590	30	"	0.52	16	
3	"	650	26	"	0.58	15	
4	"	520	30	"	0.46	14	
5	"	650	3	"	0.58	2	
6	"	720	3	"	0.64	2	
							1017 kg
K 1	Y12	2740	22	0.888	2.43	53	
2	"	2790	8	"	2.48	20	
3	"	8640	8	"	7.67	61	
K ^O 1	Y12	410	15	0.888	0.36	5	
2	"	460	5	"	0.41	2	
							141 kg
S 1	Y16	6950	23	1.58	10.98	253	
2	Y12	6420	28	0.888	5.70	160	
3	"	4580	12	"	4.07	49	
4	"	4300	12	"	3.82	46	
SO 1	Y12	1150	84	0.888	1.02	86	
							594 kg
				Y16	802		
				Y12	950		
					1752 kg		

BOXCULVERT FOR DRAINAGE-NO④

LIST OF REINFORCED BAR : B1 = B3

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECWEIGHT	WEIGHT	REMARK
S	1	Y20	9160	38	2.466	22.59	858
	2	"	4570	75	"	11.27	845
	3	Y25	2900	37	3.854	11.18	414
	4	"	2900	37	"	"	414
	5	Y16	12920	32	1.579	20.40	653
	6	Y12	1590	38	0.888	1.41	54
	7	"	1590	38	"	"	54
	8	"	1550	88	"	1.38	121
	9	Y25	9000	9	3.854	34.69	312
	10	"	8120	8	"	31.29	250
	11	Y20	5180	17	2.466	12.77	217
	12	Y12	1690	8	0.888	1.50	12
	13	"	1550	7	"	1.38	10
	14	"	1710	19	"	1.52	29
	15	"	5180	2	"	4.60	9
							4252 kg
W	1	Y12	11570	11	0.888	10.27	113
	2	"	11820	11	"	10.50	116
	3	"	13750	11	"	12.21	134
	4	"	14000	11	"	12.43	137
	5	Y16	4170	38	1.579	6.58	250
	6	"	4170	38	"	"	250
	7	"	4170	8	"	"	53
	8	"	4170	1	"	"	7
	9	Y12	710	90	0.888	0.63	57
	10	"	710	90	"	"	57
	11	"	770	15	"	0.68	10
							1184 kg
F	1	Y16	9390	38	1.579	14.83	564
	2	Y20	4570	75	2.466	11.27	845
	3	"	3030	37	"	7.47	276
	4	"	3030	37	"	"	276
	5	Y16	12920	32	1.579	20.40	653
	6	Y12	1730	38	0.888	1.54	59
	7	"	1730	38	"	"	59
	8	"	1750	88	"	1.55	136
	9	Y20	8040	9	2.466	19.83	178
	10	"	8920	8	"	22.00	176
	11	"	5180	17	"	12.77	217
	12	Y12	1830	8	0.888	1.63	13
	13	"	1750	7	"	1.55	11
							3463 kg
Y25				1390 kg			
Y20				3888 kg			
Y16				2430 kg			
Y12				1191 kg			
				8899 kg			

BOXCULVERT FOR DRAINAGE -NO④

LIST OF REINFORCED BAR---B2

MARK	DIAMETER	LENGTH	NUMBER	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y20	9150	51	2.466	22.56	1151
	2	"	4570	101	"	11.27	1138
	3	Y25	2900	50	3.854	11.18	559
	4	"	2900	50	"	"	559
	5	Y16	15430	32	1.579	24.36	780
	6	Y12	1590	51	0.888	1.41	72
	7	"	1590	51	"	"	72
	8	"	1550	120	"	1.38	166
						4497 kg	
W	1	Y12	15290	11	0.888	13.58	149
	2	"	15290	11	"	"	149
	3	"	15290	11	"	"	149
	4	"	15290	11	"	"	149
	5	Y16	4170	51	1.579	6.58	336
	6	"	4170	51	"	"	336
	7	Y12	710	123	0.888	0.63	77
	8	"	710	123	"	"	77
						1422 kg	
F	1	Y16	9390	51	1.579	14.83	756
	2	Y20	4570	101	2.466	11.27	1138
	3	"	3030	50	"	7.47	374
	4	"	3030	50	"	"	374
	5	Y16	15430	32	1.579	24.36	780
	6	Y12	1730	51	0.888	1.54	79
	7	"	1730	51	"	"	79
	8	"	1750	120	"	1.55	186
						3766 kg	
Y25				1118 kg			
Y20				4175 kg			
Y16				2988 kg			
Y12				1404 kg			
				9685 kg			

LIST OF REINFORCED BAR ---RETAINING WALL

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
NO-4 BOX FOR DRAINAGE							
W 1	Y16	5990	30	1.58	9.46	284	
2	Y12	2700	30	0.888	2.40	72	
3	Y16	3500	8	1.58	5.53	44	
4	"	3060	4	"	4.83	19	
5	Y12	830	6	0.888	0.74	4	
6	"	870	8	"	0.77	6	
7	"	2830	25	"	2.51	63	
8	"	4100	25	"	3.64	91	
9	"	6000	4	"	5.33	21	
10	"	7370	4	"	6.54	26	
11	"	2000	1	"	1.78	2	
12	"	2200	1	"	1.95	2	
W ^O 1	Y12	750	19	0.888	0.67	13	
2	"	620	21	"	0.55	12	
3	"	650	18	"	0.58	10	
4	"	520	23	"	0.46	11	
5	"	650	3	"	0.58	2	
6	"	750	3	"	0.67	2	
							684 kg
K 1	Y12	2750	21	0.888	2.44	51	
2	"	2810	5	"	2.50	13	
3	"	7570	8	"	6.72	54	
K ^O 1	Y12	420	13	0.888	0.37	5	
2	"	480	3	"	0.43	1	
							124 kg
S 1	Y16	6190	15	1.58	9.78	147	
2	Y12	3960	30	0.888	3.52	106	
3	"	3040	8	"	2.70	22	
4	"	2500	6	"	2.22	13	
S0 1	Y12	1150	46	0.888	1.02	47	
							335 kg
				Y16	494		
				Y12	649		
				1143 kg			

BOXCULVERT FOR DRAINAGE-NO⑤

LIST OF REINFORCED BAR --- B1 = B9

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y20	6160	37	2.466	15.19	562
	2	Y25	4770	37	3.854	18.38	680
	3	Y20	6190	37	2.466	15.26	565
	4	"	9470	73	"	23.35	1705
	5	"	4790	36	"	11.81	425
	6	Y25	4770	36	3.854	18.38	662
	7	Y20	5460	36	2.466	13.46	485
	8	"	14060	56	"	34.67	1942
	9	Y12	2710	37	0.888	2.41	89
	10	"	2710	37	"	"	89
	11	"	2350	204	"	2.09	426
	12	Y25	17040	19	3.854	65.67	1248
	13	"	16340	18	"	62.97	1133
	14	Y20	11640	37	2.466	28.70	1062
	15	Y12	2920	17	0.888	2.59	44
	16	"	2100	74	"	1.86	138
	17	"	2250	19	"	2.00	38
	18	"	2350	46	"	2.09	96
	19	"	2510	38	"	2.23	85
	20	"	11360	2	"	10.09	20
						11494 kg	
W	1	Y16	11190	13	1.579	17.67	230
	2	Y12	11550	13	0.888	10.26	133
	3	"	16010	13	"	14.22	185
	4	Y16	16650	13	1.579	26.29	342
	5	Y12	13640	13	0.888	12.11	157
	6	"	13920	13	"	12.36	161
	7	Y16	5370	74	1.579	8.48	628
	8	"	5370	74	"	"	628
	9	"	5370	35	"	"	297
	10	"	5370	2	"	"	17
	11	Y12	1100	88	0.888	0.98	86
	12	"	1100	88	"	"	86
	13	"	1240	38	"	1.10	42
	14	"	700	20	"	0.62	12
						3004 kg	

BOXCULVERT FOR DRAINAGE-NO⑤

LIST OF REINFORCED BAR --- B1 = B9

[illegible]

BOXCULVERT FOR DRAINAGE - NO ⑤

LIST OF REINFORCED BAR --- B2 = B8

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y20	6160	51	2.466	15.19	775
	2	Y25	4980	51	3.854	19.19	979
	3	Y20	5980	51	2.466	14.75	752
	4	"	9470	101	"	23.35	2358
	5	"	4580	50	"	11.29	564
	6	Y25	4980	50	3.854	19.19	960
	7	Y20	5460	50	2.466	13.46	673
	8	"	15570	56	"	38.40	2150
	9	Y12	2710	51	0.888	2.41	123
	10	"	2710	51	"	"	123
	11	"	2100	102	"	1.86	190
	12	"	2350	288	"	2.09	602
						10249 kg	
W	1	Y16	15430	13	1.579	24.36	317
	2	Y12	15290	26	0.888	13.58	353
	3	"	15290	26	"	"	353
	4	Y16	15430	13	1.579	24.36	317
	5	"	5370	102	"	8.48	865
	6	"	5370	102	"	"	865
	7	Y12	1100	123	0.888	0.98	121
	8	"	1100	123	"	"	121
	9	"	700	123	"	0.62	76
						3388 kg	
F	1	Y20	5980	51	2.466	14.75	752
	2	Y25	4980	51	3.854	19.19	979
	3	Y20	6160	51	2.466	15.19	775
	4	"	9470	101	"	23.35	2358
	5	Y25	14960	50	3.854	57.66	2883
	6	Y20	15570	56	2.466	38.40	2150
	7	Y12	2710	51	0.888	2.41	123
	8	"	2710	51	"	"	123
	9	"	2100	102	"	1.86	190
	10	"	2350	288	"	2.09	602
						10935 kg	
Y25				5801 kg			
Y20				13307 kg			
Y16				2364 kg			
Y12				3100 kg			
				24572 kg			

BOXCULVERT FOR DRAINAGE-NO⑤

LIST OF REINFORCED BAR---B3 ~ B7

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y25	6760	51	3.854	26.05	1329
	2	Y32	5220	51	6.313	32.95	1680
	3	Y25	6760	51	3.854	26.05	1329
	4	"	9860	51	"	38.00	1938
	5	Y20	9860	50	2.466	24.31	1215
	6	Y25	15740	50	3.854	60.66	3033
	7	Y20	15560	56	2.466	38.37	2149
	8	Y12	3270	51	0.888	2.90	148
	9	"	3270	51	"	"	148
	10	"	2370	51	"	2.10	107
	11	"	2760	288	"	2.45	706
						13782 kg	
W	1	Y20	15560	13	2.466	38.37	499
	2	Y12	15280	26	0.888	13.57	353
	3	"	15280	26	"	"	353
	4	Y20	15560	13	2.466	38.37	499
	5	"	5760	102	"	14.20	1448
	6	"	5760	102	"	"	1448
	7	Y12	1310	123	0.888	1.16	143
	8	"	1310	123	"	"	143
	9	"	700	123	"	0.62	76
						4962 kg	
F	1	Y32	18690	51	6.313	117.99	6017
	2	Y25	9860	101	3.854	38.00	3838
	3	"	15740	50	"	60.66	3033
	4	Y20	15560	56	2.466	38.37	2149
	5	Y12	3270	51	0.888	2.90	148
	6	"	3270	51	"	"	148
	7	"	2370	51	"	2.10	107
	8	"	2760	288	"	2.45	706
						16146 kg	
Y32				7697 kg			
Y25				14500 kg			
Y20				9407 kg			
Y12				3286 kg			
						34890 kg	

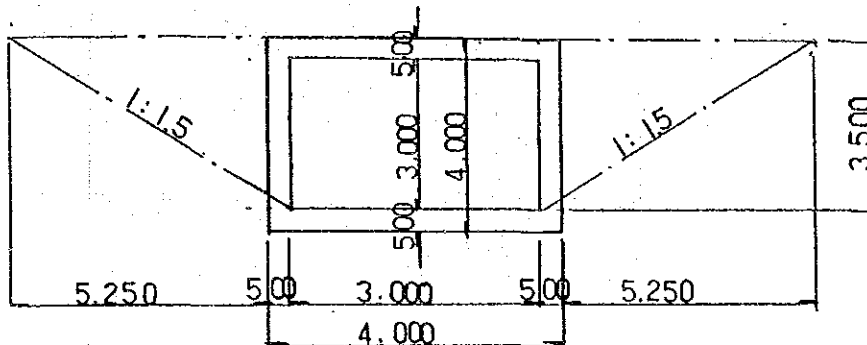
LIST OF REINFORCED BAR ---RETAINING WALL

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	#EIGHT	REMARK
NO-5 BOX FOR DRAINAGE							
W 1	Y16	6850	84	1.58	10.82	909	
2	Y12	3150	84	0.888	2.80	235	
3	Y16	4150	23	1.58	6.56	151	
4	"	3400	16	"	5.37	86	
5	Y12	860	6	0.888	0.76	5	
6	"	880	8	"	0.78	6	
"	"	5100	31	"	4.53	140	
8-1	"	10000	11	"	8.88	98	
8-2	"	1910	11	"	1.70	19	
9	"	5580	20	"	4.96	99	
10	"	10000	4	"	8.88	36	
11-1	"	10000	4	"	8.88	36	
11-2	"	3880	4	"	3.45	14	
12	"	2000	1	"	1.78	2	
13	"	2200	1	"	1.95	2	
W ⁰ 1	Y12	900	46	0.888	0.80	37	
2	"	770	79	"	0.68	54	
3	"	740	45	"	0.66	30	
4	"	610	78	"	0.54	42	
5	"	740	3	"	0.66	2	
6	"	900	3	"	0.80	2	
2005							
K 1	Y12	2940	46	0.888	2.61	120	
2	"	3020	15	"	2.68	40	
3-1	"	10000	8	"	8.88	71	
3-2	"	8490	8	"	7.54	60	
k ⁰ 1	Y12	410	33	0.888	0.36	12	
2	"	490	11	"	0.44	5	
308							
S 1	Y16	7500	42	1.58	11.85	498	
2	"	3800	84	1.58	5.00	504	
3	Y12	7500	42	0.888	6.66	280	
4	"	8110	62	"	7.20	446	
5	"	6730	26	"	5.98	155	
6	"	6000	26	"	5.33	139	
SO 1	Y12	1250	378	0.888	1.11	420	
2442							
Y16				2148			
Y12				2607			
4755 kg							

NO ① BOX CULVERT FOR DRAINAGE

BACK-FILL

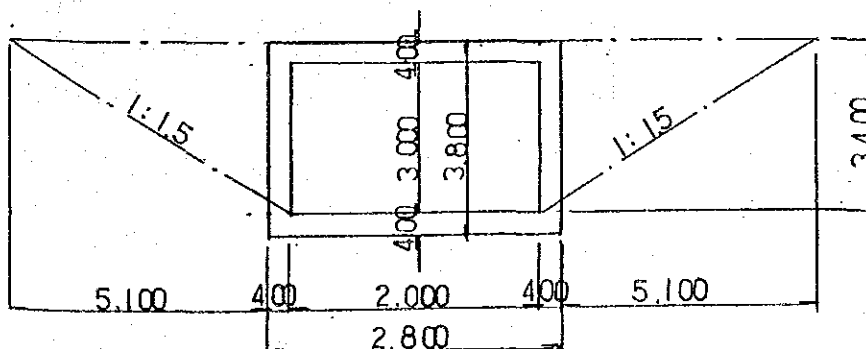
$$V = 3.50 \times 5.25 \times (59.00 + \frac{1}{3} \times 10.00 \times 2) = 1206.6 \text{ m}^3$$



NO ② BOX CULVERT FOR DRAINAGE

BACK-FILL

$$V = 3.40 \times 5.10 \times (34.20 + \frac{1}{3} \times 4.50 \times 2) = 645.0 \text{ m}^3$$

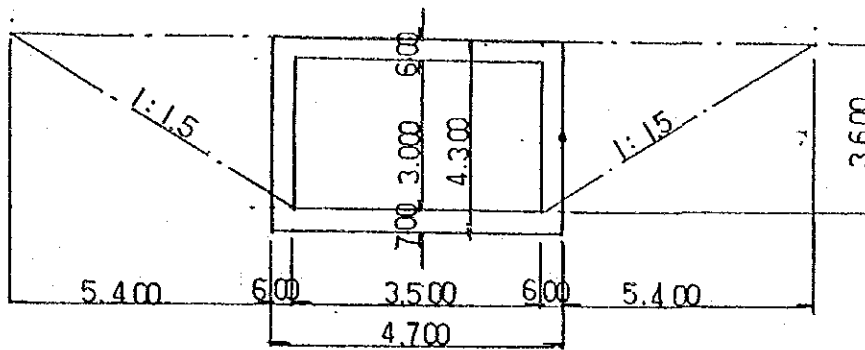


note
include retaining
wall

NO ③ BOX CULVERT FOR DRAINAGE

BACK-FILL

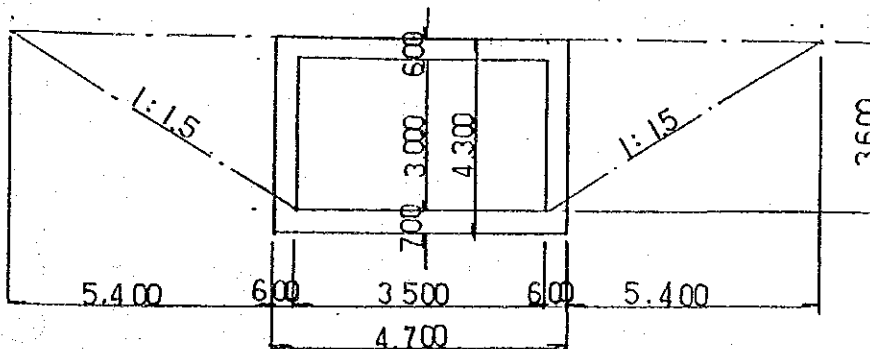
$$V = 3.60 \times 5.40 \times (67.00 + \frac{1}{3} \times 8.00 \times 2) = 1406.2 \text{ m}^3$$



NO ④ BOX CULVERT FOR DRAINAGE

BACK-FILL

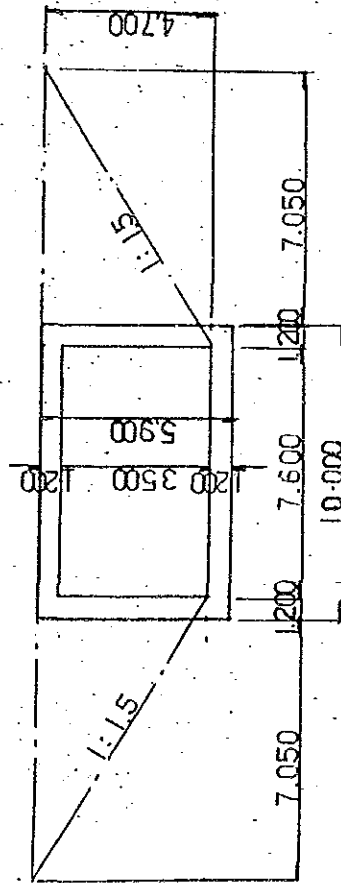
$$V = 3.60 \times 5.40 \times (40.00 + \frac{1}{3} \times 5.50 \times 2) = 848.9 \text{ m}^3$$



NO 5 BOX-CULVERT FOR DRAINAGE

BACK-FILL

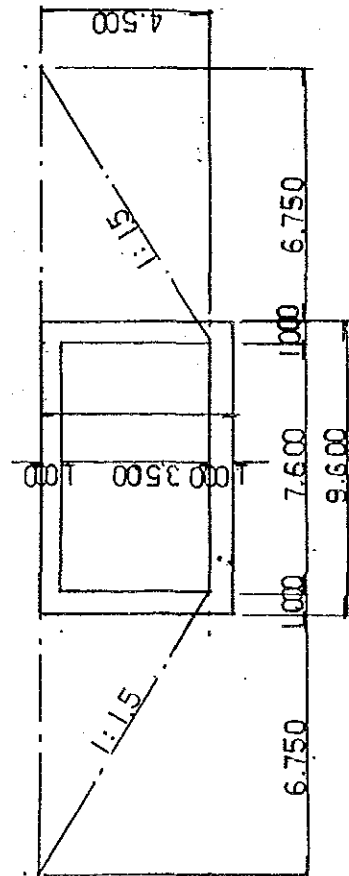
$$V = 4.60 \times 6.90 \left(132.00 + \frac{1}{3} \times 10.50 \times 2 \right) = 4411.8 \text{ m}^3$$



mean

$$h = \frac{4.70 + 4.50}{2} = 4.60 \text{ m}$$

$$b = \frac{7.05 + 6.75}{2} = 6.90 \text{ ''}$$



BOX FOR DRAINAGE

$$\begin{aligned} \text{NO① UF2 A} &= (4.00 + 3.00) \times 59.00 + \{(3.464 + 9.17) \times 1/2 \times 7.794 \times (9.00 + 12.247) \times 0.40\} \times 2 \\ &= 528.467 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{NO② " A} &= (2.80 + 2.00) \times 34.20 + \{(2.07 + 7.404) \times 1/2 \times 3.381 \times (5.019 + 6.147) \times 0.40\} \times 2 \\ &= 205.124 \text{ "} \end{aligned}$$

$$\begin{aligned} \text{NO③ " A} &= (4.70 + 3.50) \times 67.00 + \{(3.775 + 7.869) \times 1/2 \times 6.490 \times (7.473 + 9.288) \times 0.40\} \times 2 \\ &= 638.378 \text{ "} \end{aligned}$$

$$\begin{aligned} \text{NO④ " A} &= (4.70 + 3.50) \times 40.00 + \{(3.964 + 6.752) \times 1/2 \times 3.973 \times (4.984 + 6.64) \times 0.40\} \times 2 \\ &= 379.874 \text{ "} \end{aligned}$$

$$\begin{aligned} \text{NO⑤ " A} &= (9.60 + 7.00) \times 28.50 \times 2 + (10.00 + 7.00) \times 75.00 \\ &\quad + \{(8.776 + 16.997) \times 1/2 \times 8.227 + (9.093 + 12.86) \times 0.50\} \times 2 = 2455.187 \text{ "} \end{aligned}$$

NO① BOX FOR DRAINAGE

$$\begin{aligned}
 \text{porous drainage } A &= \{59.00 \times 3.20 \times 2 + \frac{1}{2} \times 10.00 \times 3.20 \times 2 \times 2\} (\times 0.300) = 441.600 \text{ m}^3 \\
 \text{perforated pipe } L &= 59.00 \times 2 + 10.00 \times 2 \times 2 = 158.000 \text{ m} \\
 \text{drain pipe } N &= (59.00 / 5.00 + 1) \times 2 + (10.00 / 5.00 + 1) \times 2 \times 2 = 38 \text{ N} \\
 &(\phi 25\text{mm})
 \end{aligned}$$

NO② BOX FOR DRAINAGE

$$\begin{aligned}
 \text{porous drainage } A &= \{34.20 \times 3.10 \times 2 + \frac{1}{2} \times 4.50 \times 3.10 \times 2 \times 2\} (\times 0.300) = 239.940 \text{ m}^3 \\
 \text{perforated pipe } L &= 34.20 \times 2 + 4.50 \times 2 \times 2 = 86.400 \text{ m} \\
 \text{drain pipe } N &= (34.20 / 5.00 + 1) \times 2 + (4.50 / 5.00 + 1) \times 2 \times 2 = 26 \text{ N} \\
 &(\phi 75\text{mm})
 \end{aligned}$$

NO③ BOX FOR DRAINAGE

$$\begin{aligned}
 \text{porous drainage } A &= \{67.00 \times 3.30 \times 2 + \frac{1}{2} \times 8.00 \times 3.30 \times 2 \times 2\} (\times 0.300) = 495.000 \text{ m}^3 \\
 \text{perforated pipe } L &= 67.00 \times 2 + 8.00 \times 2 \times 2 = 166.000 \text{ m} \\
 \text{drain pipe } N &= (67.00 / 5.00 + 1) \times 2 + (8.00 / 5.00 + 1) \times 2 \times 2 = 40 \text{ N} \\
 &(\phi 75\text{mm})
 \end{aligned}$$

NO④ BOX FOR DRAINAGE

$$\begin{aligned}
 \text{porous drainage } A &= \{40.00 \times 3.30 \times 2 + \frac{1}{2} \times 5.50 \times 3.30 \times 2 \times 2\} (\times 0.300) = 300.300 \text{ m}^3 \\
 \text{perforated pipe } L &= 40.00 \times 2 + 5.50 \times 2 \times 2 = 102.000 \text{ m} \\
 \text{drain pipe } N &= (40.00 / 5.00 + 1) \times 2 + (5.50 / 5.00 + 1) \times 2 \times 2 = 26 \text{ N} \\
 &(\phi 75\text{mm})
 \end{aligned}$$

NO⑤ BOX FOR DRAINAGE

$$\begin{aligned}
 \text{porous drainage } A &= \{132.0 \times 4.30 \times 2 + \frac{1}{2} \times 10.50 \times 4.30 \times 2 \times 2\} (\times 0.300) = 1225.500 \text{ m}^3 \\
 \text{perforated pipe } L &= 132.0 \times 2 + 10.50 \times 2 \times 2 = 306.000 \text{ m} \\
 \text{drain pipe } N &= 66 \text{ N} \\
 &(\phi 75\text{mm})
 \end{aligned}$$

B.Q 21.01 Waterproofing materials

NO① BOX for Drainage

$$A = 59.00 \times 4.00 \times 3 + \frac{1}{2} \times 3.90 (9.00 + 12.247) \times 2 = 790.863 \text{ m}^3$$

NO② BOX for Drainage

$$A = 34.20 (3.80 \times 2 + 2.80) + \frac{1}{2} \times 3.80 (5.019 + 6.147) \times 2 = 397.070 \text{ m}^3$$

NO③ BOX for Drainage

$$A = 67.00 (4.30 \times 2 + 4.70) + \frac{1}{2} \times 4.00 (7.473 + 9.288) \times 2 = 958.144 \text{ m}^3$$

NO④ BOX for Drainage

$$A = 40.00 (4.30 \times 2 + 4.70) + \frac{1}{2} \times 4.00 (4.984 + 6.640) \times 2 = 578.496 \text{ m}^3$$

NO⑤ BOX for drainage

$$A = 75.00 (5.90 \times 2 + 10.00) + 28.50 (5.50 \times 2 + 9.60) \times 2 + \frac{1}{2} \times 5.00 (9.093 + 12.860) \times 2 = 2918.965 \text{ m}^3$$

NO1 BOX FOR FOOTPATH

(B1)-(B2)

1) concrete(grade:25)

bottom slab	$V = 3.80 \times 0.40 \times 14.00$	$= 21.280 \text{ m}^3$
top	$V = 3.80 \times 0.40 \times "$	$= 21.280 "$
side wall	$V = 0.40 \times 3.00 \times " \times 2$	$= 33.600 "$
wing	$V = (13.60 \times 4.155 - 2.933 \times 4.40 - 3.80 \times 3.80) \times 0.40$ $= (29.163) \times 0.40$	$= 11.665 "$

total $V =$ $= 87.825 "$

2) formwork

form-section	$A = (3.80^2 - 3.00^2) \times 2 = 5.440 \times 2$	$= 10.880 \text{ m}^2 (5.440)$
out side	$A = 3.80 (14.00 - 0.40) \times 2$	$= 103.360 "$
" (wing)	$A = 3.80 \times 0.40 \times 2$	$= 3.040 "$
wing side	$= 29.163 \times 2$	$= 58.326 "$
section	$= 0.40 (1.222 + \sqrt{4.40^2 + 2.933^2}) \times 2$	$= 5.208 "$
in side	$A = 3.00 \times 14.00 \times 2$	$= 84.000 "$
top slab	$A = 3.00 \times 14.00$	$= 42.000 "$

total $A =$ $= 306.814 " (301.374)$
(B1) (B2)

3) base concrete(grade:15)

concrete:main	$V = 0.10 \times 4.0 \times (14.00 - 0.40 + 0.10) + 0.10 \times 4.80 \times 0.40$	$= 5.673 \text{ m}^3$
and wing		
form:main	$A = \{2(14.00 + 0.100) + 4(4.80 - 4.00) + 4.00\} \times 0.10$	$= 3.540 \text{ m}^2$
andwing		

4) base (crushierran)

$V = 4.00 \times 14.10 \times 0.20$ $= 11.280 \text{ m}^3$

5) suport

top slab	$V = 3.00 (3.00 - 0.10) \times 14.00$	$= 121.800 \text{ m}^3$
wing	$V = 4.40 \times (2.933 - 0.10) \times 0.40$	$= 4.986 "$

6) scaffold:main

$V = 1.20 \times 3.80 \times 14.00 \times 2$ $= 127.680 "$

$V = 1.20 \times 3.80 \times 4.90 \times 2 \times 2$ $= 89.376 "$

7) joint filler

$A = 3.80^2 - 3.00^2$ $= 5.440 \text{ m}^2/\text{box}$

8) water stop

$L = 3.40 \times 4$ $= 13.600 \text{ m}/\text{box}$

9) excavation

excavation(earth)

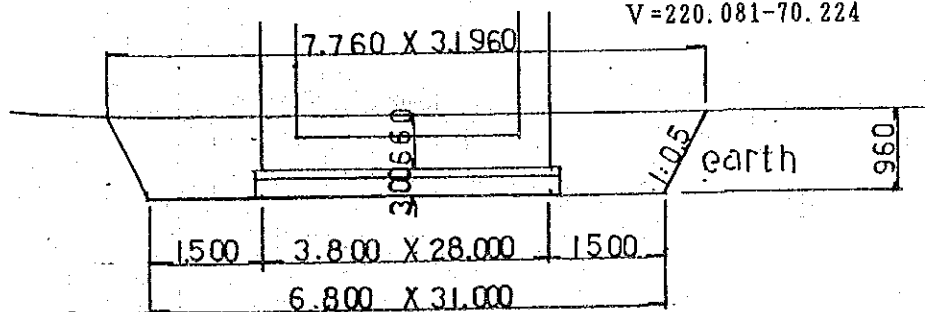
$V = 0.960/6 \{6.80 \times 31.00 + 7.76 \times 31.96$
 $+ (6.80 + 7.760) (31.00 + 31.960)\}$ $= 220.081 \text{ m}^3/\text{box}$

remain

$V = 4.00 \times 28.2 \times 0.30 + 3.80 \times 28.0 \times 0.660 = 104.064 \text{ m}^3/\text{box}$

fill

$V = 220.081 - 70.224$ $= 116.017 \text{ m}^3/\text{box}$



NO 2 BOX FOR FOOTPATH

(B1)-(B2)

1) concrete(grade:25)

bottom slab	$V = 3.80 \times 0.40 \times 12.250$	$= 18.620 m^3$
top	$V = 3.80 \times 0.40 \times "$	$= 18.620 "$
side wall	$V = 0.40 \times 3.00 \times " \times 2$	$= 29.400 "$
wing	$V = (13.60 \times 4.155 - 2.933 \times 4.40 - 3.8 \times 3.8) \times 0.40$ $= (29.163) \times 0.40$	$= 11.665 "$

total $V =$ $= 78.305 "$

2) FORMWORK

form:section	$A = (3.80^2 - 3.00^2) \times 2$	$= (5.440) \times 10.880 m^2$	(162.074) 167.514
out side	$A = 3.80 (12.250 - 0.40) \times 2$	$= 90.060 "$	
" (wing)	$A = 3.80 \times 0.40 \times 2$	$= 3.040 "$	
:wing side	$= 29.163 \times 2$	$= 58.326 m^2$	
section	$= 0.40 (1.222 + \sqrt{4.40^2 + 2.933^2}) \times 2$	$= 5.208 "$	
in side	$A = 3.00 \times 12.250 \times 2$	$= 73.500 "$	
top slab	$A = 3.00 \times "$	$= 36.750 "$	

total $A =$ $= 277.764 m^2 (272.324)$
(B1) (B2)

3) base concrete(grade:15)

concrete:main $V = 0.10 \times 4.00 \times (12.250 - 0.40 + 0.10) + 0.10 \times 4.80 \times 0.40 = 4.972 m^3$

and wing

form :main $A = \{2(12.250 + 0.10) + 4(4.80 - 4.00) + 4.00\} \times 0.10 = 3.190 m^2$

and wing

4) base(crusherran)

$V = 4.00 \times 12.350 \times 0.20 = 9.880 m^3$

5) suport

:top slab $V = 3.00 (3.00 - 0.10) \times 12.25 = 106.575 m^3$
wing $V = 4.40 \times (2.933 - 0.10) \times 0.40 = 4.986 "$ $] = 111.561$

6) scaffold:main

$V = 1.20 \times 3.80 \times 12.25 \times 2 = 111.720 m^3$

wing $V = 1.20 \times 3.80 \times 4.90 \times 2 \times 2 = 89.376 "$ $] = 201.096$

7) joint filler

$A = 3.80^2 - 3.00^2 = 5.440 m^2/box$

8) water stop

$L = 3.40 \times 4 = 13.600 m/box$

9) excavation

excavation(earth)

$V = 1.44/6 \{ (6.80 \times 27.50 + 8.240 \times 28.940) + (6.80 + 8.240) (27.50 + 28.940) \} = 305.837 m^3/box$

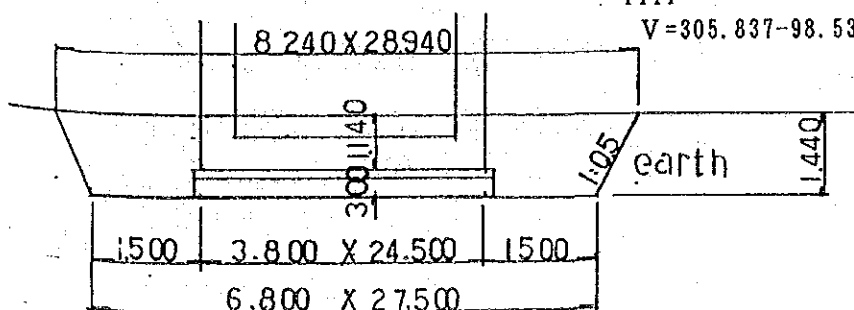
backfill

remain

$V = 4.00 \times 24.70 \times 0.30 + 3.80 \times 24.50 \times 1.140 = 98.534 m^3/box$

fill

$V = 305.837 - 98.534 = 207.303 m^3/box$



NO 3 BOX FOR FOOTPATH

(B1) (B2)

1) concrete(grade:25)

bottom slab	$V = 3.80 \times 0.40 \times 12.250$	$= 18.620 m^3$
top slab	$V = 3.80 \times 0.40 \times "$	$= 18.620 "$
side wall	$V = 0.40 \times 3.00 \times " \times 2$	$= 29.400 "$
wing	$V = \{13.50 \times 4.20 - 1/2(2.60 \times 3.90 + 3.20 \times 4.80) - 3.80^2\} \times 0.40$ $= \{29.510\} \times 0.40$	$= 11.804 "$

total $V = 78.444 "$

2) formwork

form:section	$A = (3.80^2 - 3.00^2) \times 2 = 5440 \times 2$	$= 10.880 m^2 (5.440)$	(162.782) 168,222
:out side	$A = 3.80(12.250 - 0.40) \times 2$	$= 90.060 "$	
: " (wing)	$A = 3.80 \times 0.40 \times 2$	$= 3.040 "$	
:wing side	$= 29.510 \times 2$	$= 59.020 m^2$	
section	$= 0.40(1.60 + 1.00 + \sqrt{2.60^2 + 3.90^2} + \sqrt{3.20^2 + 4.80^2})$	$= 5.222$	
:in side	$A = 3.00 \times 12.250 \times 2$	$= 73.500 "$	
:top slab	$A = 3.00 \times "$	$= 36.750 "$	

total $A = 278.472 (273.032)$
(B1) (B2)

3) base concrete(grade:15)

concrete:main $V = 0.10 \times 4.00 \times (12.250 - 0.40 + 0.10) + 0.10 \times 4.80 \times 0.40 = 4.972 \times 2 = 9.944 m^3 / box$

and wing

form :main $A = \{2(12.250 + 0.10) + 4(4.80 - 4.00) + 4.00\} \times 0.10 = 3.190 m^2$

and wing

4) base $V = 4.00 \times 12.350 \times 0.20 = 9.880 \times 2 = 19.760 m^3 / box$

5) suport

top slab $V = 3.00(3.00 - 0.10) \times 12.250 = 106.575 m^3$

wing $V = 0.40(2.50 \times 3.90 + 3.10 \times 4.80) / 2 = 4.926 "$

6) scaffold:main $V = 1.20 \times 3.80 \times 12.250 \times 2 = 111.720 m^3$

:wing $V = 1.20 \times 3.80 \times (4.40 + 5.30) \times 2 = 88.464 m^3$

7) joint filler $A = 3.80^2 - 3.00^2 = 5.440 m^2 / box$

8) water stop $L = 3.40 \times 4 = 13.600 m / box$

9) excavation

excavation(earth)

$V = 1.070/6 \{6.80 \times 27.50 + 7.870 \times 28.570 + (6.80 + 7.870)(27.50 + 28.570)\} = 220.133 m^3 / box$

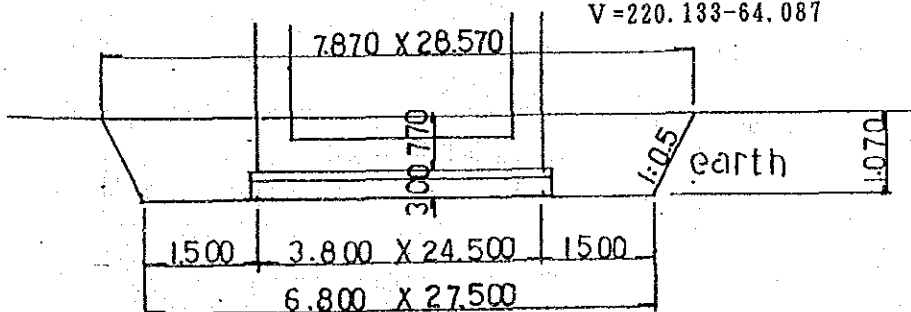
backfill

remain:

$V = 4.00 \times 24.70 \times 0.30 + 3.80 \times 24.50 \times 0.770 = 64.087 m^3 / box$

fill

$V = 220.133 - 64.087 = 156.046 m^3 / box$



NO 4 BOX FOR FOOTPATH

(B1-B2) Box length=12.350m(mean) skew angle = $76^{\circ} 54' 30'' \sim 90^{\circ}$
 $\alpha = 1/\sin 76^{\circ} 54' 30'' = 1.0267$

1) concrete(grade:25)

bottom slab $V = 3.80 \times 0.40 \times 12.350 = 18.772 \text{ m}^3$
top " $V = 3.80 \times 0.40 \times " = 18.772 "$
side wall $V = 0.40 \times 3.00 \times " \times 2 = 29.640 "$
wing " $V = \{13.602 \times 4.105 - 1/2(2.740 \times 4.110 + 3.073 \times 4.610) - 3.902 \times 3.80\} \times 0.40$
 $= \{28.295\} \times 0.40 = 11.318 "$

total $V = 78.502 \text{ m}^3$

2) formwork

form:section $A = (3.80^2 - 3.00^2)(1 + 1.0267)$
 $= 5.440 \times (")$

$= 11.025 \text{ m}^2 (5.585)$

:out side $A = 3.80(12.350 - 0.40 \times 1.0267) \times 2$

$= 90.738 "$

(161.184)

" (wing) $A = 3.80 \times 0.40 \times 1.0267 \times 2$

$= 3.121 "$

166.624

:wing: side $= 28.295 \times 2$

$= 56.590 \text{ m}^2$

section $= 0.40(1.365 + 1.032 + \sqrt{2.740^2 + 4.110^2} + \sqrt{3.073^2 + 4.610^2}) = 5.150 "$

$= 5.150 "$

:in side $A = 3.00 \times 12.350 \times 2$

$= 74.100 "$

:top slab $A = 3.00 \times "$

$= 37.050 "$

total $A = 166.624 " (161.184)$

3) base concrete(grade:15)

concrete:main $V = 0.10 \times 4.00 \times \{12.350 - (0.40 - 0.10) \times 1.0267\}$

and wing $+ 0.10 \times 4.882 \times 0.40$

$= 5.012 \times 2 = 10.024 \text{ m}^3/\text{box}$

form :main $A = \{2(12.350 + 0.10 \times 1.0267) + (4.882 - 4.0 \times 1.0267) \times 4$

and wing $+ 4.0 \times 1.0267\} \times 0.10$

$= 3.211 \text{ m}^2$

4) base(crucherran)

$V = 4.00 \times (12.350 + 0.10 \times 1.0267) \times 0.20$

$= 9.962 \times 2 = 19.924 \text{ m}^3/\text{box}$

5) suport

:top slab $V = 3.00(3.00 - 0.10) \times 12.350$

$= 107.445 \text{ m}^3$

wing $V = 0.40(2.740 \times 4.110 + 3.073 \times 4.610)/2$

$= 5.085 "$

112.530

6) scaffo'd:main $V = 1.20 \times 3.80 \times 12.350 \times 2$

$= 112.632 \text{ m}^3$

:wing $V = 1.20 \times 3.80 \times (4.60 + 5.10) \times 2$

$= 88.464 \text{ m}^3$

201.096

7) joint filler $A = 3.80^2 - 3.00^2$

$= 5.440 \text{ m}^2/\text{box}$

8) water stop $L = 3.40 \times 4$

$= 13.600 \text{ m}/\text{box}$

9) excavation.

excavation(earth)

$V = 1.210/6 \{6.80 \times 27.70 + 8.010 \times 28.910 + (6.80 + 8.010)(27.70 + 28.910)\}$

$= 253.761 \text{ m}^3/\text{box}$

backfill

remain

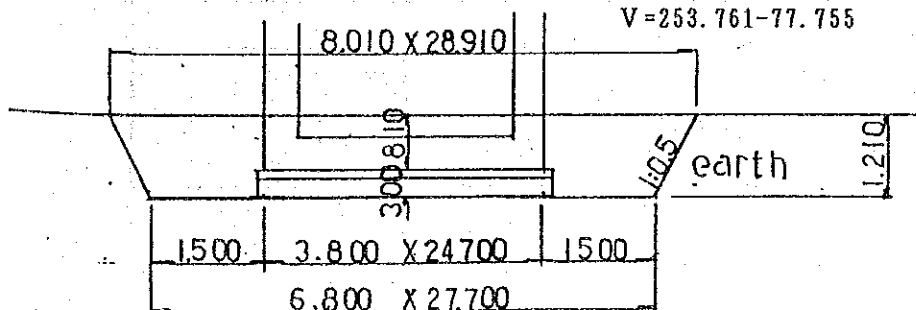
$V = 4.00(24.70 + 0.20 \times 1.0267) \times 0.30 + 3.80 \times 24.70 \times 0.810$

$= 77.755 \text{ m}^3/\text{box}$

fill

$V = 253.761 - 77.755$

$= 176.006 \text{ m}^3/\text{box}$



BOXCULVERT FOR FOOTPATH-NO ①

LIST OF REINFORCED BAR ---B1 = B2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y16	7820	48	1.579	12.35	593
	2	"	3700	95	"	5.84	555
	3	"	2440	47	"	3.85	181
	4	"	2440	47	"	"	181
	5	Y12	14320	28	0.888	12.72	356
	6	"	1090	48	"	0.97	47
	7	"	1090	48	"	"	47
	8	"	1190	113	"	1.06	120
						2080 kg	
W	1	Y12	14320	11	0.888	12.72	140
	2	"	14320	11	"	"	140
	3	"	14320	11	"	"	140
	4	"	14320	11	"	"	140
	5	Y16	3690	48	1.579	5.83	280
	6	"	3690	48	"	"	280
	7	Y12	530	115	0.888	0.47	54
	8	"	530	115	"	"	54
						1228 kg	
F	1	Y16	7800	48	1.579	12.32	591
	2	"	3700	95	"	5.84	555
	3	"	2430	47	"	3.84	180
	4	"	2430	47	"	"	180
	5	Y12	14320	28	0.888	12.72	356
	6	"	1080	48	"	0.96	46
	7	"	1080	48	"	"	46
	8	"	1170	113	"	1.04	118
						2072 kg	
Y16				3576 kg x 2 = 7 152 kg			
Y12				1804 kg x 2 = 3 608 ,			
				5380 kg x 2 = 10 760 ,			

BOXCULVERT FOR FOOTPATH - NO. ①

LIST OF REINFORCED BAR --- WING 1-2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y16	5440	5	1.579	8.59	43
	2	"	3340	19	"	5.27	100
	3	Y12	4050	2	0.888	3.60	7
	4	"	2650	14	"	2.35	33
	5	"	7230	1	"	6.42	6
	6	Y16	5440	5	1.579	8.59	43
	7	"	3340	19	"	5.27	100
	8	Y12	4050	2	0.888	3.60	7
	9	"	2650	14	"	2.35	33
	10	"	7230	1	"	6.42	6
	11	"	5440	2	"	4.83	10
	12	"	3340	10	"	2.97	30
	13	"	4050	2	"	3.60	7
	14	"	2650	14	"	2.35	33
	15	"	7230	1	"	6.42	6
	16	"	5440	2	"	4.83	10
	17	"	3340	10	"	2.97	30
	18	"	4050	2	"	3.60	7
	19	"	2650	14	"	2.35	33
	20	"	7230	1	"	6.42	6
	21	Y16	1370	12	1.579	2.16	26
	22	Y12	500	12	0.888	0.44	5
	23	Y16	1370	12	1.579	2.16	26
	24	Y12	500	12	0.888	0.44	5
	25	"	480	16	"	0.43	7
	26	"	480	16	"	"	7
	27	"	1590	13	"	1.41	18
	28	"	14060	2	"	12.49	25
	29	"	14060	2	"	"	25
	30	"	500	2	"	0.44	1
	30	"	500	2	"	"	1
	32	Y16	3240	12	1.579	5.12	61
	33	"	3240	12	"	"	61
	34	Y12	530	14	0.888	0.47	7
	35	"	530	14	"	"	7
832 kg							
Y16							460 kg x 2 = 920kg
Y12							372 kg x 2 = 744 "
							832 kg x 2 = 1664 "

BOXCULVERT FOR FOOTPATH-NO ②

LIST OF REINFORCED BAR ---B₁ = B₂

MARK		DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y12	7850	42	0.888	6.97	293	
	2	Y16	3700	41	1.579	5.84	239	
	3	Y12	3700	42	0.888	3.29	138	
	4	Y16	2440	82	1.579	3.85	316	
	5	Y12	12570	28	0.888	11.16	312	
	6	"	1090	42	"	0.97	41	
	7	"	1090	42	"	"	41	
	8	"	1190	98	"	1.06	104	
							1484 kg	
W	1	Y12	12570	11	0.888	11.16	123	
	2	"	12570	11	"	"	123	
	3	"	12570	11	"	"	123	
	4	"	12570	11	"	"	123	
	5	Y16	3690	42	1.579	5.83	245	
	6	"	3690	42	"	"	245	
	7	Y12	530	100	0.888	0.47	47	
	8	"	530	100	"	"	47	
							1076 kg	
F	1	Y12	7830	42	0.888	6.95	292	
	2	Y16	3700	41	1.579	5.84	239	
	3	Y12	3700	42	0.888	3.29	138	
	4	Y16	2430	82	1.579	3.84	315	
	5	Y12	12570	28	0.888	11.16	312	
	6	"	1080	42	"	0.96	40	
	7	"	1080	42	"	"	40	
	8	"	1170	98	"	1.04	102	
							1478 kg	
Y16					1599 kg			
Y12					2439 kg			
							4038 kg	

BOXCULVERT FOR FOOTPATH - NO.②

LIST OF REINFORCED BAR ---WING

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W 1	Y16	5440	5	1.579	8.59	43	
2	"	3340	19	"	5.27	100	
3	Y12	4050	2	0.888	3.60	7	
4	"	2650	14	"	2.35	33	
5	"	7230	1	"	6.42	6	
6	Y16	5440	5	1.579	8.59	43	
7	"	3340	19	"	5.27	100	
8	Y12	4050	2	0.888	3.60	7	
9	"	2650	14	"	2.35	33	
10	"	7230	1	"	6.42	6	
11	"	5440	2	"	4.83	10	
12	"	3340	10	"	2.97	30	
13	"	4050	2	"	3.60	7	
14	"	2650	14	"	2.35	33	
15	"	7230	1	"	6.42	6	
16	"	5440	2	"	4.83	10	
17	"	3340	10	"	2.97	30	
18	"	4050	2	"	3.60	7	
19	"	2650	14	"	2.35	33	
20	"	7230	1	"	6.42	6	
21	Y16	1370	12	1.579	2.16	26	
22	Y12	500	12	0.888	0.44	5	
23	Y16	1370	12	1.579	2.16	26	
24	Y12	500	12	0.888	0.44	5	
25	"	480	16	"	0.43	7	
26	"	480	16	"	"	7	
27	"	1590	13	"	1.41	18	
28	"	14060	2	"	12.49	25	
29	"	14060	2	"	"	25	
30	"	500	2	"	0.44	1	
30	"	500	2	"	"	1	
32	Y16	3240	12	1.579	5.12	61	
33	"	3240	12	"	"	61	
34	Y12	530	14	0.888	0.47	7	
35	"	530	14	"	"	7	
						832 kg	
Y16				460 kg			
Y12				372 kg			
				832 kg			

BOXCULVERT FOR FOOTPATH--NO ③

LIST OF REINFORCED BAR --- B₁ = B₂

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y12	7850	42	0.888	6.97	293
	2	Y16	3700	41	1.579	5.84	239
	3	Y12	3700	42	0.888	3.29	138
	4	Y16	2440	82	1.579	3.85	316
	5	Y12	12570	28	0.888	11.16	312
	6	"	1090	42	"	0.97	41
	7	"	1090	42	"	"	41
	8	"	1190	98	"	1.06	104
						1484 kg	
W	1	Y12	12570	11	0.888	11.16	123
	2	"	12570	11	"	"	123
	3	"	12570	11	"	"	123
	4	"	12570	11	"	"	123
	5	Y16	3690	42	1.579	5.83	245
	6	"	3690	42	"	"	245
	7	Y12	530	100	0.888	0.47	47
	8	"	530	100	"	"	47
						1076 kg	
F	1	Y12	7830	42	0.888	6.95	292
	2	Y16	3700	41	1.579	5.84	239
	3	Y12	3700	42	0.888	3.29	138
	4	Y16	2430	82	1.579	3.84	315
	5	Y12	12570	28	0.888	11.16	312
	6	"	1080	42	"	0.96	40
	7	"	1080	42	"	"	40
	8	"	1170	98	"	1.04	102
						1478 kg	
Y16				1599 kg			
Y12				2439 kg			
				4038 kg			

BOXCULVERT FOR FOOTPATH - NO.③

LIST OF REINFORCED BAR ---WING₁₋₂

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W 1	Y16	4940	8	1.579	7.80	62	
2	"	3070	16	"	4.85	78	
3	Y12	4090	2	0.888	3.63	7	
4	"	2830	12	"	2.51	30	
5	"	7000	1	"	6.22	6	
6	Y16	5840	4	1.579	9.22	37	
7	"	3520	20	"	5.56	111	
8	Y12	4090	2	0.888	3.63	7	
9	"	2530	15	"	2.25	34	
10	"	7490	1	"	6.65	7	
11	"	4900	4	"	4.35	17	
12	"	2910	8	"	2.58	21	
13	"	4090	2	"	3.63	7	
14	"	2830	12	"	2.51	30	
15	"	7000	1	"	6.22	6	
16	"	5800	2	"	5.15	10	
17	"	3360	10	"	2.98	30	
18	"	4090	2	"	3.63	7	
19	"	2530	15	"	2.25	34	
20	"	7490	1	"	6.65	7	
21	Y16	1370	12	1.579	2.16	26	
22	Y12	500	12	0.888	0.44	5	
23	Y16	1370	12	1.579	2.16	26	
24	Y12	500	12	0.888	0.44	5	
25	"	480	14	"	0.43	6	
26	"	480	17	"	"	7	
27	"	1680	14	"	1.49	21	
28	"	13820	2	"	12.27	25	
29	"	13820	2	"	"	25	
30	"	500	2	"	0.44	1	
31	"	500	2	"	"	1	
32	Y16	3240	12	1.579	5.12	61	
33	"	3240	12	"	"	61	
34	Y12	530	14	0.888	0.47	7	
35	"	530	15	"	"	7	
832 kg							
Y16							462 kg
Y12							370 kg
832 kg							

BOXCULVERT FOR FOOTPATH--NO ④

LIST OF REINFORCED BAR ---B1 = B2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1	Y12	7850	40	0.888	6.97	279
	2	Y16	3700	39	1.579	5.84	228
	3	Y12	3700	40	0.888	3.29	132
	4	Y16	2440	78	1.579	3.85	300
	5	Y12	12620	28	0.888	11.21	314
	6	"	1090	40	"	0.97	39
	7	"	1090	40	"	"	39
	8	"	1190	95	"	1.06	101
	9	Y16	6800	3	1.579	10.74	32
	10	"	6240	3	"	9.85	30
	11	"	3800	6	"	6.00	36
	12	Y12	1110	3	0.888	0.99	3
	13	"	1190	1	"	1.06	1
						1534 kg	
W	1	Y12	12190	11	0.888	10.82	119
	2	"	12260	11	"	10.89	120
	3	"	12980	11	"	11.53	127
	4	"	13050	11	"	11.59	127
	5	Y16	3690	40	1.579	5.83	233
	6	"	3690	40	"	"	233
	7	"	3690	3	"	"	17
	8	"	3690	1	"	"	6
	9	Y12	530	95	0.888	0.47	45
	10	"	530	95	"	"	45
	11	"	540	3	"	0.48	1
						1073 kg	
F	1	Y12	7830	40	0.888	6.95	278
	2	Y16	3700	39	1.579	5.84	228
	3	Y12	3700	40	0.888	3.29	132
	4	Y16	2430	78	1.579	3.84	300
	5	Y12	12620	28	0.888	11.21	314
	6	"	1080	40	"	0.96	38
	7	"	1080	40	"	"	38
	8	"	1170	95	"	1.04	99
	9	Y16	6230	3	1.579	9.84	30
	10	"	6790	3	"	10.72	32
	11	"	3800	6	"	6.00	36
	12	Y12	1090	3	0.888	0.97	3
	13	"	1170	1	"	1.04	1
						1529 kg	
Y16				1741 kg			
Y12				2395 kg			
				4136 kg			
04							

BOXCULVERT FOR FOOTPATH - NO.④

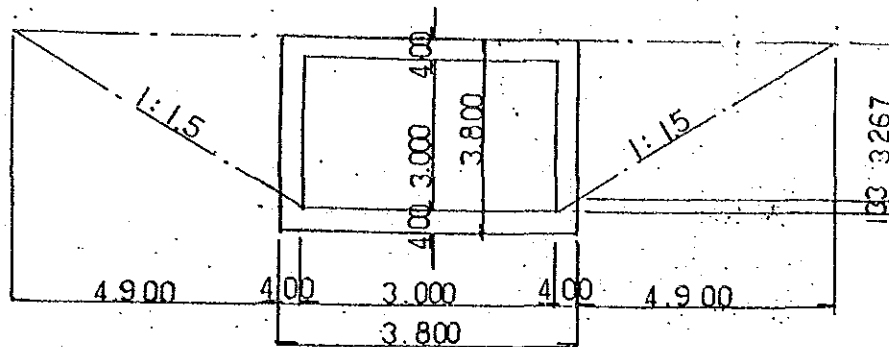
LIST OF REINFORCED BAR ---WING1=2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y16	5240	6	1.579	8.27	50
	2	"	3160	18	"	4.99	90
	3	Y12	4000	2	0.888	3.55	7
	4	"	2690	13	"	2.39	31
	5	"	7100	1	"	6.30	6
	6	Y16	5570	4	1.579	8.80	35
	7	"	3220	20	"	5.08	102
	8	Y12	4000	2	0.888	3.55	7
	9	"	2560	15	"	2.27	34
	10	"	7210	1	"	6.40	6
	11	"	5120	3	"	4.55	14
	12	"	2930	10	"	2.60	26
	13	"	4000	2	"	3.55	7
	14	"	2690	13	"	2.39	31
	15	"	7030	1	"	6.24	6
	16	"	5600	2	"	4.97	10
	17	"	3130	11	"	2.78	31
	18	"	4000	1	"	3.55	4
	19	"	2560	15	"	2.27	34
	20	"	7280	1	"	6.46	6
	21	Y16	1480	11	1.579	2.34	26
	22	Y12	500	12	0.888	0.44	5
	23	Y16	1300	11	1.579	2.05	23
	24	Y12	500	12	0.888	0.44	5
	25	"	480	15	"	0.43	6
	26	"	480	16	"	"	7
	27	"	1490	14	"	1.32	18
	28	"	13920	2	"	12.36	25
	29	"	13920	2	"	"	25
	30	"	500	2	"	0.44	1
	31	"	500	2	"	"	1
	32	Y16	3240	11	1.579	5.12	56
	33	"	3240	11	"	"	56
	34	Y12	530	14	0.888	0.47	7
	35	"	530	12	"	"	6
							804 kg
Y16				438 kg			
Y12				366 kg			
				804 kg			

NO ① BOX-CULVERT FOR FOOTPATH

BACK-FILL

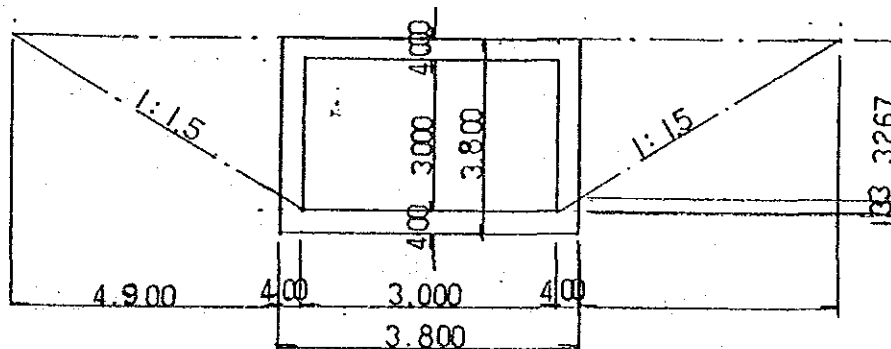
$$V = 3.267 \times 4.90 \times (28.00 - 0.40 \times 2) = 435.4 \text{ m}^3$$



NO ② BOX-CULVERT FOR FOOTPATH

BACK-FILL

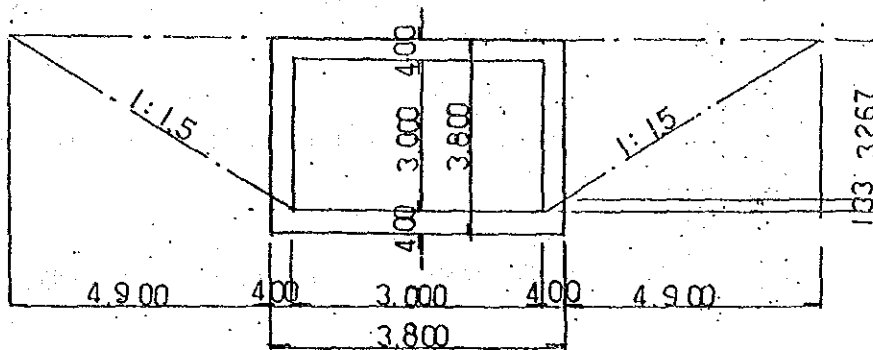
$$V = 3.267 \times 4.90 \times (24.50 - 0.40 \times 2) = 379.4 \text{ m}^3$$



NO ③ BOX CULVERT FOR FOOTPATH

BACK-FILL

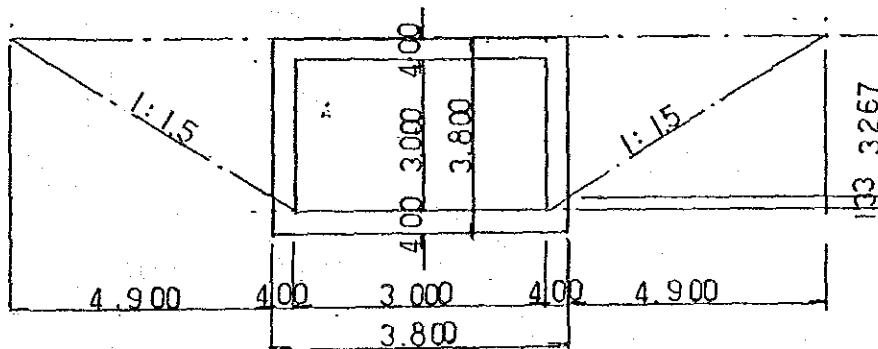
$$V = 3.267 \times 4.90 \times (24.50 - 0.40 \times 2) = 379.4 \text{ m}^3$$



NO ④ BOX CULVERT FOR FOOTPATH

BACK-FILL

$$V = 3.267 \times 4.90 \times (24.70 - 0.411 \times 2) = 382.3 \text{ m}^3$$



BOX FOR FOOTPATH

$$\text{NO①} \quad \text{UF2 A} = (3.80 + 3.00) \times 28.00 + 4.90 \times 0.40 \times 2 \times 2 = 198.240 \text{ m}^2$$

$$\text{NO②} \quad \text{A} = (3.80 + 3.00) \times 24.50 + 4.90 \times 0.40 \times 2 \times 2 = 174.440 \text{ ''}$$

$$\text{NO③} \quad \text{A} = (3.80 + 3.00) \times 24.50 + (4.40 + 5.30) \times 0.40 \times 2 = 174.360 \text{ ''}$$

$$\text{NO④} \quad \text{A} = (3.80 + 3.00) \times 24.70 + (4.60 + 5.10) \times 0.40 \times 2 = 175.720 \text{ ''}$$

NO① BOX FOR FOOTPATH

porous drainage	$A = 37.20 \times 3.40 \times 2 \times (\times 0.300)$	$= 184.960 \text{ m}^2 \quad 55.488 \text{ m}^3$
perforated pipe	$L = 27.20 \times 2$	$= 54.400 \text{ m}$
drain pipe	$N =$	$= 2 \text{ N}$
(φ 200mm)		

NO② BOX FOR FOOTPATH

porous drainage	$A = 23.7 \times 3.40 \times 2 \times (\times 0.300)$	$= 161.160 \text{ m}^2 \quad 48.348 \text{ m}^3$
perforated pipe	$L = 23.70 \times 2$	$= 47.400 \text{ m}$
drain pipe	$N =$	$= 4 \text{ N}$
(φ 200mm)		

NO③ BOX FOR FOOTPATH

porous drainage	$A = 23.7 \times 3.40 \times 2 \times (\times 0.300)$	$= 161.160 \text{ m}^2 \quad 48.348 \text{ m}^3$
perforated pipe	$L = 23.70 \times 2$	$= 47.400 \text{ m}$
drain pipe	$N =$	$= 4 \text{ N}$
(φ 200mm)		

NO④ BOX FOR FOOTPATH

porous drainage	$A = 23.879 \times 3.40 \times 2 \times (\times 0.300)$	$= 162.377 \text{ m}^2 \quad 48.713 \text{ m}^3$
perforated pipe	$L = 23.879 \times 2$	$= 47.758 \text{ m}$
drain pipe	$N = (23.879 / 5.00 + 1) \times 2$	$= 2 \text{ N}$
(φ 200mm)		

B.Q 21.01 Waterproofing materials

N0① BOX for footpath

$$A = (28.00 - 2 \times 0.40) \times 3.80 \times 3 + (4.90 \times 4.155 - \frac{1}{2} \times 2.933 \times 4.40) \times 2 \times 2 = 365.707 \text{ m}^2$$

N0② BOX for footpath

$$A = (24.50 - 2 \times 0.40) \times 3.80 \times 3 + (4.90 \times 4.155 - \frac{1}{2} \times 2.933 \times 4.40) \times 2 \times 2 = 325.807 \text{ m}^2$$

N0③ BOX for footpath

$$A = (24.50 - 2 \times 0.40) \times 3.80 \times 3 + (4.40 \times 4.20 - \frac{1}{2} \times 3.90 \times 2.60) \times 2 + (5.30 \times 4.20 - \frac{1}{2} \times 4.80 \times 3.20) \times 2 = 326.160 \text{ m}^2$$

N0④ BOX for footpath

$$A = (24.70 - 2 \times 0.411) \times 3.80 \times 3 + (4.60 \times 4.105 - \frac{1}{2} \times 4.11 \times 2.74) \times 2 + (5.10 \times 4.105 - \frac{1}{2} \times 4.61 \times 3.073) \times 2 = 326.418 \text{ m}^2$$

BILL OF QUANTITIES

OVERBRIDGES

PEDESTRIAN BRIDGE (1) ——— 1

PEDESTRIAN BRIDGE (2) ——— 11

VEHICULE BRIDGE (1) W = 6m ——— 23

VEHICULE BRIDGE (2) W = 10m ——— 33-45

NO ① PEDESTRIAN BRIDGE

Super structure —Main bridge—

1) Concrete. (Gread=30)

$$V = \{0.50 \times 28.20 + (0.50 + 0.625) \times 5.00\} \times 3.60$$

$$- 0.30 \times 3.00 \times 0.26 \times 2$$

$$+ (3.60 \times 0.10 \times 2 + 37.60 \times 0.10 + 31.60 \times 0.10) \times 0.30$$

$$= \{19.725\} \times 3.60 + (7.640) \times 0.30 - 0.468$$

$$= 72.834 \text{ m}^3$$

$$UF_2 : A = 38.20 \times 3.60$$

$$= 137.520 \text{ m}^3$$

2) formwork.

side

$$A = \{19.725 \times 2 + (31.60 + 37.60 + 3.30 + 3.60) \times 0.10 \times 2$$

$$+ 0.10 \times 0.30 \times 6 + 0.30 \times 0.26 \times 2 \times 2$$

$$= 55.162 \text{ m}^3$$

top slab

$$A = 3.60 \times 38.20 - 1.50 \times 0.50 \times 3$$

$$= 135.270 \text{ m}^3$$

3) Support

$$V = 1/2 \{ (6.90 - 0.10) + (6.30 - 0.10) \} \times 3.60 \times 38.20$$

$$= 893.880 \text{ m}^3$$

4) Scaffold

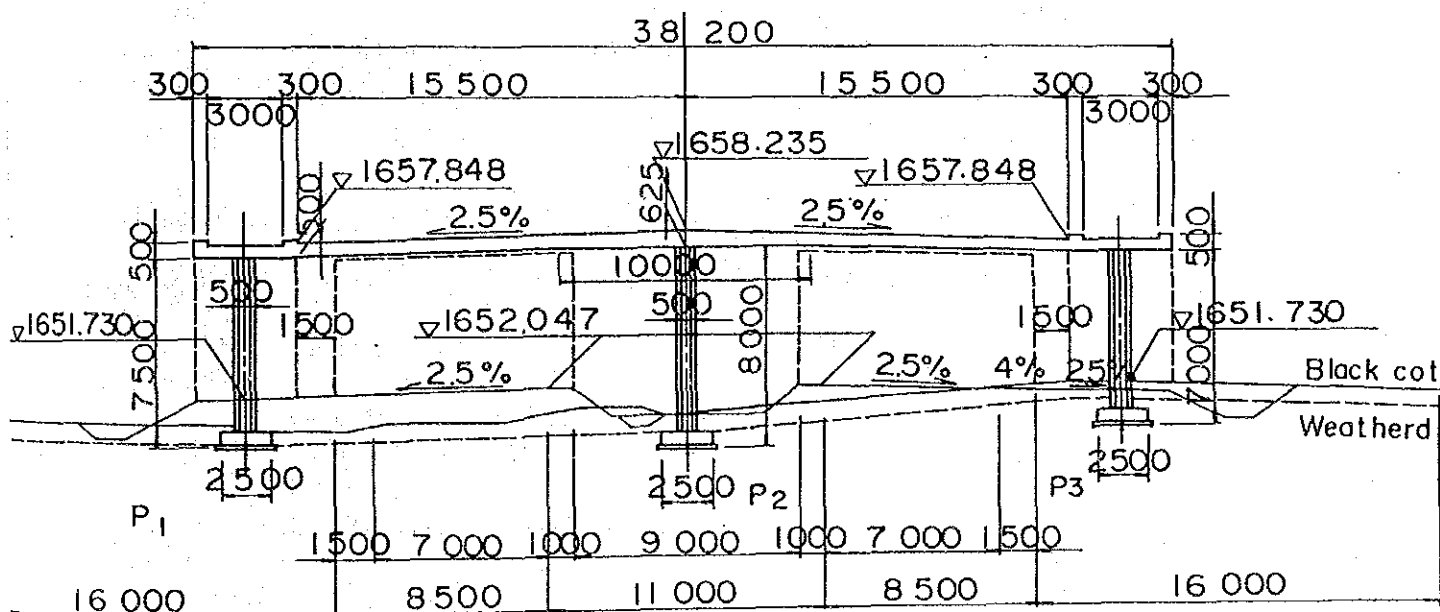
$$V = (3.60 + 1.00) \times 38.20$$

$$= 175.720 \text{ m}^3$$

5) Handrail

$$= 31.60 + 37.60 + 3.60 \times 2$$

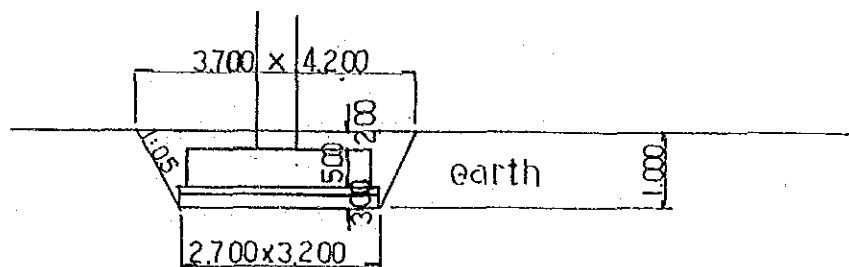
$$= 76.400 \text{ m}$$



NO ① PEDESTRIAN BRIDGE

Sub structure main pier : P₁

1) concrete : pillar	$V = \Sigma 0.741 \times 7.00$	=	5.187m ³
: footing	$V = 2.50 \times 3.00 \times 0.50$	=	3.750m ³
total		=	8.937m ³
UF ₂ :	$V = \Sigma 0.741 + 2.50 \times 3.00 - \Sigma 0.741$	=	7.500m ³
2) formwork : pillar	$V = \Sigma 3.828 \times 7.00$	=	26.796m ³
: footing	$A = 2(2.50 + 3.00) \times 0.50$	=	5.000m ²
3) base concrete	$V = 2.70 \times 3.20 \times 0.10$	=	0.864m ³
4) base (crusherran)	$V = 2.70 \times 3.20 \times 0.20$	=	1.728m ³
5) scaffold	$V = 1.20 \{ (1.50 + 2.00) + (0.50 + 2.00) \} \times 7.00 \times 2$	=	100.800m ³



6) excavation			
earth	$V = 1.00/6 \{ 2.70 \times 3.20 + 3.70 \times 4.20 + (2.70 + 3.70)(3.20 + 4.20) \}$	=	10.073m ³
remain	$V = 3.750 + 0.704 + 1.408 + \Sigma 0.741 \times 0.20$	=	5.260m ³
backfill	$V = 10.073 - 5.260$	=	4.813m ³

* where . quantity of unit length for Piller

P₁ : H = 7.500 m

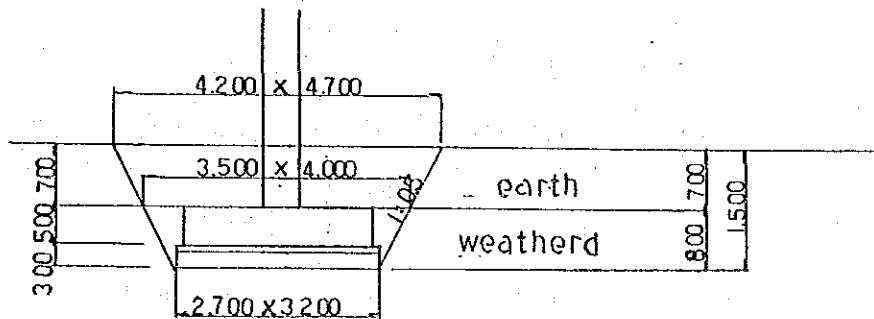
$A = 0.50 \times 1.50 - (4 \times 0.10^2 - \pi \times 0.10^2)$		
$= 0.750 - (0.0085)$	=	* 0.741m ²
$\phi R = \pi \times 0.10 \times 2$	=	0.628m
$\phi S = 2(0.50 + 1.50) - 8 \times 0.10$	=	3.200m
$\phi =$	=	* 3.828m

NO① PEDESTRIAN BRIDGE

Sub structure

main pier : P₂

1) concrete : pillar	V = ※0.741 × 7.50	=	5.557m ³
: footing	V = 2.50 × 3.00 × 0.50	=	3.750m ³
total	=		
UF ₂ : A =		=	9.307m ³
2) formwork : pillar	A = ※3.828 × 7.50	=	7.500m ²
: footing	A = 2(2.0 + 3.00) × 0.50	=	28.710m ²
3) base concrete	V = 2.50 × 3.20 × 0.10	=	5.000m ³
4) base (crusherran)	V = 2.50 × 3.20 × 0.20	=	0.864m ³
5) scaffold	V = 1.20 {(1.50 + 2.00) + (0.50 + 2.00)} × 7.50 × 2	=	1.728m ³
6) excavation		=	100.800m ³



excavation			
earth	V = 0.70/6 {3.50 × 4.00 + 4.20 × 4.70 + (3.50 + 4.20) (4.00 + 4.70)}	=	10.229m ³
excavation			
weatherd	V = 0.80/6 {2.70 × 3.20 + 3.50 × 4.00 + (2.70 + 3.50) (3.20 + 4.00)}	=	7.530m ³
remain	V = 3.000 + 0.704 + 1.408 + ※0.741 × 0.70	=	5.630m ³
backfill	V = 10.229 + 7.530 - 5.630	=	12.129m ³

※ where . quantity of unit-length for Piller

P₂ : H = 8.000 m

$$A = 0.50 \times 1.50 - (4 \times 0.10^2 - \pi \times 0.10^2) = 0.750 - (0.0085) = ※ 0.741 \text{ m}^2$$

$$Q R = \pi \times 0.10 \times 2 = 0.628 \text{ m}$$

$$Q S = 2(0.50 + 1.50) - 8 \times 0.10 = 3.200 \text{ m}$$

$$Q = ※ 3.828 \text{ m}$$

NO ① PEDESTRIAN BRIDGE

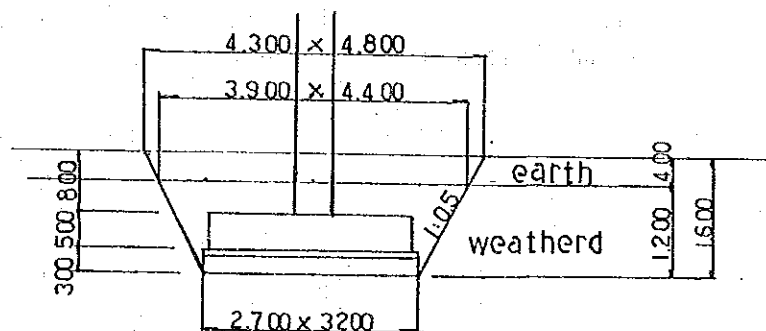
Sub structure main pier : P₃

1) concrete : pillar	$V = ※0.741 \times 6.50$	=	$4.816m^3$
: footing	$V = 2.50 \times 3.00 \times 0.50$	=	$3.750m^3$

total = $8.566m^3$

UF2 : A =

2) formwork : pillar	$A = ※3.828 \times 6.50$	=	$7.500m^2$
: footing	$A = 2 \times (2.50 + 3.00) \times 0.50$	=	$24.882m^2$
3) base concrete	$V = 2.50 \times 3.20 \times 0.10$	=	$5.000m^3$
4) base (crusherran)	$V = 2.50 \times 3.20 \times 0.20$	=	$0.864m^3$
5) scaffold	$= 1.20 \{ (1.50 + 2.00) + (0.50 + 2.00) \} \times 6.50 \times 2$	=	$1.728m^3$
6) excavation		=	$93.600m^3$



excavation earth	$V = 0.40/6 \{ 3.90 \times 4.40 + 4.30 \times 4.80 + (3.90 + 4.30) (4.40 + 4.80) \}$	=	$6.629m^3$
excavation weatherd	$V = 1.20/6 \{ 2.70 \times 3.20 + 3.90 \times 4.40 + (2.70 + 3.90) (3.20 + 4.40) \}$	=	$12.912m^3$
remain	$V = 3.000 + 0.704 + 1.408 + ※0.741 \times 0.80$	=	$5.704m^3$
backfill	$V = 6.629 + 12.912 - 5.704$	=	$13.837m^3$

※ where : quantity of unit length for Piller

P₃ : H = 7.000 m

$A = 0.50 \times 1.50 - (4 \times 0.10^2 - \pi \times 0.10^2)$		
$= 0.750 - (0.0085)$	=	$※ 0.741m^2$
$ℓ R = \pi \times 0.10 \times 2$	=	$0.628m$
$ℓ S = 2(0.50 + 1.50) - 8 \times 0.10$	=	$3.200m$
$ℓ =$	=	$※ 3.828m$

NO ① PEDESTRIAN BRIDGE

Super-structure - Stair-bridge ①:② -

1) Concrete (Gread=30)

$$\begin{aligned}
 \text{slab} &: 0.30 \times 3.60 (5.76 + 6.08) + 1/2 \times 0.19 \times 0.38 \times 3.60 \\
 &+ 0.30 \times 0.24 \times 3.0 + 0.30 \times 3.60 (2.00 + 1.68) = 17.107 \text{m}^3 \\
 \text{stair} &: 1/2 \times 0.32 \times 0.16 (18 + 19) \times 3.00 = 2.841 \text{m}^3 \\
 \text{Parapet} &: (0.10 + 0.26) (0.30 + 0.32 \times 3) \times 0.30 \\
 &+ 0.10 (1.68 + 1.36) \times 0.30 \times 2 + 2 \times 0.26 (17 + 18) \times 0.32 \times 0.30 = 2.065 \text{m}^3
 \end{aligned}$$

$$\text{total} = 22.013 \text{m}^3$$

$$\begin{aligned}
 \text{UF}_2 : A &= 3.00 (0.28 + 5.76 + 2.00 + 6.08 + 1.68) \\
 &+ 2 \times 0.30 (0.30 + 5.76 + 2.00 + 6.08 + 1.36) = 56.700 \text{m}^2
 \end{aligned}$$

2) form work.

$$\text{Vertical} \quad A = 0.30 (2.00 + 1.68) \times 2 + 0.10 (1.68 + 1.36) \times 2 = 2.816 \text{m}^2$$

$$\text{horizontal} \quad A = 3.60 (0.38 + 2.00) - 0.50 \times 0.50 = 8.318 \text{m}^2$$

$$\begin{aligned}
 \text{Sloping} \quad A &= (0.10 + 0.26) (0.30 + 0.32 \times 3) + 0.26 \times 0.32 (17 + 18) \times 2 \times 2 \\
 &+ 0.30 \times (5.76 + 6.08) \times 2 + 1/2 \times 0.19 \times 0.38 \times 2 \\
 &+ 3.60 (5.76 - 0.40 + 6.08) \times 1.1180 = 65.321 \text{m}^2
 \end{aligned}$$

$$3) \text{ Support} \quad V = 3.60 \{ (5.518 + 2.638) / 2 \times 5.76 + 2.638 \times 2.00 + 1/2 \times 2.638 \times 6.08 \} = 132.425 \text{m}^3$$

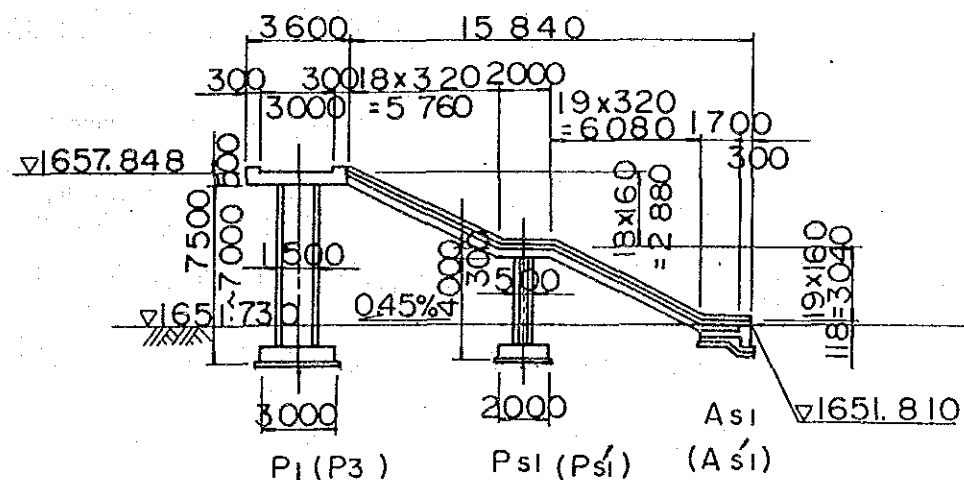
$$4) \text{ Scaffold} \quad V = (3.60 + 1.00) \times (5.76 + 2.00 + 6.08) = 63.664 \text{m}^3$$

$$\begin{aligned}
 5) \text{ Handrail} \\
 \text{vertical} &= (0.32 + 2.00 + 1.68) \times 2 = 8.000 \text{m} \\
 \text{sloping} &= 2 \times (5.76 + 6.08) = 23.680 \text{m}
 \end{aligned}$$

$$\text{total} = 31.680 \text{m}$$

6) joint filler (t=20mm)

$$A = (0.50 + 0.30) \times 3.60 + 0.30 \times 0.10 \times 2 \times 2 + 0.21 \times 0.28 \times 2 = 3.134 \text{m}^2$$



NO ① PEDESTRIAN BRIDGE

Sub-structure

Stair pier $P s_1 = P s_2$

1) concrete : pillar $V = * 0.241 \times 3.60$

footing $V = 2.00 \times 2.00 \times 0.40$

= $0.867m^3$

= $1.600m^3$

total

= $2.467m^3$

UP₂ : $A = * 0.241 + 2.00 \times 2.00 - * 0.241$

= $4.000m^2$

2) formwork : pillar $A = * 1.828 \times 3.60$

= $6.580m^2$

footing $V = 2(2.00 + 2.00) \times 0.40$

= $3.200m^2$

3) base concrete $V = 2.20 \times 2.20 \times 0.10$

= $0.484m^3$

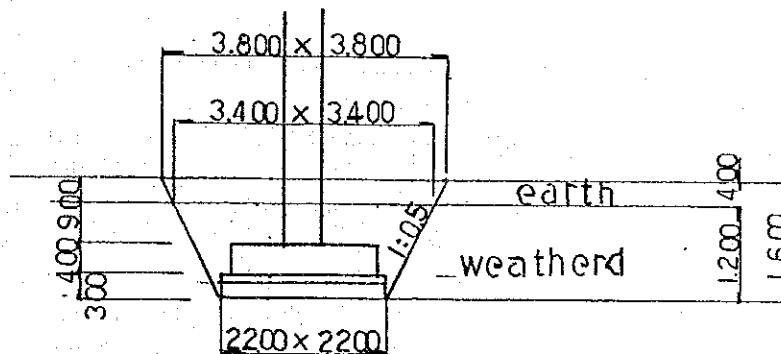
4) base (crusherran) $V = 2.20 \times 2.20 \times 0.20$

= $0.968m^3$

5) scaffold $V = 1.20(0.50 + 2.00) \times 3.60 \times 4$

= $43.200m^3$

6) excavation



excavation

earth $V = 0.40/6 \{3.40 \times 3.40 + 3.80 \times 3.80 + (3.40 + 3.80)(3.40 + 3.80)\}$

= $5.189m^3$

excavation

weatherd $V = 1.20/6 \{2.20 \times 2.20 + 3.40 \times 3.40 + (2.20 + 3.40)(2.20 + 3.40)\}$

= $9.552m^3$

remain $V = 1.60 + 0.484 + 0.968 + * 0.241 \times 0.90$

= $3.268m^3$

backfill $V = 5.189 + 9.552 - 3.268$

= $11.473m^3$

* where quantity of unit length for Pillar

$P s_1 : 4.000$

$P s_2 : 4.000$

$A = 0.500^2 - 0.0085$

= $* 0.241m^2$

$\phi R = \pi \times 0.10 \times 2$

= $0.628m$

$\phi S = 4 \times 0.50 - 8 \times 0.10$

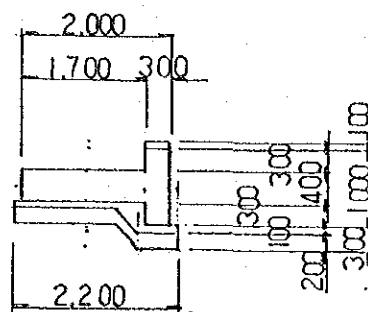
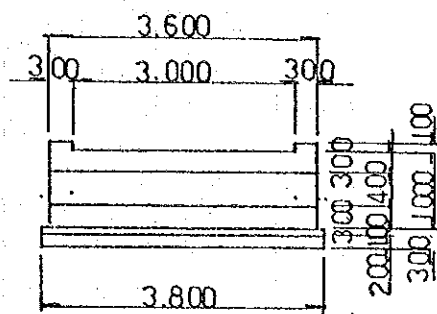
= $1.200m$

$\phi =$

= $* 1.828m$

NO ① PEDESTRIAN BRIDGE

As1 = As2 : Edge pedestal



UP₂ : A = 3.60(0.70+0.30)=7.20 m²

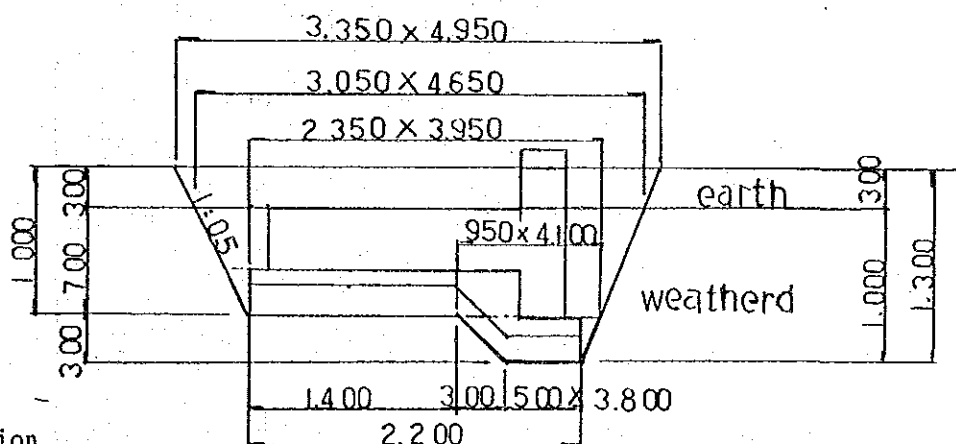
1) concrete V = 3.60 × 0.40 × 1.70 + (3.60 × 1.00 + 0.30 × 0.10 × 2) × 0.30 = 3.546 m³

2) formwork A = 0.40(3.60+1.70×2)+0.10×0.30×4×2 + 2×1.00×(3.60+0.30)-0.40×3.60 = 9.400 m²

3) base(crusherran) V = 3.80 × 2.20 × 0.20 = 1.672 m³

4) base concrete concrete V = {2.20 × 0.10 + 1/2(0.10+0.40) × 0.30} × 3.60 = {0.295} × 3.60 = 1.062 m³

formwork A = (※ 0.295 + 3.80 × 0.10) × 2 = 1.350 m²



5) excavation earth V = 0.30/6 {3.05 × 4.65 + 3.35 × 4.95 + (3.05 + 3.35)(4.65 + 4.95)} = 4.610 m³

excavation weatherd V = 0.30/6 {0.50 × 3.80 + 0.95 × 4.10 + (0.50 + 0.95)(3.80 + 4.10)} + 0.70/6 {2.35 × 3.95 + 3.05 × 4.65 + (2.35 + 3.05)(3.95 + 4.65)} = 8.928 m³

remain V = 3.546 + 1.672 + 1.062 = 6.280 m³

backfill V = 4.610 + 8.928 - 6.280 = 7.258 m³

LIST OF REINFORCED BAR --- SUPERSTRUCTURE

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
No1 PEDESTRIAN							
S	1	Y32	8000	31	6.313	50.50	2929
	2-1	Y25	4420	28	3.854	17.03	303
	2-2	"	3630	30	"	13.09	578
	2-3	"	10000	30	"	38.54	370
	3-1	Y32	3880	62	6.313	23.23	462
	3-2	"	9000	82	"	56.82	321
	4-1	Y25	4500	15	3.854	17.34	1031
	4-2	"	7250	15	"	27.94	1273
	5	"	4420	30	"	17.03	1831
	6	Y20	3450	11	2.466	8.51	696
	7	Y16	3450	120	1.579	5.45	925
	8	"	3450	203	"	5.45	240
	9	Y25	3580	22	3.854	13.80	272
	10	Y16	3580	10	1.579	5.65	687
	11	"	1070	42	"	1.69	105
	12	"	1240	42	"	1.96	22
	13	Y12	1050	264	0.888	0.93	1357
	14-1	"	10000	12	"	8.88	71
	14-2	"	9680	8	"	8.60	82
	15	"	6030	3	"	5.35	307
	16	"	3500	6	"	3.11	24
So	1	Y12	1310	308	0.888	1.16	452
	2	"	1440	162	"	1.28	
						13161	kg
K	1	Y20	3790	50	2.466	9.35	468
	2	Y12	6210	28	0.888	5.51	143
	3	"	7980	28	"	7.07	184
	4	Y16	5900	50	1.579	9.32	466
	5	Y12	3790	50	0.888	3.37	169
	6	Y16	7960	50	1.579	12.57	629
	7	"	3480	50	"	5.49	275
	8	Y12	3480	238	0.888	3.09	735
	9	Y16	940	42	1.579	1.48	62
	10	"	850	42	"	1.34	56
	11	Y12	1080	42	0.888	0.96	40
	12	"	860	212	"	0.76	161
	13	"	6210	8	"	5.51	44
	14	"	3790	8	"	3.37	27
	15	"	7960	8	"	7.07	57
Ko	1	Y12	940	280	0.888	0.82	232
H	1	Y12	900	518	0.888	0.80	414
	2	"	3480	74	"	3.09	229
						4391	kg
				Y32	8529	kg	
				Y25	3547		
				Y20	582		
				Y16	3458		
				Y12	3456		
						17552	kg

LIST OF REINFORCED BAR---NO ① PEDESTRIAN-PIER

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
① --- H = 7.500 ^m							
C	1	Y25	9500	26	3.854	36.61	952
	2	Y16	2360	94	1.579	3.73	351
	3	Y12	1640	12	0.888	1.46	18
						1321 kg	
F	1	Y20	3600	18	2.466	8.88	160
	2	"	3070	21	"	7.57	159
	3	Y12	3600	18	0.888	3.20	58
	4	"	3070	21	"	2.73	57
	5	"	1280	28	"	1.14	32
	6	"	1400	4	"	1.24	5
						471 kg	
Y25				952 kg			
Y20				319 kg			
Y16				351 kg			
Y12				170 kg			
				1792 kg			

LIST OF REINFORCED BAR---NO ② PEDESTRIAN-PIER

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
② --- H = 8.000 ^m							
C	1	Y25	10000	26	3.854	38.54	1002
	2	Y16	2360	100	1.579	3.73	373
	3	Y12	1640	12	0.888	1.46	18
						1393 kg	
F	1	Y20	3600	18	2.466	8.88	160
	2	"	3070	21	"	7.57	159
	3	Y12	3600	18	0.888	3.20	58
	4	"	3070	21	"	2.73	57
	5	"	1280	28	"	1.14	32
	6	"	1400	4	"	1.24	5
						471 kg	
Y25				1002 kg			
Y20				319 kg			
Y16				373 kg			
Y12				170 kg			
				1864 kg			

LIST OF REINFORCED BAR---NO ① PEDESTRIAN-PIER

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
③ --- H = 7.000m							
C	1	Y25	9000	26	3.854	34.69	902
	2	Y16	2360	86	1.579	3.73	321
	3	Y12	1640	12	0.888	1.46	18
						1241 kg	
F	1	Y20	3600	18	2.466	8.88	160
	2	"	3070	21	"	7.57	159
	3	Y12	3600	18	0.888	3.20	58
	4	"	3070	21	"	2.73	57
	5	"	1280	28	"	1.14	32
	6	"	1400	4	"	1.24	5
						471 kg	
Y25				902 kg			
Y20				319 kg			
Y16				321 kg			
Y12				170 kg			
				1712 kg			

(STAIRCASE)

LIST OF REINFORCED BAR---NO ① PEDESTRIAN-PIER

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
③ = ④ --- H = 4.000m							
C	1	Y25	4900	12	3.854	18.88	227
	2	Y12	2000	16	0.888	1.78	28
						255 kg	
F	1	Y12	2380	60	0.888	2.11	127
	2	"	1090	12	"	0.97	12
						139 kg	
Y25				227 kg			
Y12				167 kg			
				394 kg			

(STAIRCASE)

LIST OF REINFORCED BAR---NO ① PEDESTRIAN- ABUT

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
① = ②							
F	1	Y12	4040	18	0.888	3.59	65
	2	"	2440	30	"	2.17	65
	3	"	1940	11	"	1.72	19
	4	"	2140	4	"	1.90	8
	5	"	540	15	"	0.48	7
	6	"	1880	4	"	1.67	7
	7	"	1090	15	"	0.97	15
						186 kg	
Y12				186 kg			
				186 kg			

Super structure --Main bridge--

$$\begin{aligned} V &= (0.50 \times 48.35) \times 3.60 - 0.30 \times 0.26 \times 3.00 \times 2 \\ &\quad + (3.60 \times 0.10 + 48.05 \times 0.10 + 44.75 \times 0.10) \times 0.30 \\ &= (24.175) \times 3.60 - 0.468 + (9.640) \times 0.30 \end{aligned}$$

$$\begin{aligned} &= 89.454 \text{ m}^3 \\ &= 174.060 \text{ m}^2 \end{aligned}$$

$$\text{side : } A = \text{Rs } 24.175 \times 2 + \{(3.30 + 3.60)/2 + 48.05 + 44.75\} \times 0.10 \times 2 \\ + 0.50 \times 3.60 + 0.10 \times 0.30 \times 5 + 0.30 \times 0.26 \times 2 \times 2$$

$$= 171.060 \text{ m}^3$$

$$= 171.060 \text{ m}^3$$
$$V = 1/3 \{ (6.00 - 0.10) + (6.30 - 0.10) + (6.30 - 0.10) \} \times 3.60 \times 48.35$$

$$\approx 1061.766 \text{ m}^3$$

$$V = (3.60 + 1.00) \times 48.35$$

$$= 222.410 \text{ m}^3$$

$$= 3.60 + 48.05 + 44.75$$

$$\approx 96.400\text{m}$$



NO ② PEDESTRIAN BRIDGE

Super structure - Stair bridge ① -

1) Concrete, (Grade=30)

slab	$V = 0.30 \times 3.60 (5.12 + 6.08) + 1/2 \times 0.19 \times 0.38 \times 3.60$ $+ 0.30 \times 0.24 \times 3.0 + 0.30 \times 3.60 (2.00 + 1.68)$	= 16.416m ³
stair	$V = 1/2 \times 0.32 \times 0.16 (16 + 19) \times 3.00$	= 2.688m ³
parapet	$V = (0.10 + 0.26) (0.30 + 0.32 \times 3) \times 0.30$ $+ 0.10 (1.68 + 1.36) \times 0.30 \times 2 + 0.26 (15 + 18) \times 0.32 \times 0.30$	= 1.965m ³

total	=	= 21.069m ³
UF ₂ : A	$A = 3.00 (0.28 + 5.12 + 2.00 + 6.08 + 1.68)$ $+ 2 \times 0.30 (0.30 + 5.12 + 2.00 + 6.08 + 1.36)$	= 54.396m ²

2) form work .

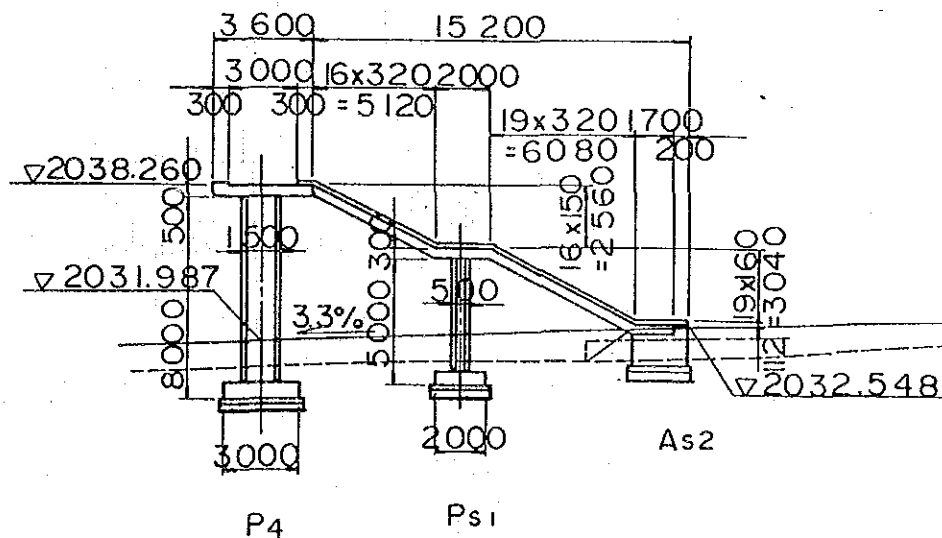
Vertical	$A = 0.30 (2.00 + 1.68) \times 2 + 0.10 (1.68 + 1.36) \times 2$	= 2.816m ²
horizontal	$A = 3.60 (0.38 + 2.00) - 0.50 \times 0.50$	= 8.318m ²
Slopping	$A = (0.10 + 0.26) (0.30 + 0.32 \times 3) + 0.26 \times 0.32 (15 + 18) \times 2 \times 2$ $+ 0.30 (5.12 + 6.08) \times 2 + 1/2 \times 0.19 \times 0.38 \times 2$ $+ 3.60 (5.12 - 0.40 + 6.08) \times 1.1180$	= 61.696m ²

3) Support	$V = 3.60 \{ (5.20 + 2.64) / 2 \times 5.12 + 2.64 \times 2.00 + 1/2 \times 2.64 \times 6.08 \}$	= 120.153m ³
4) Scaffold	$V = (3.60 + 1.00) (5.12 + 2.00 + 6.08)$	= 60.720m ³
5) Handrail		
vertical	$= (0.32 + 2.00 + 1.68) \times 2$	= 8.000m
slopping	$= 2 (5.12 + 6.08)$	= 22.400m

total	=	= 30.400m
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6) joint filler (t=20mm)

A	$A = (0.50 + 0.30) \times 3.60 + 0.30 \times 0.10 \times 2 \times 2 + 0.28 \times 0.24 \times 2$	= 3.134m ²
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NO② PEDESTRIAN BRIDGE

Super structure —Stair bridge ②—

1) Concrete (Grade=30)

slab	$V = 0.30 \times 3.60 \times 4.80 + 1/2 \times 0.19 \times 0.38 \times 3.60$ $+ 0.28 \times 0.24 \times 3.00 + 0.30 \times 3.60 \times 2.48$	=	8.193m ³
stair	$V = 1/2 \times 0.32 \times 0.16 \times 15 \times 3.00$	=	1.152m ³
parapet	$V = (0.10 + 0.26)(0.30 + 0.32) \times 0.30$ $+ 0.10 \times 2.16 \times 0.30 \times 2 + 2 \times 14 \times 0.26 \times 0.32 \times 0.30$	=	0.895m ³

total	=	=	10.240m ³
UF ₂ : A	$= 3.00(0.28 + 4.80 + 2.48) + 2 \times 0.30 \times (0.30 + 4.80 + 2.16)$	=	27.036m ²

2) form work .

Vertical	$A = 0.30 \times 2.48 \times 2 + 0.10 \times 2.16 \times 2$	=	1.920m ²
horizontal	$A = 3.60(0.38 + 0.80)$	=	4.248m ²
Slopping	$A = (0.10 + 0.26)(0.30 + 0.32) + 0.26 \times 0.32 \times 14 \times 2 \times 2$ $+ 0.30 \times 4.80 \times 2 + 1/2 \times 0.19 \times 0.38 \times 2 + 3.60(4.80 - 0.40) \times 1.1180$	=	25.543m ²

3) Support	$V = 3.60 \times 4.80 \times 4.80 \times 1/2$	=	41.472m ³
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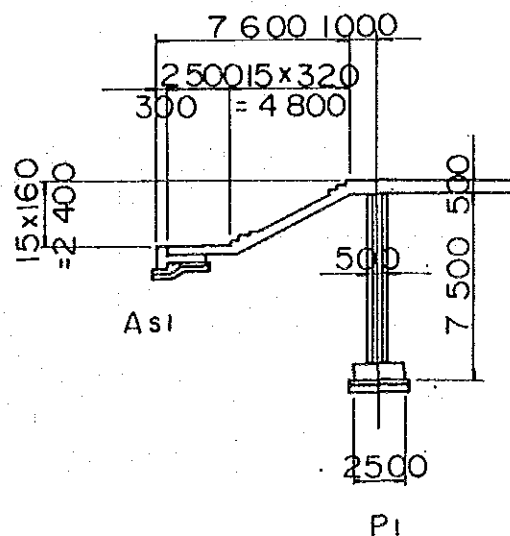
4) Scaffold	$V = (3.60 + 1.00)4.80$	=	22.080m ³
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5) Handrail			
vertical	$= (0.32 + 2.48) \times 2$	=	5.600m
slopping	$= 4.80 \times 2$	=	9.600m

total	=	=	15.200m
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6) joint filler (t=20mm)

A	$= (0.50 + 0.30) \times 3.60 + 0.30 \times 0.10 \times 2 \times 2 + 0.28 \times 0.24 \times 2$	=	3.134m ³
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NO ② PEDESTRIAN BRIDGE

Sub-structure - Main bridge -

Pier : $P_1 = P_2 = P_3 (P_4)$

1) concrete : pillar	$V = \pi \times 0.741 \times 7.00 (7.50)$	$= 5.187 (5.557)$	m^3
footing	$V = 2.50 \times 3.00 \times 0.50$	$= 3.750$	m^3
total		$= 8.937 (9.307)$	m^3
UF ₂ : $A = \pi \times 0.741 + 2.50 \times 3.00 - \pi \times 0.741$		$= 7.500$	m^2
2) formwork : pillar	$A = \pi \times 3.828 \times 7.00 (7.50)$	$= 26.796 (28.710)$	m^2
footing	$A = 2(2.50 + 3.00) \times 0.50$	$= 5.000$	m^2
3) base concrete	$V = 2.50 \times 3.20 \times 0.10$	$= 0.864$	m^3
4) " (curusherran)	$V = 2.50 \times 3.20 \times 0.20$	$= 1.728$	m^3
5) Scaffold	$V = 1.20 \{ (1.50 + 2.00) + (0.50 + 2.00) \} \times 7.00 \times 2$	$= 100.800 (108.000)$	m^3

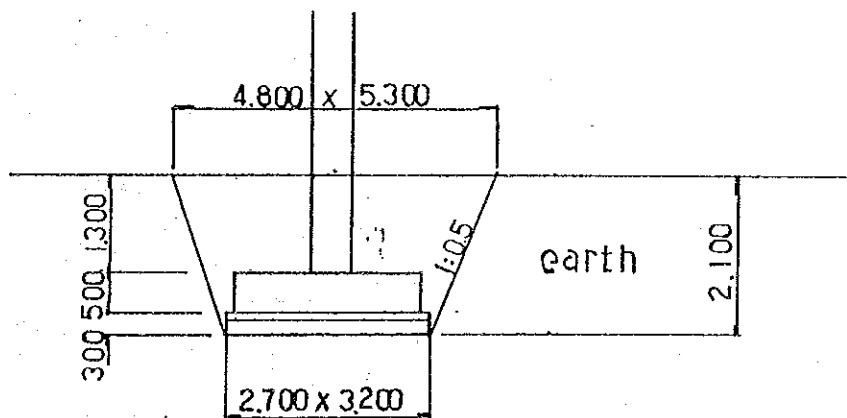
* where : quantity of unit-length for Piller

P_{1,2,3} (P₄) $H = 7.500 (8.000)$

$A = 0.50 \times 1.50 - (4 \times 0.10^2 - \pi \times 0.10^2)$	
$= 0.750 - (0.0085)$	$= \pi \times 0.741 m^2$
$Q R = \pi \times 0.10 \times 2$	$= 0.628 m$
$Q S = 2(0.50 + 1.50) - 8 \times 0.10$	$= 3.200 m$
$Q =$	$= \pi \times 3.828 m$

6) excavation

earth	$V = 2.10/6 \{ 2.70 \times 3.20 + 4.80 \times 5.30 + (2.70 + 4.80)(3.20 + 5.30) \}$	$= 29.778 m^3$
remain	$V = 3.750 + 0.704 + 1.408 + \pi \times 0.741 \times 1.300$	$= 6.075 m^3$
backfill	$V = 29.778 - 6.075$	$= 23.703 m^3$

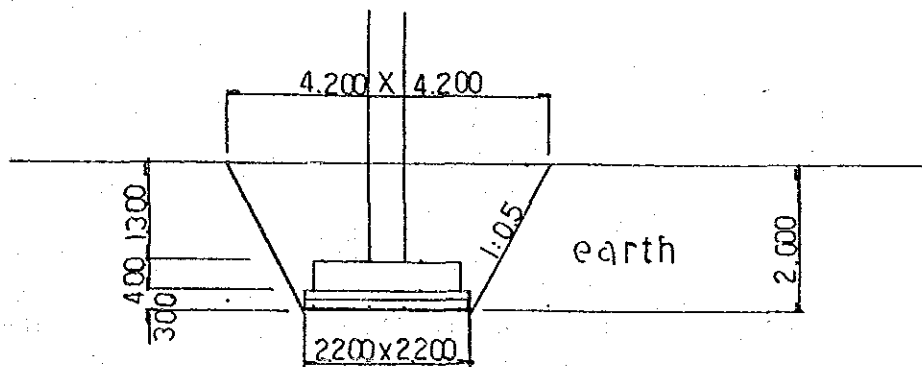


NO ② PEDESTRIAN BRIDGE

Sub-structure : stair - bridge

Pier : Ps₁

1) concrete : pillar	$V = 0.241 \times 4.60$	=	1.108m ³
footing	$V = 2.00 \times 2.00 \times 0.40$	=	1.600m ³
<hr/>			
total	=	=	2.708m ³
UF ₂ : A =	$0.241 + 2.00 \times 2.00 - 0.241$	=	4.000m ²
2) form work pillar	$A = 1.828 \times 4.60$	=	8.408m ²
footing	$A = 2(2.00 + 2.00) \times 0.40$	=	3.200m ²
3) base concrete	$V = 2.20 \times 2.20 \times 0.10$	=	0.484m ³
4) " (curusherran)	$V = 2.20 \times 2.20 \times 0.20$	=	0.908m ³
5) Scaffold	$V = 1.20 \times (0.50 + 2.00) \times 4.60 \times 4$	=	55.200m ³



6) excavation			
earth	$V = 2.00/6 \{2.20^2 \times 4.20^2 + (2.20 + 4.20^2)\}$	=	21.146m ³
remain	$V = 1.600 + 0.484 + 0.968 + 0.241 \times 1.30$	=	3.365m ³
backfill	$V = 21.146 - 3.365$	=	17.781m ³

NO ② PEDESTRIAN BRIDGE

stair - bridge ①

Ast: Abutment -- Edge pedestal

1) concrete (Gread=25)

$$V = 3.60 \times 1.50 \times 2.00 + 0.30 + 1.10 \times 0.30 \times 2.00$$

$$- 3.60 \times 0.30 \times 1.70 - \pi / 4 \times 0.750^2 \times 2.00$$

$$= 8.098 \text{ m}^3$$

$$UF_2 : A = 3.60(1.70 + 0.30)$$

$$= 7.200 \text{ m}^2$$

2) formwork

$$A = 1.20(1.70 \times 2 + 3.60) + 0.10 \times 0.30 \times 4 \times 2$$

$$+ 2.0(0.30 + 3.60) \times 0.30 - \pi / 4 \times 0.75^2 \times 2$$

$$= 10.096 \text{ m}^2$$

3) base concrete

$$V = 3.80 \times 2.20 \times 0.10$$

$$= 0.836 \text{ m}^3$$

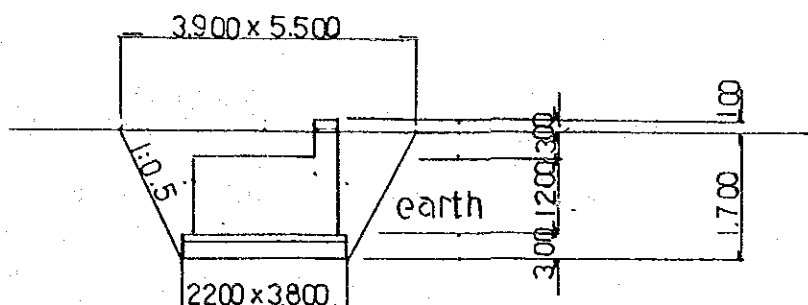
$$A = 0.10(3.80 + 2.20) \times 2$$

$$= 1.200 \text{ m}^2$$

4) base(crusherran)

$$V = 3.80 \times 2.20 \times 0.20$$

$$= 1.672 \text{ m}^3$$



5) excavation

earth.

$$V = 1.70/6 \{2.20 \times 3.80 + 3.90 \times 5.50 + (2.20 + 3.90)(3.80 + 5.50)\}$$

$$= 24.519 \text{ m}^3$$

remain

$$V = 0.836 + 1.672 + 3.60(1.20 \times 2.00 + 0.30 \times 0.20)$$

$$= 11.364 \text{ m}^3$$

backfill

$$V = 24.519 - 11.364$$

$$= 13.155 \text{ m}^3$$

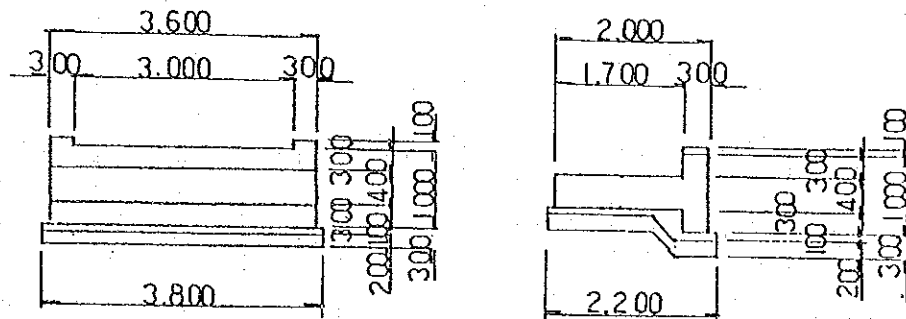
Pipe -- pu

$$\phi 600 \times 2.000 \text{ m}$$

NO ② PEDESTRIAN BRIDGE

stair bridge ②

Asst: Abutment - Edge pedestal



1) concrete

$$UF_2 : A = 3.60(1.70+0.30) = 7.200m^2$$

$$V = 3.60 \times 0.40 \times 1.70 + (3.60 \times 1.00 + 0.30 \times 0.10 \times 2) \times 0.30 = 3.546m^3$$

2) formwork

$$A = 0.40(3.60+1.70 \times 2) + 0.10 \times 0.30 \times 4 \times 2 = 9.400m^2$$

$$+ 2 \times 1.00(3.60+0.30) - 0.40 \times 3.60$$

3) base(crusherran)

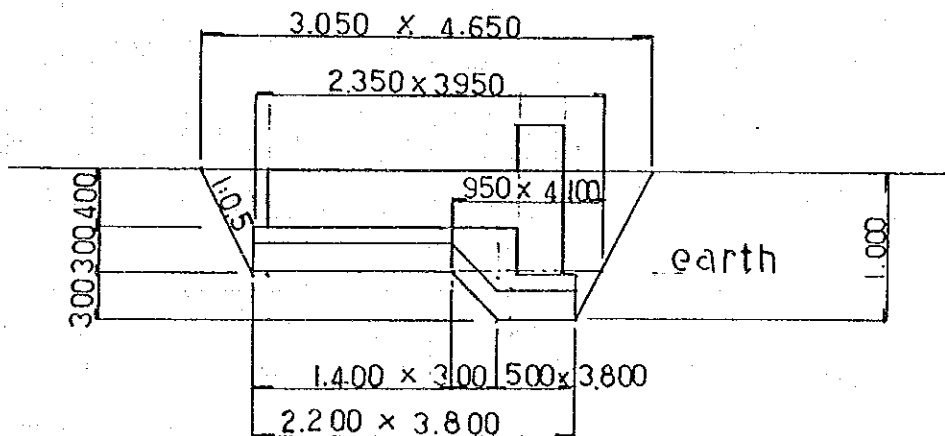
$$V = 3.80 \times 2.20 \times 0.20 = 1.672m^3$$

4) base concrete

$$concrete V = \{2.20 \times 0.10 + 1/2(0.10+0.40) \times 0.30\} \times 3.60 = 1.062m^3$$

$$= \{0.295\} \times 3.60$$

$$formwork A = (\times 0.295 + 3.80 \times 0.10) \times 2 = 1.350m^2$$



5) excavation

earth.

$$V = 0.30/6 \{0.500 \times 3.80 + 0. \times 4.10 + (0.50+0. \times 3.80+4.10)\}$$

$$+ 0.70/6 \{2.35 \times 3.95 + 3.05 \times 4.65 + (2.35+3.05)(3.95+4.65)\} = 8.928m^3$$

remain

$$V = 1.062 + 1.672 + 3.60(1.70 \times 0.40 + 0.30 \times 0.30) = 5.506m^3$$

backfill

$$V = 8.928 - 5.506 = 3.422m^3$$

LIST OF REINFORCED BAR --- SUPERSTRUCTURE

MARK	DIAMETER	LENGTH	NUMBER	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
No2-PEDESTRIAN							
S	1	Y32	8000	58	6.313	50.50	2929
	2	Y25	5250	15	3.854	20.23	303
	3-1	"	10000	15	"	38.54	578
	3-2	"	6400	15	"	24.67	370
	4-1	"	8000	15	"	30.83	462
	4-2	"	5550	15	"	21.39	321
	5-1	Y32	10000	29	6.313	63.13	1031
	5-2	"	6950	29	"	43.88	1273
	6-1	"	10000	29	"	63.13	1831
	6-2	"	3800	29	"	23.99	696
	7	Y25	8000	30	3.854	30.83	925
	8	Y16	5250	29	1.579	8.29	240
	9	Y20	3450	32	2.466	8.51	272
	10	Y16	3450	128	1.579	5.45	687
	11	Y20	3540	12	2.466	8.73	105
	12	Y16	3540	4	1.579	5.59	22
	13	Y16	3450	249	"	5.45	1357
	14	"	1070	42	"	1.69	71
	15	"	1240	42	"	1.96	82
	16	Y12	1050	330	0.888	0.93	307
	17	Y16	1000	15	1.579	1.58	24
So	1	Y12	1310	390	0.888	1.16	452
							14338 kg
M	1	Y12	900	238	0.888	0.80	190
	2	"	3480	35	"	3.09	108
							2143 kg

LIST OF REINFORCED BAR --- SUPERSTRUCTURE

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
No2-PEDESTRIAN							
K	1	Y20	4240	25	2.466	10.46	282
	2	Y12	5270	13	0.888	4.68	61
	3	"	7740	13	"	6.87	89
	4	Y16	4960	25	1.579	7.83	198
	5	Y12	4240	25	0.888	3.77	94
	6	Y16	7740	25	1.579	12.22	306
	7	Y25	3480	9	3.854	13.41	121
	8	Y16	3480	9	1.579	5.49	49
	9	Y12	3480	122	0.888	3.09	377
	10	Y16	940	21	1.579	1.48	31
	11	"	850	21	"	1.34	28
	12	Y12	1080	21	0.888	0.96	20
	13	"	860	102	"	0.76	78
	14	"	1060	21	"	0.94	20
Ko	1	"	940	136	"	0.83	113
K	21	Y12	2440	23	0.888	2.17	50
	22	"	6020	23	"	5.35	123
	23	Y20	2440	25	2.466	6.02	151
	24	"	5970	25	"	14.72	368
	25	Y12	3480	32	0.888	3.09	99
	26	"	3480	49	"	3.09	151
	27	Y16	940	21	1.579	1.48	31
	28	"	850	21	"	1.34	28
	29	Y12	1080	21	0.888	0.96	20
	30	"	860	50	"	0.76	38
	31	"	1060	21	"	0.94	20
Ko	2	Y12	940	60	0.888	0.83	50
M	21	Y12	900	98	0.888	0.80	78
	22	"	3480	15	"	3.09	46
							1253 kg
				Y32	7760	kg	
				Y25	3080		
				Y20	1158		
				Y16	3152		
				Y12	2584		
							17734 kg

LIST OF REINFORCED BAR---NO ② PEDESTRIAN-PIER

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
P②③ --- H=7.500m							
C	1	Y25	9500	26	3.854	36.61	952
	2	Y16	2360	94	1.579	3.73	351
	3	Y12	1640	12	0.888	1.46	18
						1321 kg	
F	1	Y20	3600	18	2.466	8.88	160
	2	"	3070	21	"	7.57	159
	3	Y12	3600	18	0.888	3.20	58
	4	"	3070	21	"	2.73	57
	5	"	1280	28	"	1.14	32
	6	"	1400	4	"	1.24	5
						471 kg	
Y25				952 kg			
Y20				319 kg			
Y16				351 kg			
Y12				170 kg			
				1792 kg			

LIST OF REINFORCED BAR---NO ② PEDESTRIAN-PIER

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
P④ --- H=8.000m							
C	1	Y25	10000	26	3.854	38.54	1002
	2	Y16	2360	100	1.579	3.73	373
	3	Y12	1640	12	0.888	1.46	18
						1393 kg	
F	1	Y20	3600	18	2.466	8.88	160
	2	"	3070	21	"	7.57	159
	3	Y12	3600	18	0.888	3.20	58
	4	"	3070	21	"	2.73	57
	5	"	1280	28	"	1.14	32
	6	"	1400	4	"	1.24	5
						471 kg	
Y25				1002 kg			
Y20				319 kg			
Y16				373 kg			
Y12				170 kg			
				1864 kg			

(STAIRCASE)

LIST OF REINFORCED BAR---NO ② PEDESTRIAN-PIER

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
(P1) --- H = 5.000 ^m							
C	1	Y25	5900	12	3.854	22.74	273
	2	Y12	2000	19	0.888	1.78	34
						307 kg	
F	1	Y12	2380	60	0.888	2.11	127
	2	"	1090	12	"	0.97	12
						139 kg	
Y25				273 kg			
Y12				173 kg			
				446 kg			

(STAIRCASE)

LIST OF REINFORCED BAR---NO ② PEDESTRIAN-A1

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
(A1)							
F	1	Y12	4040	18	0.888	3.59	65
	2	"	2440	30	"	2.17	65
	3	"	1940	11	"	1.72	19
	4	"	2140	4	"	1.90	8
	5	"	540	15	"	0.48	7
	6	"	1880	4	"	1.67	7
	7	"	1090	15	"	0.97	15
						186 kg	
Y12				186 kg			
				186 kg			

(STAIRCASE)

LIST OF REINFORCED BAR --- NO. 2 PEDESTRIAN - A2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
(A2)							
F 1	Y12	2240	12	0.888	1.99	24	
2	"	4040	12	"	3.59	43	
3	"	2150	3	"	1.91	6	
4	"	2110	3	"	1.87	6	
5	"	3840	9	"	3.41	31	
6	"	5640	9	"	5.01	45	
7	"	540	4	"	0.48	2	
8	"	980	3	"	0.87	3	
9	"	1680	12	"	1.49	18	
10	"	180	4	"	0.16	1	
11	"	3480	2	"	3.09	6	
12	"	760	6	"	0.67	4	
13	"	2310	6	"	2.05	12	
14	"	2240	6	"	1.99	12	
15	"	1000	8	"	0.89	7	
16	"	3150	2	"	2.80	6	
						226 kg	
Y12				226 kg			
				226 kg			

NO ① VEHICLE BRIDGE

Super structure

1) Concrete (Grade=30)

$$\begin{aligned} \text{Girder slab and parapet : } V &= 3.225 \times 30.05 &= 96.911 \text{ m}^3 \\ \text{cross girder} &= 1.60 \times 0.65 (0.60 \times 3 + 0.35 \times 2) \times 2 &= 5.200 \text{ m}^3 \end{aligned}$$

$$\begin{aligned} \text{total} &= &= 102.111 \text{ m}^3 \\ \text{OF UF}_2 : A &= 30.05 \times (6.00 + 0.60 \times 2) &= 216.360 \text{ m}^2 \end{aligned}$$

2) formwork

$$\begin{aligned} \text{horizontal} &A = 30.05 (\sqrt{0.15^2 + 1.10^2} \times 2 + 0.60 \times 3 + 1.60 \times 2) &= 216.961 \text{ m}^2 \\ \text{Vertical} &A = 30.05 (0.20 + 0.65 + 0.80 \times 2 + 0.15 \times 2) \times 2 \\ &\quad + 0.65 \times 1.60 \times 2 \times 8 - (0.65 \times 0.60 \times 3 + 0.65 \times 0.35 \times 2) \times 2 &= 178.665 \text{ m}^2 \end{aligned}$$

3) Support

$$\begin{aligned} V &= \{ (0.65 + 0.80) \times 1.10 + 0.80 \times 1.60 \times 2 \} \times 30.05 \\ &\quad + 6.05 \times 7.20 \times (30.10 - 0.80 \times 2 - 0.50) &= 1344.538 \text{ m}^3 \end{aligned}$$

4) Scaffold

$$V = (7.20 + 1.00) \times 30.05 = 246.410 \text{ m}^3$$

5) Guard rail

$$= 2 (30.05 + 10.20 + 11.20) = 102.900 \text{ m}$$

6) Joint filler

$$\begin{aligned} (t=25\text{mm}) \cdots \text{expansion joint : } &= 6.00 \times 2 &= 12.000 \text{ m} \\ A &= \{ (0.20 + 0.35) \times 1.10 + 0.80 \times 5.00 \} \times 2 &= 9.210 \text{ m}^2 \end{aligned}$$

7) Asphalt

$$\begin{aligned} V &= (0.050 + 0.095) \times 3.00 \times 30.05 &= 13.071 \text{ m}^3 \\ &&= (180.300 \text{ m}^2) \end{aligned}$$

* Section of Superstructure.

$$A = 2 \times 0.15 \times 0.60 + (0.20 + 0.35) \times 1.10 + (1.00 \times 5.00 - 0.80 \times 1.60 \times 2) = 3.225 \text{ m}^2$$

NO ① VEHICLE BRIDGE

Sub structure P₁ : Pier

1) Concrete.

beam	$V = \Sigma 2.991 \times 0.60$	=	1.794m ³
Pillar	$V = \Sigma 2.241 \times 6.10$	=	13.670m ³
footing	$V = 4.50 \times 6.00 \times 0.80$	=	21.600m ³

total = 37.064m³

OF. UF₂ : $A = (4.50 \times 6.00 - \Sigma 2.241) + \Sigma 2.991$ = 27.750m²

2) form work.

horizontal	$A = \Sigma 2.991 \times 2.241$	=	0.750m ²
Vertical	$A = \Sigma 12.828 \times 0.60 + 9.828 \times 6.10$	=	67.647m ²
" (footing)	$A = (4.50 + 6.00) \times 0.80 \times 2$	=	9.600m ²

3) base concrete

$V = 4.70 \times 6.20 \times 0.10$ = 2.914m³

" formwork

$A = (4.70 + 6.20) \times 0.10 \times 2$ = 2.180m²

4) Support

$V = (2.991 - 2.241) \times (6.10 - 0.10)$ = 4.500m³

5) Scaffold

$V = 1.20 \{ (0.50 + 2.00) + (6.00 + 2.00) \} \times 6.70 \times 2$ = 168.840m³

* Where, quantity of unit-length

Piller	{	$A = 4.50 \times 0.50 - (0.10^2 \times 4 - \pi \times 0.10^2)$	= Σ 2.241m ²
		$\varnothing R = \pi \times 0.10 \times 2$	= 0.628m ²
		$\varnothing S = (4.50 + 0.50) \times 2 - 8 \times 0.10$	= 9.200m ²

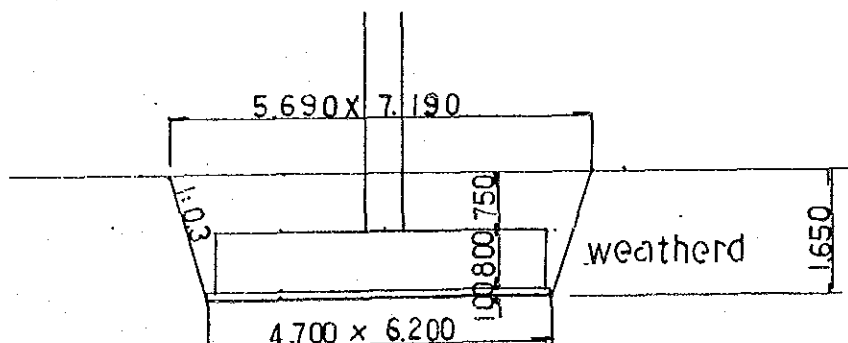
$\varnothing =$

= ~~Σ~~ 9.828m²

Beam	{	$A = 6.00 \times 0.50 - (0.10^2 \times 4 - \pi \times 0.10^2)$	= Σ 2.991m ²
		$\varnothing R = \pi \times 0.10 \times 2$	= 0.628m
		$\varnothing S = (6.00 + 0.50) \times 2 - 8 \times 0.10$	= 12.200m

$\varnothing =$

= ~~Σ~~ 12.828m



6) excavation

Hard	$V = 1.65/6 \{ 4.70 \times 6.20 + 5.69 \times 7.19 + (4.70 + 5.69)(6.20 + 7.19) \}$	=	57.522m ³
remain	$V = 2.914 + 21.600 + \Sigma 2.241 \times 0.750$	=	26.194m ³
back fill	$V = 57.522 - 26.194$	=	31.328m ³

NO① VEHICLE BRIDGE

Sub structure $A_1 = A_2$

1) Concrete

$$V = 0.15 \times 0.60 \times 0.30 \times 2 + 7.20 (1.10 \times 0.30 + 1.10 \times 7.60 + 5.00 \times 0.80) = 91.422 \text{ m}^3$$

$$\text{OF UF}_2 : A = 7.20 \{ (5.00 - 1.10) + 0.30 + 0.80 \} = 36.000 \text{ m}^2$$

2) formwork.

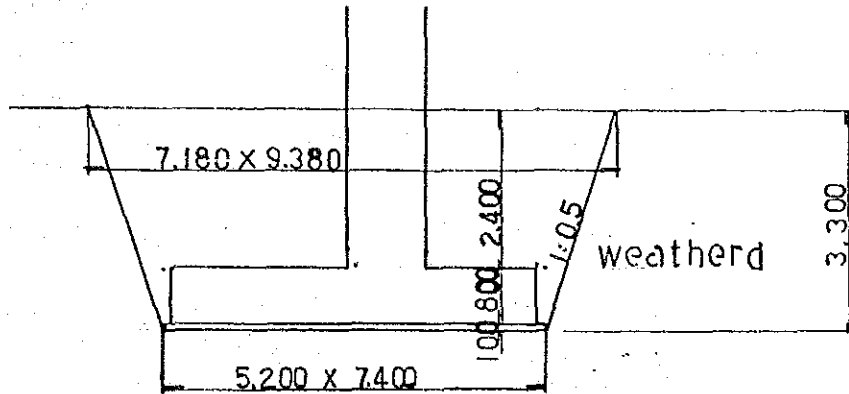
$$\begin{aligned} \text{Vertical } A &= (0.30 + 0.60) \times 0.15 \times 2 \times 2 + (0.30 + 7.20) \times 1.10 \times 2 \\ &\quad + (1.10 + 7.20) \times 7.60 \times 2 = 143.200 \text{ m}^2 \end{aligned}$$

$$\text{" (footing) } A = (5.00 + 7.20) \times 0.80 \times 2 = 19.520 \text{ m}^2$$

$$3) \text{ Scaffold } V = 1.20 \{ (1.10 + 2.00) + (7.20 + 2.00) \} \times 8.70 \times 2 = 256.824 \text{ m}^3$$

$$4) \text{ base concrete } V = 5.20 \times 7.40 \times 0.10 = 3.848 \text{ m}^3$$

$$A = (5.20 + 7.40) \times 0.10 \times 2 = 2.520 \text{ m}^2$$



5) excavation

$$\text{Hard } V = 3.30/6 \{ 5.20 \times 7.40 + 7.18 \times 9.38 + (5.20 + 7.18) (7.40 + 9.38) \} = 172.460 \text{ m}^3$$

$$\text{remain } V = 3.848 + 7.20 \times (5.0 \times 0.80 + 1.10 \times 2.40) = 51.656 \text{ m}^3$$

$$\text{back fill } V = 172.460 - 51.656 = 120.804 \text{ m}^3$$

WING : A₁

concrete

$$V = \{1/2(8.851+8.858) \times 2.40 + 1/2(8.858-2.896+0.628) \times 7.50\} \times 0.70 \times 2$$

$$= \{45.963\} \times 0.70 \times 2$$

$$= 64.348\text{m}^3$$

$$UF_2 : A = 9.90 \times 0.70 \times 2$$

$$= 13.860\text{m}^2$$

form work.

Vertical

$$A = 2 \times 0.70(0.628+2.896)$$

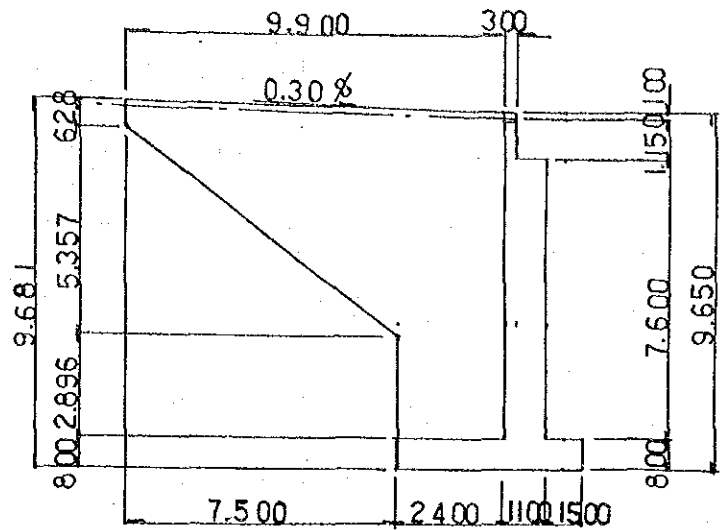
$$+ ※45.963 \times 2 \times 2$$

$$= 188.785\text{m}^2$$

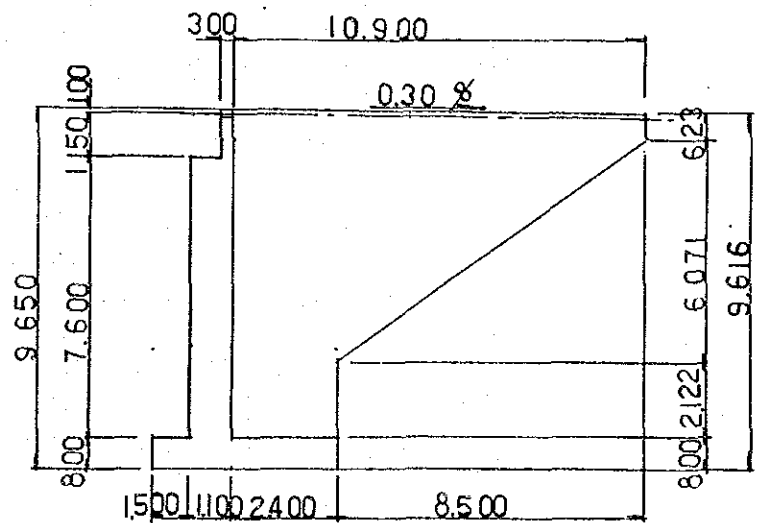
Sloping

$$A = \sqrt{5.357^2 + 7.50^2} \times 0.70 \times 2$$

$$= 12.903\text{m}^2$$



WING : A₂



concrete

$$V = \{1/2(8.849+8.841) \times 2.40 + 1/2(8.841-2.122+0.623) \times 8.50\} \times 0.70 \times 2$$

$$= \{52.431\} \times 0.70 \times 2$$

$$= 73.403\text{m}^3$$

$$UF_2 : A = 10.90 \times 0.70 \times 2$$

$$= 15.260\text{m}^2$$

formwork.

$$\text{Vertical } A = 2 \times 0.70(0.623+2.122) + ※52.431 \times 2 \times 2$$

$$= 213.567\text{m}^2$$

$$\text{Sloping } A = \sqrt{8.50^2 + 6.071^2} \times 0.70 \times 2$$

$$= 14.623\text{m}^2$$

LIST OF REINFORCED BAR ---NOØ VEHICLE-SUPERSTRUCTURE

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S	1 Y16	7120	140	1.579	11.24	1574	
	2 Y12	4850	140	0.888	4.31	603	
	3 Y16	1720	280	1.579	2.72	762	
	4-1 Y12	8000	132	0.888	7.10	937	
	4-2 "	3790	88	"	3.37	297	
	5 Y16	1660	16	1.579	2.62	42	
4215 kg							
K	1 Y12	1120	140	0.888	0.99	139	
	2-1 "	8000	12	"	7.10	85	
	2-2 "	4070	8	"	3.61	29	
253 kg							
B	1-1 Y32	10000	12	6.313	63.13	758	
	1-2 "	6000	24	"	37.88	909	
	1-3 "	7030	24	"	44.38	1065	
	2 Y32	8000	12	6.313	50.50	606	
	3-1 "	8000	36	"	50.50	1818	
	3-2 "	5670	24	"	35.79	859	
	4 Y25	10000	24	3.854	38.54	925	
	5-1 Y12	7000	36	0.888	6.22	224	
	5-2 "	5290	24	"	4.70	113	
	BO 1-1 Y16	2730	162	1.579	4.31	698	
	1-2 "	960	162	"	1.52	246	
	2-1 Y12	2600	126	0.888	2.31	291	
BO	2-2 "	840	126	"	0.75	95	
	3 "	690	135	"	0.61	82	
8689 kg							
C	1 Y25	5600	12	3.854	21.58	259	
	2 "	6160	12	"	23.74	285	
	3 Y12	4850	12	0.888	4.31	52	
	4 Y25	5600	6	3.854	21.58	129	
	5 "	6160	6	"	23.74	142	
	6 Y12	4850	8	0.888	4.31	34	
	CO 1-1 Y12	2220	36	0.888	1.97	71	
	1-2 "	840	36	"	0.75	27	
	2-1 "	1840	24	"	1.63	39	
	2-2 "	600	24	"	0.53	13	
1051 kg							
Y32 6015 kg							
Y25 1740							
Y16 3322							
Y12 3131							
14208 kg							

LIST OF REINFORCED BAR---NO①VEHICLE--A1

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
P	1	Y12	2000	88	0.888	1.78	157
	2	"	660	43	"	0.59	25
	3	"	7060	8	"	6.27	50
	4	"	400	10	"	0.36	4
						236 kg	
A	1	Y32	5000	22	6.313	31.57	695
	2	"	6000	21	"	37.88	795
	3	Y25	4830	22	3.854	18.61	409
	4	"	3830	21	"	14.76	310
	5	"	8650	25	"	33.34	834
	6	Y16	8520	4	1.579	13.45	54
	7	"	1450	45	"	2.29	103
	8	"	7060	5	"	11.15	56
	9	Y25	7060	25	3.854	27.21	680
	10	Y16	7060	25	1.579	11.15	279
	11	Y12	1210	60	0.888	1.07	64
						4279 kg	
E	1	Y12	1140	19	0.888	1.01	19
	2	"	7060	2	"	6.27	13
						32 kg	
F	1	Y25	3750	45	3.854	14.45	650
	2	Y20	2680	25	2.466	6.61	165
	3	Y25	3050	49	3.854	11.75	576
	4	Y20	4040	25	2.466	9.96	249
	5	Y16	7060	33	1.579	11.15	368
	6	"	7580	4	"	11.97	48
	7	"	5390	4	"	8.51	34
	8	"	1150	8	"	1.82	15
	9	Y12	1950	48	0.888	1.73	83
						2188 kg	
S	1	Y16	2880	40	1.579	4.55	182
	2	Y12	5880	11	0.888	5.22	57
						239 kg	
Y32				1490 kg			
Y25				3459 kg			
Y20				414 kg			
Y16				1139 kg			
Y12				472 kg			
				6974 kg			

LIST OF REINFORCED BAR---NO① VEHICLE --AI--WING

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y16	10630	2	1.579	16.78	34
	2	Y25	7580	20	3.854	29.21	584
	3	"	3750	9	"	14.45	130
	4	"	3750	25	"	"	361
	5	Y20	7510	20	2.466	18.52	370
	6	"	3670	9	"	9.05	81
	7	"	9830	8	"	24.24	194
	8	"	5000	4	"	12.33	49
	9	"	3500	24	"	8.63	207
	10	Y16	9770	8	1.579	15.43	123
	11	"	3440	24	"	5.43	130
	12	"	10000	1	"	15.79	16
	13	"	10000	1	"	"	16
	14	"	950	34	"	1.50	51
	15	"	1050	32	"	1.66	53
	16	"	1050	30	"	"	50
	17	Y25	2700	4	3.854	10.41	42
	18	"	3690	24	"	14.22	341
	19	"	2500	3	"	9.64	29
	20	Y12	800	48	0.888	0.71	34
							2895 kg
				Y25	1487 kg		
				Y20	901 kg		
				Y16	473 kg		
				Y12	34 kg		
							2895 kg

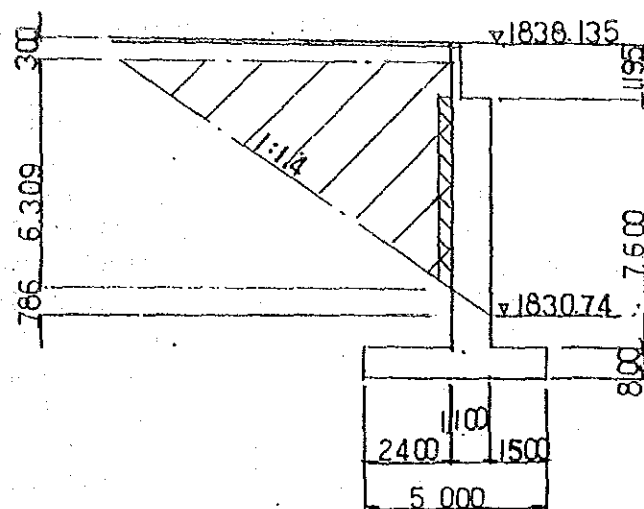
LIST OF REINFORCED BAR---NO① VEHICLE-A2---WING

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y16	11630	2	1.579	18.36	37
	2	Y32	7190	29	6.313	45.39	1316
	3	Y25	3750	25	3.854	14.45	361
	4	"	7130	29	"	27.48	797
	5	Y20	3850	27	2.466	9.49	256
	6	"	9800	8	"	24.17	193
	7	"	4500	4	"	11.10	44
	8	Y16	3790	27	1.579	5.98	161
	9	"	9740	8	"	15.38	123
	10	"	12000	1	"	18.95	19
	11	"	12000	1	"	"	19
	12	Y32	2760	4	6.313	17.42	70
	13	"	3870	24	"	24.43	586
	14	"	2460	3	"	15.53	47
	15	Y16	1040	35	1.579	1.64	57
	16	"	950	37	"	1.50	56
	17	"	1040	29	"	1.64	48
	18	Y12	800	59	0.888	0.71	42
						4232 kg	
Y32				2019 kg			
Y25				1158 kg			
Y20				493 kg			
Y16				520 kg			
Y12				42 kg			
						4232 kg	

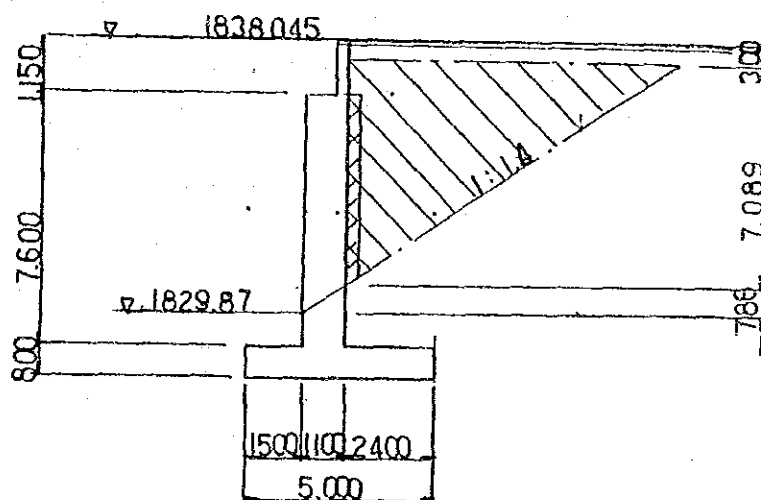
LIST OF REINFORCED BAR --- NO ① VEHICLE - PIER

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
B	1	Y12	6780	6	0.888	6.02	36
	2	"	2000	4	"	1.78	7
	3	"	6600	4	"	5.86	23
	4	"	1530	27	"	1.36	37
	5	"	580	27	"	0.52	14
						117 kg	
C	1	Y32	7660	60	6.313	48.36	2902
	2	Y16	5360	52	1.579	8.46	440
	3	"	1340	126	"	2.12	267
						3609 kg	
F	1	Y25	5700	39	3.854	21.97	857
	2	Y20	4940	21	2.460	12.18	256
	3	"	7200	15	"	17.76	266
	4	Y12	6200	15	0.888	5.51	83
	5	Y16	6360	4	1.579	10.04	40
	6	"	4860	6	"	7.67	46
	7	"	1980	50	"	3.13	156
						1704 kg	
Y32				2902 kg			
Y25				857 kg			
Y20				522 kg			
Y16				949 kg			
Y12				200 kg			
				5430 kg			

A1 --- BACK FILL



A2 --- BACK-FILL



BACK-FILL

$$A1: V = \frac{1}{2} \times 6.309^2 \times 1.5 \times 5.80 = 173.2 \text{ m}^3$$

$$A_2 \cdot V = \frac{1}{2} \times 7.089^2 \times 1.5 \times 5.80 = 218.6''$$

$$= 391.8$$

NO ② VEHICLE BRIDGE

Super structure

1) Concrete (Grade=30)

$$\begin{aligned} \text{Girder slab and parapet : } V &= 4.985 \times 28.050 &= 139.829 \text{ m}^3 \\ \text{cross girder} &= 1.50 \times 0.65 (0.60 \times 3 + 0.35 \times 2) \times 4 &= 9.750 \text{ m}^3 \end{aligned}$$

$$\begin{aligned} \text{total} &= &= 149.579 \text{ m}^3 \\ \text{UF}_2 : A &= 28.05 \times (10.00 + 0.60 \times 2) &= 314.160 \text{ m}^2 \end{aligned}$$

2) formwork

$$\text{horizontal } A = 28.05 (\sqrt{0.15^2 + 1.10^2} \times 2 + 0.60 \times 5 + 1.50 \times 4) = 314.721 \text{ m}^2$$

$$\begin{aligned} \text{Vertical } A &= 28.05 \times (0.20 + 0.65 + 0.80 \times 4 + 0.15 \times 2) \times 2 \\ &\quad + 0.65 \times 1.50 \times 4 \times 8 - (0.65 \times 0.60 \times 3 + 0.65 \times 0.35 \times 2) \times 2 &= 271.985 \text{ m}^2 \end{aligned}$$

3) Support

$$\begin{aligned} V &= \{ (0.65 + 0.80) \times 1.10 + 0.80 \times 1.50 \times 4 \} \times 28.05 \\ &\quad + 6.05 \times 11.20 \times (28.10 - 0.80 \times 2 - 0.50) &= 1941.139 \text{ m}^3 \end{aligned}$$

4) Scaffold

$$V = (11.20 + 1.00) \times 28.05 = 342.210 \text{ m}^3$$

5) Guard rail

$$Q = 2 \times 28.05 = 56.100 \text{ m}^2$$

6) Joint filler (t=25mm) ... expansion joint : Q = 10.000 × 2

$$= 20.000 \text{ m}^2$$

$$A = \{ (0.20 + 0.35) \times 1.10 + 0.80 \times 9.00 \} \times 2 = 15.610 \text{ m}^2$$

7) Asphalt

$$\begin{aligned} V &= (0.05 + 0.125) \times 5.00 \times 28.05 &= 24.543 \text{ m}^3 \\ &&= (280.500 \text{ m}^2) \end{aligned}$$

※ Section of Superstructure.

$$A = 2 \times 0.15 \times 0.60 + (0.20 + 0.35) \times 1.10 + (1.00 \times 9.00 - 0.80 \times 1.50 \times 4) = 4.985 \text{ m}^2$$

NO② VEHICLE BRIDGE

Sub structure $A_1 = A_2$

1) Concrete

$$V = 0.15 \times 0.60 \times 0.30 \times 2 + 11.20 (1.10 \times 0.30 + 1.10 \times 7.50 + 5.00 \times 0.90) = 146.550 \text{ m}^3$$

$$UF_2 : A = 11.20 \{ (5.00 - 1.10) + 0.30 + 0.80 \} = 56.000 \text{ m}^2$$

2) formwork.

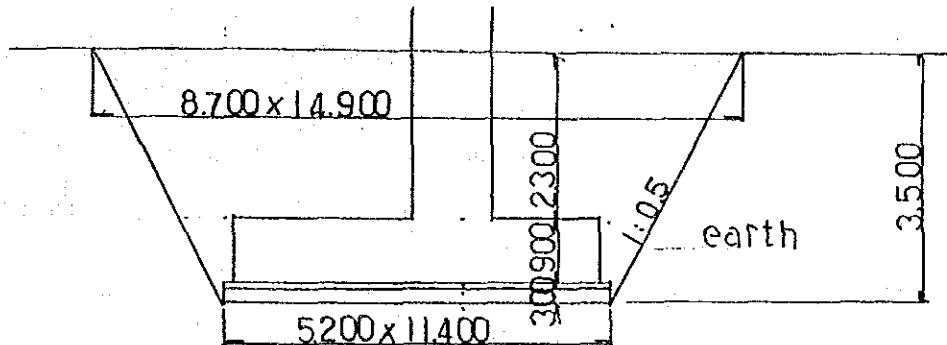
$$\begin{aligned} \text{Vertical } A &= (0.30 + 0.60) \times 0.15 \times 2 \times 2 + (0.30 + 11.20) \times 1.10 \times 2 \\ &\quad + (1.10 + 11.20) \times 7.50 \times 2 = 210.340 \text{ m}^2 \\ \text{" (footing) } A &= (5.00 + 11.20) \times 0.90 \times 2 = 29.160 \text{ m}^2 \end{aligned}$$

$$3) \text{ Scaffold } V = 1.20 \{ (1.10 + 2.00) + (11.20 + 2.00) \} \times 8.60 \times 2 = 336.432 \text{ m}^3$$

$$4) \text{ base concrete } V = 5.20 \times 11.40 \times 0.10 = 5.928 \text{ m}^3$$

$$A = (5.20 + 11.40) \times 0.10 \times 2 = 3.320 \text{ m}^2$$

$$5) \text{ base (curusherran) } V = 5.20 \times 11.40 \times 0.20 = 11.856 \text{ m}^3$$



6) excavation

$$\text{earth } V = 3.50/6 \{ 5.20 \times 11.40 + 8.70 \times 14.90 + (5.20 + 8.70) (11.40 + 14.90) \} = 323.446 \text{ m}^3$$

$$\text{remain } V = 5.928 + 11.856 + 11.20 (5.0 \times 0.90 + 1.10 \times 2.30) = 96.520 \text{ m}^3$$

$$\text{back fill } V = 323.446 - 96.520 = 226.926 \text{ m}^3$$

Wing : A_1

$$7) \text{ SPP400 : } \phi 500 \times 9 \times 8.000 \times 20^{\text{no}}$$

where.

SPP : Pile of Steel Pipe

NO② VEHICLE BRIDGE

Sub structure P₁ : Pier

1) Concrete.

beam	$V = \sum 4.991 \times 1.00$	=	4.991m ³
Pillar	$V = \sum 2.991 \times 5.60$	=	16.749m ³
footing	$V = 4.50 \times 8.00 \times 0.90$	=	32.420m ³

total = 54.140m³

$$UP_2 : A = (4.50 \times 8.00 - \sum 2.991) \times 4.991$$

= 38.000m²

2) formwork.

horizontal $A = \sum 4.991 \times 2.991$ = 2.000m²

Vertical $A = \sum 20.828 \times 1.00 + 12.828 \times 5.60$ = 92.664m²

" (footing) $A = (4.50 + 8.00) \times 0.90 \times 2$ = 22.500m²

3) base concrete $V = 4.70 \times 8.20 \times 0.10$ = 3.854m³

" formwork $A = (4.70 + 8.20) \times 0.10 \times 2$ = 2.580m²

4) base(crusherran) $V = 4.70 \times 8.20 \times 0.20$ = 7.708m³

5) Support $V = (4.991 - 2.991) \times (5.60 - 0.10)$ = 11.000m³

6) Scaffold $V = 1.20 \{ (0.50 + 2.00) + (10.00 + 2.00) \} \times 6.60 \times 2$ = 229.680m³

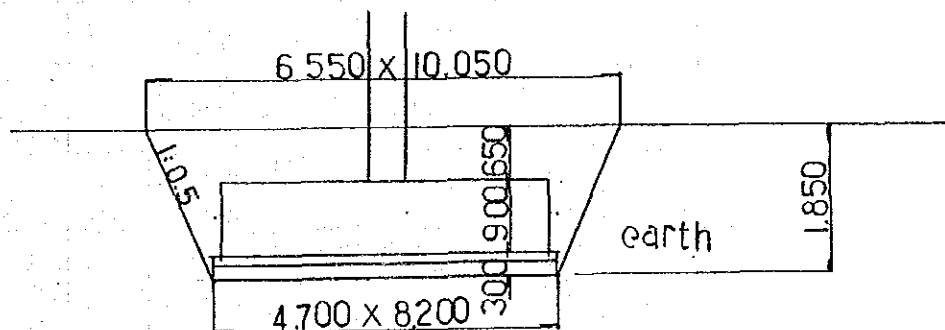
7) SPP400 : $\phi 500 \times 9 \times 8.500^{mm} \times 8^{no}$

* where. quantity of unit length.

Pillar { $A = (6.00 \times 0.50 - (0.10^2 \times 4 - u \times 0.10^2))$ = $\sum 2.991m^2$
 $\varnothing R = (u \times 0.10 \times 2)$ = 0.628m²
 $\varnothing S = ((6.00 + 0.50) \times 2 - 8 \times 0.10)$ = 12.200m²

Beam { $A = 10.00 \times 0.50 - (0.10^2 \times 4 - u \times 0.10^2)$ = $\sum 12.828m^2$
 $\varnothing R = u \times 0.10 \times 2$ = $\sum 4.991m^2$
 $\varnothing S = (10.00 + 0.50) \times 2 - 8 \times 0.10$ = 0.628m²
= 20.200m²

$\varnothing = \sum 20.828m$



8) excavation

Hard $V = 1.85/6 \{ 4.70 \times 8.20 + 6.55 \times 10.05 + (4.70 + 6.55) (8.20 + 10.05) \}$ = 95.484m³
remain $V = 3.854 + 7.708 + 32.40 + 2.991 \times 0.650$ = 45.906m³
back fill $V = 95.484 - 45.906$ = 49.578m³

LIST OF REINFORCED BAR---NO. VEHICLE-SUPERSTRUCTURE

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
S							
1-1	Y16	6000	172	1.579	9.47	1629	
1-2	"	5680	172	"	8.97	1543	
2	Y12	8850	172	0.888	7.86	1352	
3	Y16	1720	344	1.579	2.72	936	
4-1	Y12	10000	60	0.888	8.88	532	
4-2	"	9410	120	"	8.36	1003	
5	Y16	1670	16	1.579	2.54	42	
						7037 kg	
K							
1	Y12	1120	172	0.888	0.99	170	
2-1	"	10000	4	"	8.88	36	
2-2	"	9410	8	"	8.36	67	
						273 kg	
B							
1-1	Y32	7000	60	6.313	44.19	2651	
1-2	"	6530	40	"	41.22	1649	
2	"	8000	20	"	50.50	1010	
3-1	"	7000	60	"	44.19	2651	
3-2	"	6170	40	"	38.95	1558	
4	Y25	10000	40	3.854	58.54	1542	
5-1	Y12	10000	20	0.888	8.88	178	
5-2	"	9370	40	"	8.32	333	
BO							
1-1	Y16	2730	280	1.579	4.31	1207	
1-2	"	960	280	"	1.52	426	
2-1	Y12	2600	160	0.888	2.31	370	
2-2	"	840	160	"	0.75	120	
3	"	690	225	"	0.61	137	
						13832 kg	
C							
1	Y25	6000	12	3.854	23.12	277	
2-1	"	7500	12	"	28.91	347	
2-2	"	3540	12	"	13.64	164	
3	Y12	4850	12	0.888	4.31	52	
4	Y25	9600	6	3.854	37.00	222	
5-1	"	7500	6	"	28.91	173	
5-2	"	3540	6	"	13.64	82	
6	Y12	8850	6	0.888	7.86	47	
CO							
1-1	Y12	2220	60	0.888	1.97	118	
1-2	"	840	60	"	0.75	45	
2-1	"	1840	40	"	1.63	65	
2-2	"	600	40	"	0.53	21	
						1613 kg	
Y32					9519 kg		
Y25					2807		
Y16					5783		
Y12					4646		
						22755 kg	

LIST OF REINFORCED BAR---NO② VEHICLE-- A1-A2

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
P	1	Y12	2000	154	0.888	1.78	274
	2	"	660	77	"	0.59	45
	3	"	11480	8	"	10.19	82
	4	"	400	16	"	0.36	6
407 kg							
A	1	Y32	5000	39	6.313	31.57	1231
	2	"	6000	38	"	37.88	1439
	3	Y25	4740	39	3.854	18.27	713
	4	"	3740	38	"	14.41	548
	5	"	8560	39	"	32.99	1287
	6	Y16	8430	6	1.579	13.31	80
	7	"	1450	77	"	2.29	176
	8	"	11620	5	"	18.35	92
	9	Y25	11940	24	3.854	46.02	1104
	10	Y16	11620	24	1.579	18.35	440
	11	Y12	1210	150	0.888	1.07	160
7270 kg							
E	1	Y12	1140	33	0.888	1.01	33
	2	"	11480	2	"	10.19	20
53 kg							
F	1	Y25	3750	71	3.854	14.45	1026
	2	Y20	2680	39	2.466	6.61	258
	3	Y25	3040	71	3.854	11.72	832
	4	Y20	4060	39	2.466	10.01	390
	5	Y16	11620	33	1.579	18.35	606
	6	"	12140	4	"	19.17	77
	7	"	5390	4	"	8.51	34
	8	"	1210	22	"	1.91	42
	9	"	1990	90	"	3.14	283
3548 kg							
S	1	Y16	2880	67	1.579	4.55	305
	2	Y12	9880	11	0.888	8.77	96
401 kg							
Y32 2670 kg							
Y25 5510 kg							
Y20 648 kg							
Y16 2135 kg							
Y12 716 kg							
11679 kg							

LIST OF REINFORCED BAR ---NO @VEHICLE-PIER

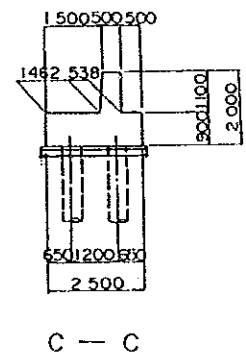
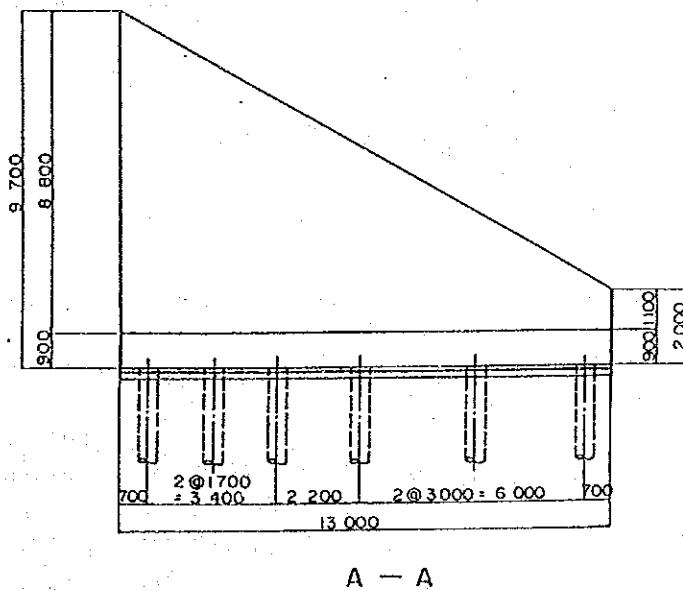
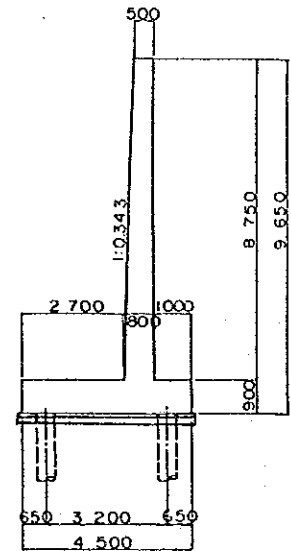
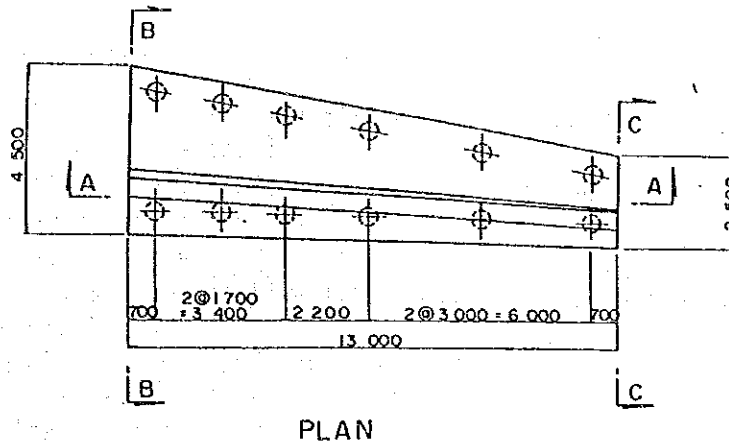
MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
B	1	Y32	11850	4	6.313	74.81	299
	2	"	9850	4	"	62.18	249
	3	Y25	12410	2	3.854	47.83	96
	4	"	5000	4	"	19.27	77
	5	"	11490	6	"	44.28	266
						987 kg	
C	1	Y32	7550	96	6.313	47.66	4575
	2	Y16	6860	48	1.579	10.83	520
	3	"	1430	160	"	2.26	362
						5457 kg	
F	1	Y25	5900	63	3.854	22.74	1433
	2	Y20	4940	33	2.460	12.18	402
	3	"	9400	19	"	23.18	440
	4	Y12	8200	19	0.888	7.28	138
	5	Y16	8360	4	1.579	13.20	53
	6	"	4860	6	"	7.67	46
	7	"	2130	82	"	3.36	276
						2788 kg	
Y32				5123 kg			
Y25				1872 kg			
Y20				842 kg			
Y16				1257 kg			
Y12				138 kg			
				9232 kg			

LIST OF REINFORCED BAR---NO② VEHICLE-

RETAINING
- WALL

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
W	1	Y25	5980	53	3.854	23.05	1222
	2	"	4500	26	"	17.34	451
	3	Y20	5900	53	2.466	14.55	771
	4	Y16	850	53	1.579	1.34	71
	5	Y12	15350	2	0.888	13.63	27
	6	Y16	13430	4	1.579	21.21	85
	7	"	11950	7	"	18.87	132
	8	"	5020	23	"	7.93	182
	9	Y12	13290	4	0.888	11.80	47
	10	"	11810	7	"	10.49	73
	11	"	5020	23	"	4.46	103
	12	Y16	960	34	1.579	1.52	52
	13	"	830	4	"	1.31	5
	14	Y12	760	113	0.888	0.67	76
3297 kg							
F	1	Y25	3310	53	3.854	12.76	676
	2	Y20	1590	53	2.466	3.92	208
	3	Y25	1970	53	3.854	7.59	402
	4	Y20	2920	53	2.466	7.20	382
	5	Y25	2350	26	3.854	9.06	236
	6	"	3670	26	"	14.14	368
	7	Y16	13430	12	1.579	21.21	255
	8	"	13440	1	"	21.22	21
	9	"	6420	1	"	10.14	10
	10	"	13520	1	"	21.35	21
	11	"	4910	4	"	7.75	31
	12	Y12	13290	10	0.888	11.80	118
	13	"	13300	1	"	11.81	12
	14	"	6420	1	"	5.70	6
	15	"	13380	1	"	11.88	12
	16	"	4910	4	"	4.36	17
	17	Y16	1130	22	1.579	1.78	39
	18	Y12	1930	117	0.888	1.71	200
3014 kg							
Y25				3355 kg			
Y20				1361 kg			
Y16				904 kg			
Y12				691 kg			
				6311 kg			

NO ② VEHICIE BRIDGE RETAININGWALL : $W_1 = W_2 = W_3 = W_4$



RETAINING WALL

NO ② VEHICIE BRIDGE

WALL : $W_1 = W_2 = W_3 = W_4$

1) concrete

wall	$V = 1/2 \{ (0.50+0.80)/2 \times 8.75 + (0.50+0.538)/2 \times 1.10 \} \times 13.00$ $= 1/2 \{ 6.258 \} \times 13.00$	= 45.373m ³
footing	$V = 1/2(4.50+2.50) \times 0.90 \times 13.00$	= 45.675m ³

total	=	= 91.048m ³
UF ₂ : A	$= 1/2(4.50+2.50) - 1/2(0.80+0.538) \} \times 14.50 + 0.50 \times 13.00$	= 48.300m ³

2) formwork.

F ₂ (V)	$A = 1/2(8.75+1.10) \times 13.00$	= 71.412m ²
vertical F ₁ (V)	$A = (0.50+0.538)/2 \times 1.10 + (8.75+1.10) \times 13.00 \times 1/2$	= 71.982m ²
footing F ₁ (V)	$A = 2.50 \times 0.90 + 2 \times 0.90 \times 13.00$	= 28.350m ²

total	=	= 100.332m ²
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3) scaffold	$V = 1.20(8.75+1.10) \times 13.00$	= 171.390m ³
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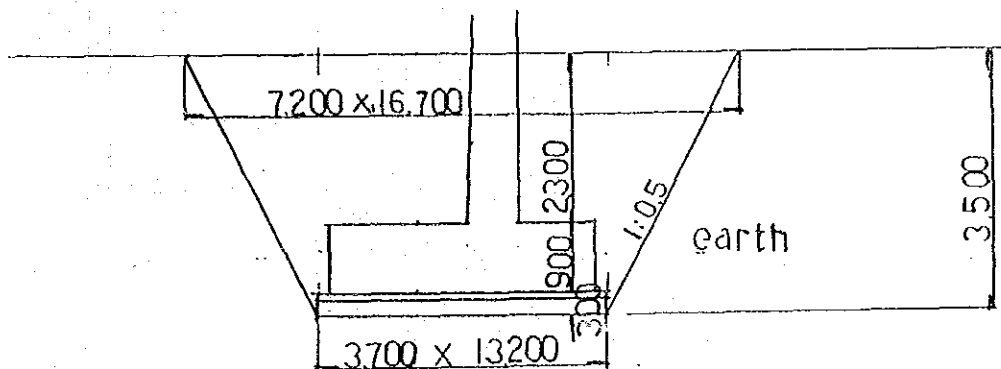
4) joint filler	$A = 1/2(0.50+0.80) \times 8.75$	= 5.687m ²
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5) water stop	$l = (8.75-0.10)$	= 8.650m
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6) base concrete	$V = 1/2(4.70+2.70) \times 13.00 \times 0.10$	= 5.365m ³
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	$A = (4.70+2.70+13.00 \times 2) \times 0.10$	= 3.640m ²
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7) base(crusherran)	$V = 1/2(4.70+2.70) \times 13.00 \times 0.20$	= 10.730m ³
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8) excavation earth	$V = 3.50/6 \{ 3.70 \times 13.20 + 7.20 \times 16.70 + (3.70+7.20)(13.20+16.70) \}$	= 317.356m ³
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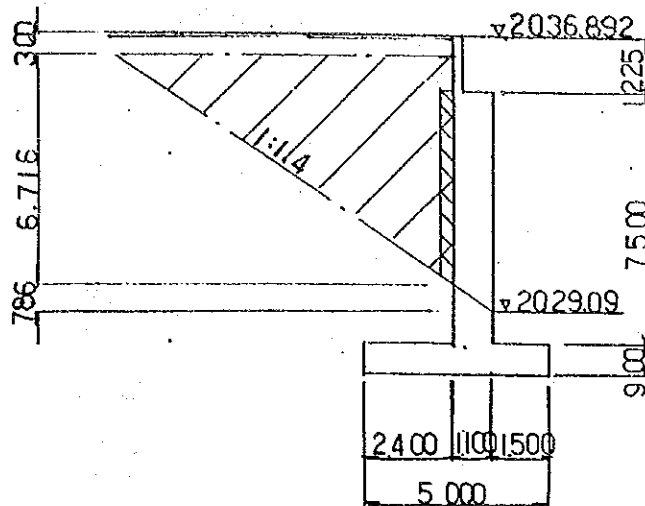
remain	$V = 5.365+10.730+45.675+0.585 \times 2.30 \times 13.00$	= 81.280m ³
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backfill	$V = 317.356-81.280$	= 236.076m ³
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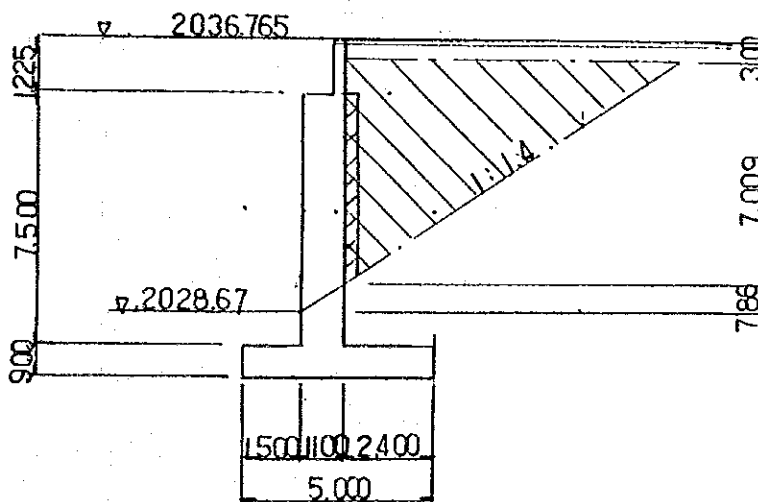
9) SPP400	$\phi 500 \times 9 \times 8.000m \times 12^{no}$	
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NO. ② VEHICLE

A1 --- BACK-FILL



A2 --- BACK-FILL



--- BACK-FILL --- include retaining wall.

$$A1: V = \frac{1}{2} \times 6.716^2 \times 1.5 \left(11.20 + 6.716 \times 1.5 \times \frac{1}{3} \times 2 \right) = 606.1 \text{ m}^3$$

$$A2: V = \frac{1}{2} \times 7.009^2 \times 1.5 \left(11.20 + 7.009 \times 1.5 \times \frac{1}{3} \times 2 \right) = 670.9 \text{ m}^3$$

$$= 1277.0 \text{ m}^3$$

N0① Vehicle bridge

$$\begin{aligned} \text{porous drainage } A &= 6.00 \times 5.90 \times 2 (\times 0.300) &= 70.800 \text{ m}^2 & 21.240 \text{ m}^3 \\ \text{perforated pipe } L &= 6.00 \times 2 &= 12.000 \text{ m} \\ \text{drain pipe } (\phi 75 \text{ mm}) N &= (6.00 / 5.00 + 1) \times 2 &= 4 \text{ N} \end{aligned}$$

N0② Vehicle bridge

$$\begin{aligned} \text{porous drainage } A &= (10.00 \times 5.90 + \frac{1}{2} \times 5.9 \times 8.80 \times 2) \times 2 (\times 0.300) &= 221.840 \text{ m}^2 & 66.552 \text{ m}^3 \\ \text{perforated pipe } L &= (10.00 + 8.80 \times 2) \times 2 &= 55.200 \text{ m} \\ \text{drain pipe } (\phi 75 \text{ mm}) N &= ((10.00 / 5.00 + 1) + (8.80 / 5.00 + 1) \times 2) \times 2 &= 18 \text{ N} \end{aligned}$$

B. Q 21.01 Waterproofing materials

N0① Vehicle bridge

super structure:	$A = 30.050 \times 6.00 + 6.00 \times 3.00 \times 2 \times 2$	= 252.300 m ²
sub " A1 :	$A = (7.20 - 2 \times 0.70) \times 8.70$ $+ (8.851 + 8.853) \times 2.40 + (0.628 + 8.858 - 2.896) \times 7.50$	= 142.386 "
A2 :	$A = (7.20 - 2 \times 0.70) \times 8.70$ $+ (8.849 + 8.841) \times 2.40 + (8.841 - 2.122 + 0.623) \times 8.50$	= 155.323 "

total = 550.009 m²

N0② Vehicle bridge

super structure:	$A = 28.050 \times 10.00 + 10.00 \times 3.00 \times 2 \times 2$	= 400.500 m ²
sub " A1=A2 :	$A = 11.20 \times 8.60 \times 2$	= 192.640 "
Wall:	$A = \frac{1}{2} (8.75 + 1.10) \times 14.50 \times 4$	= 285.650 "

total = 878.790 m²

Approach slab 200mm × 3.000m

Vehicle ① bridge

approach slab

concrete:	$V = 3.00 \times 0.20 \times 6.00 \times 2$	$= 7.200 \text{ m}^3$
UF2	$A = 3.00 \times 6.00 \times 2$	$= 36.000 \text{ m}^2$
joint filler	$A = 0.20 \times 6.00 \times 2$	$= 2.400 \text{ m}^2$
(t=20)		

Sub, structure

concrete:	$V = 0.30 \times 0.30 \times 6.00 \times 2$	$= 1.080 \text{ m}^3$
form work	$A = (0.30 + 0.30) \times 6.00 \times 2$	$= 7.200 \text{ m}^2$

Vehicle ② bridge

approach slab

concrete:	$V = 3.00 \times 0.20 \times 10.00 \times 2$	$= 12.000 \text{ m}^3$
UF2	$A = 3.00 \times 10.00 \times 2$	$= 60.000 \text{ m}^2$
joint filler	$A = 0.20 \times 10.00 \times 2$	$= 4.000 \text{ m}^2$
(t=20)		

Sub, structure

concrete:	$V = 0.30 \times 0.30 \times 10.00 \times 2$	$= 1.800 \text{ m}^3$
form work	$A = (0.30 + 0.30) \times 10.00 \times 2$	$= 12.000 \text{ m}^2$

MORTAR OF SHOE --- THE CALCULATION BE ABRIDGE TO A LITTLE.

