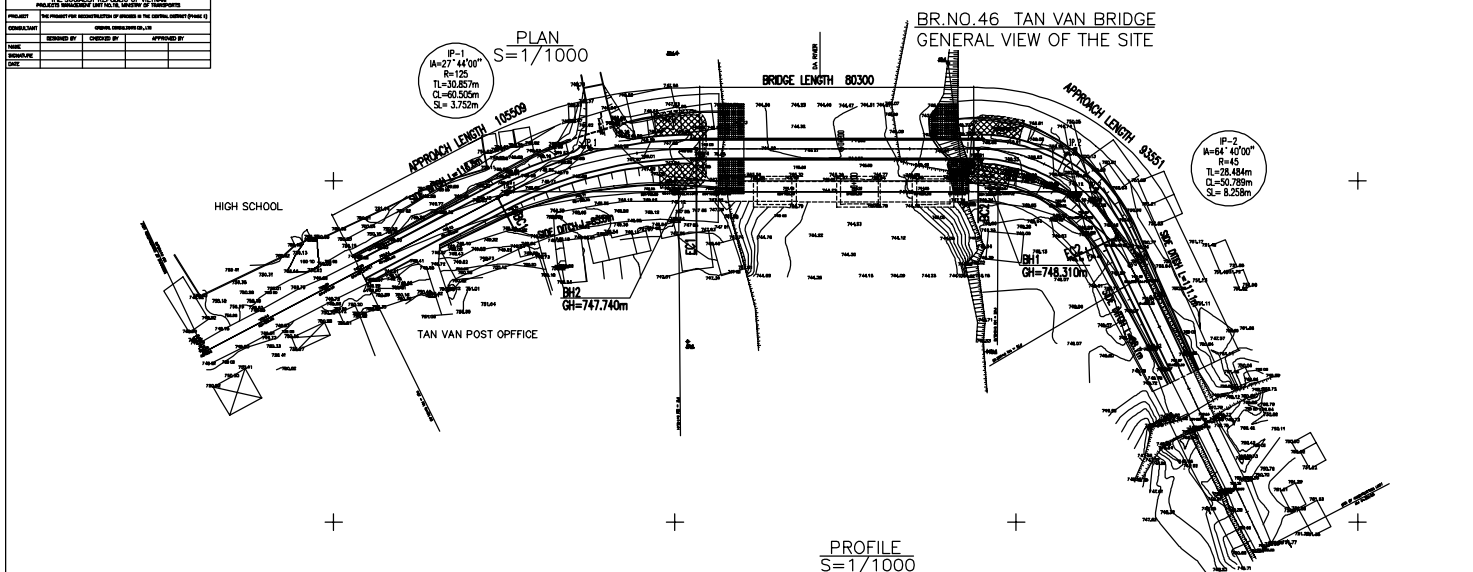
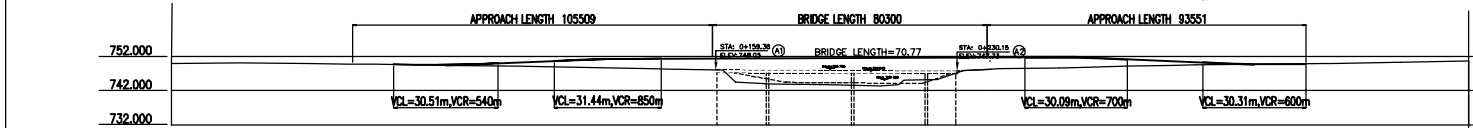
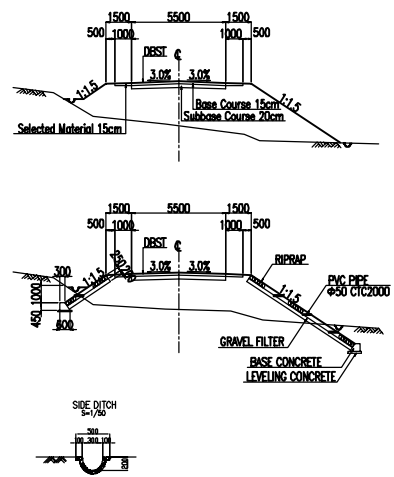


| | | |
|--|-------------|-------------|
| THE SOCIALIST REPUBLIC OF VIETNAM PROJECT: THE PROJECT FOR RECONSTRUCTION AND MAINTENANCE OF TRANSPORTATION | | |
| DESIGNER: VIETNAM GENERAL CONTRACTING CORPORATION | | |
| DATE | REVIEWED BY | APPROVED BY |
| | | |
| | | |

| | | |
|-------|-------------|--------|
| SCALE | SECTION NO. | DATE |
| 1/200 | 4-4 | 1/8/11 |
| | | |
| | | |



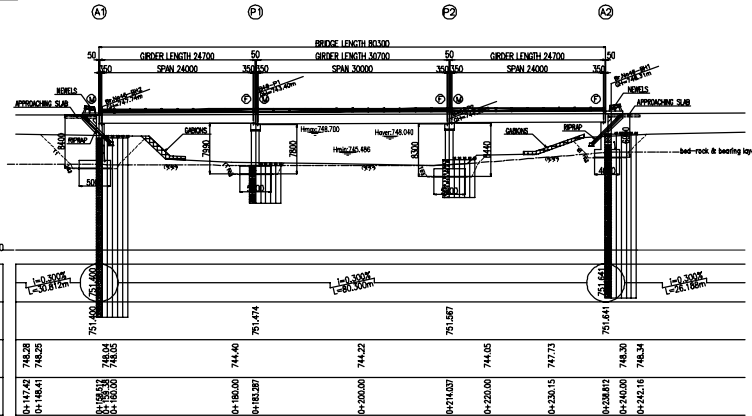
TYPICAL CROSS SECTION OF APPROACH ROAD
S=1/200



| GRADE | APPROACH LENGTH 105509 | | BRIDGE LENGTH 80300 | | APPROACH LENGTH 93551 | |
|-----------------|------------------------|----------|---------------------|----------|-----------------------|----------|
| PROPOSED HEIGHT | 750.000 | 750.040 | 750.962 | 751.163 | 751.615 | 751.720 |
| GROUND HEIGHT | 750.000 | 750.040 | 748.710 | 748.360 | 747.730 | 748.870 |
| STATION | 0+000.00 | 0+020.00 | 0+120.00 | 0+140.00 | 0+200.00 | 0+260.00 |

| | |
|-------------|---------------------------|
| PROJECT NO. | BR. NO. 46 TAN VAN BRIDGE |
| DATE | 10/2010 |
| SCALE | AS SHOWN |
| DESIGNER | ... |
| CHECKER | ... |
| APPROVER | ... |

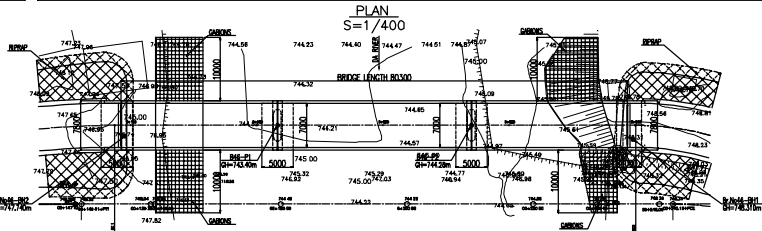
PROFILE
S=1/400



DATUM ELEV. 730.00

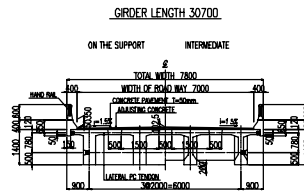
| GRADE | PROPOSED HEIGHT | GROUND HEIGHT | STATION |
|--------|-----------------|---------------|----------|
| 751.60 | 748.25 | 748.25 | 0+145.41 |
| 751.60 | 748.05 | 748.05 | 0+148.41 |
| 751.60 | 744.40 | 744.40 | 0+180.01 |
| 751.60 | 744.22 | 744.22 | 0+183.37 |
| 751.60 | 744.05 | 744.05 | 0+220.00 |
| 751.60 | 747.73 | 747.73 | 0+221.15 |
| 751.60 | 748.30 | 748.30 | 0+238.01 |
| 751.60 | 748.34 | 748.34 | 0+240.00 |
| 751.60 | 748.34 | 748.34 | 0+242.16 |

PLAN
S=1/400

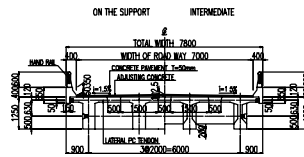


BR. NO. 46 TAN VAN BRIDGE
GENERAL VIEW OF THE BRIDGE

CROSS SECTION
S=1/100

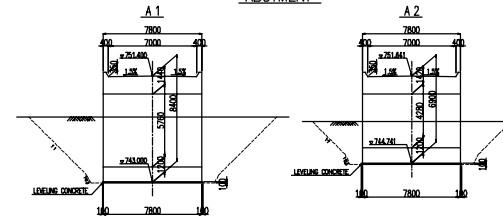


GIRDER LENGTH 24.700

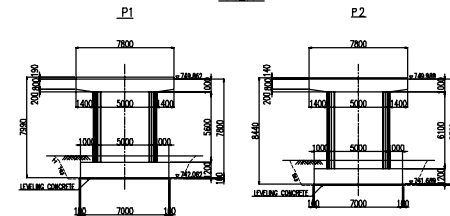


FRONT VIEW
S=1/200

ABUTMENT



PIER



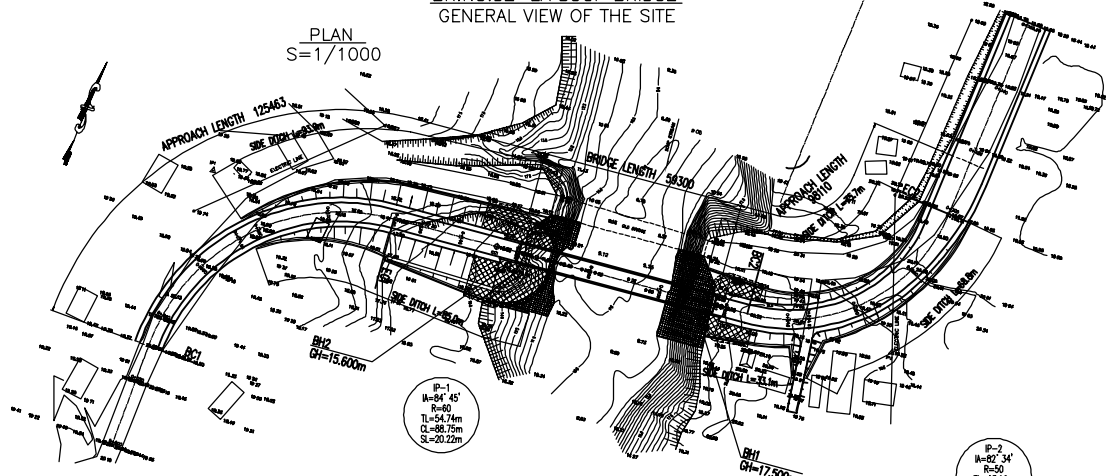
DESIGN CRITERIA

| General Condition | |
|-------------------------|---------------------|
| Design Life (year) | 100 Year |
| Design Speed | 100 km/h |
| Bridge Length (m) | 80.000 (295.275 ft) |
| Span Length (m) | 24.000 (78.740 ft) |
| Load Factor | 1.35 |
| Clearance of Bridge (m) | 5.50 |
| Sub Structure Type | Abutment |
| Foundation Type | Abutment: P1, P2 |
| Pier | P1, P2 |
| Material Strength | |
| Concrete | C25 |
| Steel | S275 |
| Reinforcement | R235 |

| | | | |
|---|---|------------|-------------|
| THE SOCIALIST REPUBLIC OF VIETNAM PROJECT BUREAU AND PLAN. CENTER OF HOANG PHO | | | |
| PROJECT | THE PROJECT FOR CONSTRUCTION OF BRIDGE AT THE CENTRAL CANAL (PHASE 1) | | |
| DESIGN UNIT | VIETNAM ENGINEERING CO., LTD | | |
| DATE | DESIGNED BY | CHECKED BY | APPROVED BY |
| REVISION | | | |
| SCALE | | | |

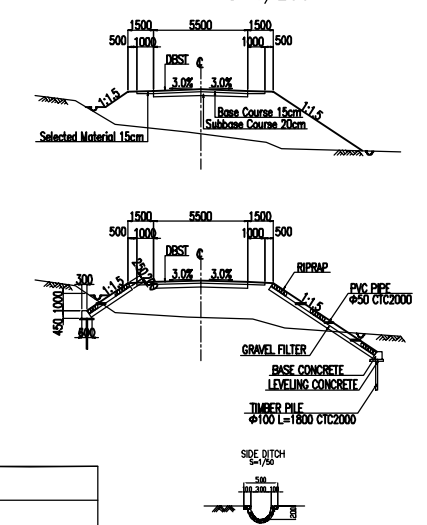
BR. NO. 52 EA SOUP BRIDGE
GENERAL VIEW OF THE SITE

PLAN
S=1/1000

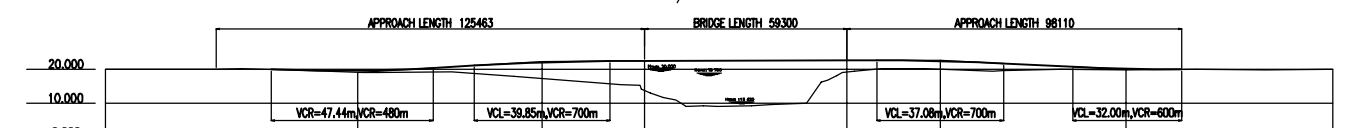


| | | | |
|----------|-------|-------|-------|
| SCALE | 1:500 | 1:100 | 1:200 |
| DATE | | | |
| REVISION | | | |
| SCALE | | | |

TYPICAL CROSS SECTION OF APPROACH ROAD
S=1/200

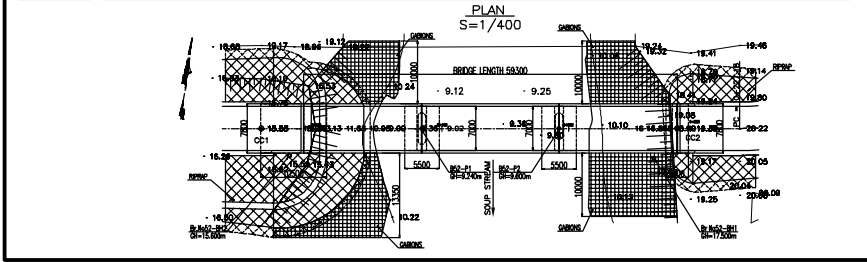
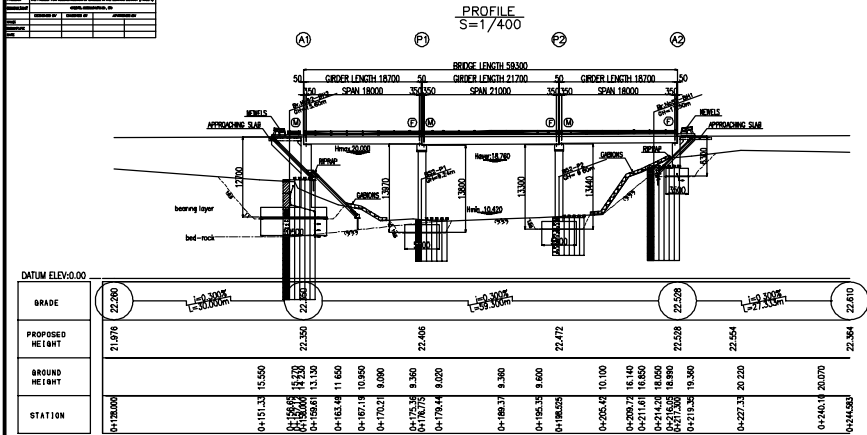


PROFILE
S=1/1000

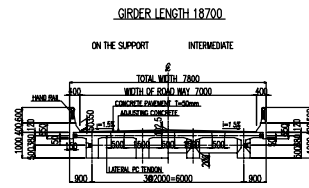
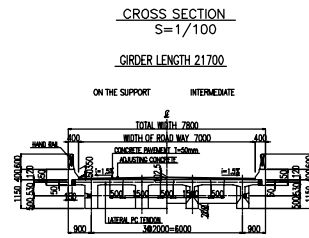


| GRADE | APPROACH LENGTH 125463 | | BRIDGE LENGTH 59300 | | | | | | | | | | APPROACH LENGTH 98110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|------------------------|---------|---------------------|---------|----------|---------|---------|---------|----------|----------|-----------|----------|-----------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----|
| | 20.000 | 19.023 | 19.023 | 22.260 | 22.350 | 22.528 | 22.610 | 19.871 | 19.925 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PROPOSED HEIGHT | 20.041 | 20.010 | 20.060 | 20.120 | 20.000 | 19.662 | 19.821 | 18.704 | 20.446 | 20.671 | 21.065 | 21.664 | 21.978 | 22.320 | 22.370 | 22.380 | 22.390 | 22.400 | 22.410 | 22.420 | 22.430 | 22.440 | 22.450 | 22.460 | 22.470 | 22.480 | 22.490 | 22.500 | 22.510 | 22.520 | 22.530 | 22.540 | 22.550 | 22.560 | 22.570 | 22.580 | 22.590 | 22.600 | 22.610 | 22.620 | 22.630 | 22.640 | 22.650 | 22.660 | 22.670 | 22.680 | 22.690 | 22.700 | 22.710 | 22.720 | 22.730 | 22.740 | 22.750 | 22.760 | 22.770 | 22.780 | 22.790 | 22.800 | 22.810 | 22.820 | 22.830 | 22.840 | 22.850 | 22.860 | 22.870 | 22.880 | 22.890 | 22.900 | 22.910 | 22.920 | 22.930 | 22.940 | 22.950 | 22.960 | 22.970 | 22.980 | 22.990 | 23.000 | 23.010 | 23.020 | 23.030 | 23.040 | 23.050 | 23.060 | 23.070 | 23.080 | 23.090 | 23.100 | 23.110 | 23.120 | 23.130 | 23.140 | 23.150 | 23.160 | 23.170 | 23.180 | 23.190 | 23.200 | 23.210 | 23.220 | 23.230 | 23.240 | 23.250 | 23.260 | 23.270 | 23.280 | 23.290 | 23.300 | 23.310 | 23.320 | 23.330 | 23.340 | 23.350 | 23.360 | 23.370 | 23.380 | 23.390 | 23.400 | 23.410 | 23.420 | 23.430 | 23.440 | 23.450 | 23.460 | 23.470 | 23.480 | 23.490 | 23.500 | 23.510 | 23.520 | 23.530 | 23.540 | 23.550 | 23.560 | 23.570 | 23.580 | 23.590 | 23.600 | 23.610 | 23.620 | 23.630 | 23.640 | 23.650 | 23.660 | 23.670 | 23.680 | 23.690 | 23.700 | 23.710 | 23.720 | 23.730 | 23.740 | 23.750 | 23.760 | 23.770 | 23.780 | 23.790 | 23.800 | 23.810 | 23.820 | 23.830 | 23.840 | 23.850 | 23.860 | 23.870 | 23.880 | 23.890 | 23.900 | 23.910 | 23.920 | 23.930 | 23.940 | 23.950 | 23.960 | 23.970 | 23.980 | 23.990 | 24.000 | 24.010 | 24.020 | 24.030 | 24.040 | 24.050 | 24.060 | 24.070 | 24.080 | 24.090 | 24.100 | 24.110 | 24.120 | 24.130 | 24.140 | 24.150 | 24.160 | 24.170 | 24.180 | 24.190 | 24.200 | 24.210 | 24.220 | 24.230 | 24.240 | 24.250 | 24.260 | 24.270 | 24.280 | 24.290 | 24.300 | 24.310 | 24.320 | 24.330 | 24.340 | 24.350 | 24.360 | 24.370 | 24.380 | 24.390 | 24.400 | 24.410 | 24.420 | 24.430 | 24.440 | 24.450 | 24.460 | 24.470 | 24.480 | 24.490 | 24.500 | 24.510 | 24.520 | 24.530 | 24.540 | 24.550 | 24.560 | 24.570 | 24.580 | 24.590 | 24.600 | 24.610 | 24.620 | 24.630 | 24.640 | 24.650 | 24.660 | 24.670 | 24.680 | 24.690 | 24.700 | 24.710 | 24.720 | 24.730 | 24.740 | 24.750 | 24.760 | 24.770 | 24.780 | 24.790 | 24.800 | 24.810 | 24.820 | 24.830 | 24.840 | 24.850 | 24.860 | 24.870 | 24.880 | 24.890 | 24.900 | 24.910 | 24.920 | 24.930 | 24.940 | 24.950 | 24.960 | 24.970 | 24.980 | 24.990 | 25.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUND HEIGHT | 20.040 | 20.010 | 20.060 | 20.120 | 19.662 | 19.821 | 18.704 | 20.446 | 20.671 | 21.065 | 21.664 | 21.978 | 22.320 | 22.370 | 22.380 | 22.390 | 22.400 | 22.410 | 22.420 | 22.430 | 22.440 | 22.450 | 22.460 | 22.470 | 22.480 | 22.490 | 22.500 | 22.510 | 22.520 | 22.530 | 22.540 | 22.550 | 22.560 | 22.570 | 22.580 | 22.590 | 22.600 | 22.610 | 22.620 | 22.630 | 22.640 | 22.650 | 22.660 | 22.670 | 22.680 | 22.690 | 22.700 | 22.710 | 22.720 | 22.730 | 22.740 | 22.750 | 22.760 | 22.770 | 22.780 | 22.790 | 22.800 | 22.810 | 22.820 | 22.830 | 22.840 | 22.850 | 22.860 | 22.870 | 22.880 | 22.890 | 22.900 | 22.910 | 22.920 | 22.930 | 22.940 | 22.950 | 22.960 | 22.970 | 22.980 | 22.990 | 23.000 | 23.010 | 23.020 | 23.030 | 23.040 | 23.050 | 23.060 | 23.070 | 23.080 | 23.090 | 23.100 | 23.110 | 23.120 | 23.130 | 23.140 | 23.150 | 23.160 | 23.170 | 23.180 | 23.190 | 23.200 | 23.210 | 23.220 | 23.230 | 23.240 | 23.250 | 23.260 | 23.270 | 23.280 | 23.290 | 23.300 | 23.310 | 23.320 | 23.330 | 23.340 | 23.350 | 23.360 | 23.370 | 23.380 | 23.390 | 23.400 | 23.410 | 23.420 | 23.430 | 23.440 | 23.450 | 23.460 | 23.470 | 23.480 | 23.490 | 23.500 | 23.510 | 23.520 | 23.530 | 23.540 | 23.550 | 23.560 | 23.570 | 23.580 | 23.590 | 23.600 | 23.610 | 23.620 | 23.630 | 23.640 | 23.650 | 23.660 | 23.670 | 23.680 | 23.690 | 23.700 | 23.710 | 23.720 | 23.730 | 23.740 | 23.750 | 23.760 | 23.770 | 23.780 | 23.790 | 23.800 | 23.810 | 23.820 | 23.830 | 23.840 | 23.850 | 23.860 | 23.870 | 23.880 | 23.890 | 23.900 | 23.910 | 23.920 | 23.930 | 23.940 | 23.950 | 23.960 | 23.970 | 23.980 | 23.990 | 24.000 | 24.010 | 24.020 | 24.030 | 24.040 | 24.050 | 24.060 | 24.070 | 24.080 | 24.090 | 24.100 | 24.110 | 24.120 | 24.130 | 24.140 | 24.150 | 24.160 | 24.170 | 24.180 | 24.190 | 24.200 | 24.210 | 24.220 | 24.230 | 24.240 | 24.250 | 24.260 | 24.270 | 24.280 | 24.290 | 24.300 | 24.310 | 24.320 | 24.330 | 24.340 | 24.350 | 24.360 | 24.370 | 24.380 | 24.390 | 24.400 | 24.410 | 24.420 | 24.430 | 24.440 | 24.450 | 24.460 | 24.470 | 24.480 | 24.490 | 24.500 | 24.510 | 24.520 | 24.530 | 24.540 | 24.550 | 24.560 | 24.570 | 24.580 | 24.590 | 24.600 | 24.610 | 24.620 | 24.630 | 24.640 | 24.650 | 24.660 | 24.670 | 24.680 | 24.690 | 24.700 | 24.710 | 24.720 | 24.730 | 24.740 | 24.750 | 24.760 | 24.770 | 24.780 | 24.790 | 24.800 | 24.810 | 24.820 | 24.830 | 24.840 | 24.850 | 24.860 | 24.870 | 24.880 | 24.890 | 24.900 | 24.910 | 24.920 | 24.930 | 24.940 | 24.950 | 24.960 | 24.970 | 24.980 | 24.990 | 25.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| STATION | 0+0.00 | 0+20.00 | 0+31.24 | 0+40.00 | 0+46.619 | 0+59.89 | 0+74.09 | 0+79.85 | 0+101.52 | 0+119.66 | 0+126.000 | 0+151.33 | 0+153.70 | 0+155.00 | 0+156.30 | 0+157.60 | 0+158.90 | 0+160.20 | 0+161.50 | 0+162.80 | 0+164.10 | 0+165.40 | 0+166.70 | 0+168.00 | 0+169.30 | 0+170.60 | 0+171.90 | 0+173.20 | 0+174.50 | 0+175.80 | 0+177.10 | 0+178.40 | 0+179.70 | 0+181.00 | 0+182.30 | 0+183.60 | 0+184.90 | 0+186.20 | 0+187.50 | 0+188.80 | 0+190.10 | 0+191.40 | 0+192.70 | 0+194.00 | 0+195.30 | 0+196.60 | 0+197.90 | 0+199.20 | 0+200.50 | 0+201.80 | 0+203.10 | 0+204.40 | 0+205.70 | 0+207.00 | 0+208.30 | 0+209.60 | 0+210.90 | 0+212.20 | 0+213.50 | 0+214.80 | 0+216.10 | 0+217.40 | 0+218.70 | 0+220.00 | 0+221.30 | 0+222.60 | 0+223.90 | 0+225.20 | 0+226.50 | 0+227.80 | 0+229.10 | 0+230.40 | 0+231.70 | 0+233.00 | 0+234.30 | 0+235.60 | 0+236.90 | 0+238.20 | 0+239.50 | 0+240.80 | 0+242.10 | 0+243.40 | 0+244.70 | 0+246.00 | 0+247.30 | 0+248.60 | 0+249.90 | 0+251.20 | 0+252.50 | 0+253.80 | 0+255.10 | 0+256.40 | 0+257.70 | 0+259.00 | 0+260.30 | 0+261.60 | 0+262.90 | 0+264.20 | 0+265.50 | 0+266.80 | 0+268.10 | 0+269.40 | 0+270.70 | 0+272.00 | 0+273.30 | 0+274.60 | 0+275.90 | 0+277.20 | 0+278.50 | 0+279.80 | 0+281.10 | 0+282.40 | 0+283.70 | 0+285.00 | 0+286.30 | 0+287.60 | 0+288.90 | 0+290.20 | 0+291.50 | 0+292.80 | 0+294.10 | 0+295.40 | 0+296.70 | 0+298.00 | 0+299.30 | 0+300.60 | 0+301.90 | 0+303.20 | 0+304.50 | 0+305.80 | 0+307.10 | 0+308.40 | 0+309.70 | 0+311.00 | 0+312.30 | 0+313.60 | 0+314.90 | 0+316.20 | 0+317.50 | 0+318.80 | 0+320.10 | 0+321.40 | 0+322.70 | 0+324.00 | 0+325.30 | 0+326.60 | 0+327.90 | 0+329.20 | 0+330.50 | 0+331.80 | 0+333.10 | 0+334.40 | 0+335.70 | 0+337.00 | 0+338.30 | 0+339.60 | 0+340.90 | 0+342.20 | 0+343.50 | 0+344.80 | 0+346.10 | 0+347.40 | 0+348.70 | 0+350.00 | 0+351.30 | 0+352.60 | 0+353.90 | 0+355.20 | 0+356.50 | 0+357.80 | 0+359.10 | 0+360.40 | 0+361.70 | 0+363.00 | 0+364.30 | 0+365.60 | 0+366.90 | 0+368.20 | 0+369.50 | 0+370.80 | 0+372.10 | 0+373.40 | 0+374.70 | 0+376.00 | 0+377.30 | 0+378.60 | 0+379.90 | 0+381.20 | 0+382.50 | 0+383.80 | 0+385.10 | 0+386.40 | 0+387.70 | 0+389.00 | 0+390.30 | 0+391.60 | 0+392.90 | 0+394.20 | 0+395.50 | 0+396.80 | 0+398.10 | 0+399.40 | 0+400.70 | 0+402.00 | 0+403.30 | 0+404.60 | 0+405.90 | 0+407.20 | 0+408.50 | 0+409.80 | 0+411.10 | 0+412.40 | 0+413.70 | 0+415.00 | 0+416.30 | 0+417.60 | 0+418.90 | 0+420.20 | 0+421.50 | 0+422.80 | 0+424.10 | 0+425.40 | 0+426.70 | 0+428.00 | 0+429.30 | 0+430.60 | 0+431.90 | 0+433.20 | 0+434.50 | 0+435.80 | 0+437.10 | 0+438.40 | 0+439.70 | 0+441.00 | 0+442.30 | 0+443.60 | 0+444.90 | 0+446.20 | 0+447.50 | 0+448.80 | 0+450.10 | 0+451.40 | 0+452.70 | 0+454.00 | 0+455.30 | 0+456.60 | 0+457.90 | 0+459.20 | 0+460.50 | 0+461.80 | 0+463.10 | 0+464.40 | 0+465.70 | 0+467.00 | 0+468.30 | 0+469.60 | 0+470.90 | 0+472.20 | 0+473.50 | 0+474.80 | 0+476.10 | 0+477.40 | 0+478.70 | 0+480.00 | 0+481.30 | 0+482.60 | 0+483.90 | 0+485.20 | 0+486.50 | 0+487.80 | 0+489.10 | 0+490.40 | 0+491.70 | 0+493.00 | 0+494.30 | 0+495.60 | 0+496.90 | 0+498.20 | 0+499.50 | 0+500.80 | 0+502.10 | 0+503.40 | 0+504.70 | 0+506.00 | 0+507.30 | 0+508.60 | 0+509.90 | 0+511.20 | 0+512.50 | 0+513.80 | 0+515.10 | 0+516.40 | 0+517.70 | 0+519.00 | 0+520.30 | 0+521.60 | 0+522.90 | 0+524.20 | 0+525.50 | 0+526.80 | 0+528.10 | 0+529.40 | 0+530.70 | 0+532.00 | 0+533.30 | 0+534.60 | 0+535.90 | 0+537.20 | 0+538.50 | 0+539.80 | 0+541.10 | 0+542.40 | 0+543.70 | 0+545.00 | 0+546.30 | 0+547.60 | 0+548.90 | 0+550.20 | 0+551.50 | 0+5 |

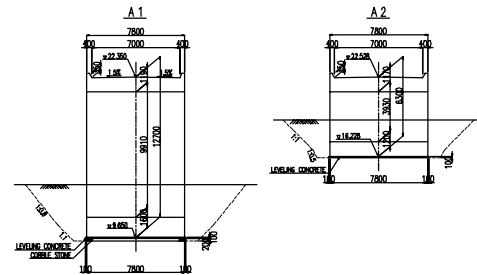
| | | | | |
|-----|------|----|-------|------|
| NO. | DATE | BY | CHKD. | APP. |
| | | | | |
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| | | | | |



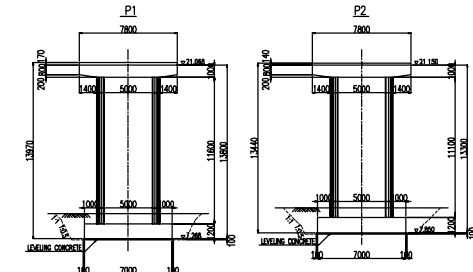
BR NO.52 FA SOUP BRIDGE
GENERAL VIEW OF THE BRIDGE



FRONT VIEW
S=1/200
ABUTMENT



PIER

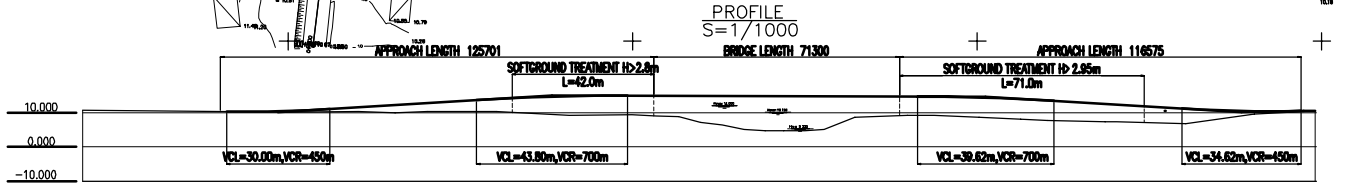
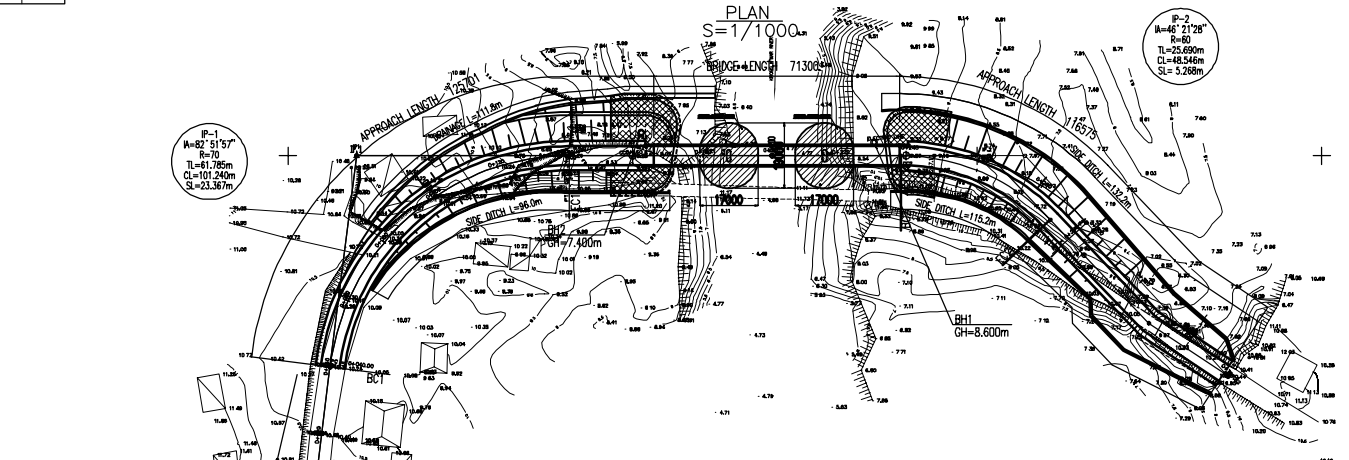


| DESIGN CRITERIA | |
|---------------------------|--|
| General Exhibition | |
| Design Life (year) | 100/120 |
| Design Speed | 40/50km/h |
| Water Level (from level) | 50/100cm (21/100cm 18.00m) |
| Swallow | 1/20 |
| Load Factor Coefficient | 0.95 |
| Cross-section Coefficient | 1.05 |
| Sub Structure Type | Reinforced Concrete |
| Foundation Type | Abutment: Reinforced Concrete Pier: Reinforced Concrete |
| Material Strength | |
| Super Structure Type | Concrete |
| Concrete | C25-C30 |
| Reinforcement | HRB335 |
| Sub Structure Type | Reinforced Concrete |
| Reinforcement | HRB335 |

| | | | |
|--|-----------|----------|-------|
| THE SOCIAL REPUBLIC OF VIETNAM Republic of Vietnam | | | |
| PROJECT: Technical design of construction of BRIDGE AND APPROACH ROADS | | | |
| APPROVED: | DESIGNED: | CHECKED: | DATE: |
| | | | |
| | | | |
| | | | |

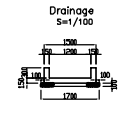
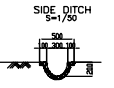
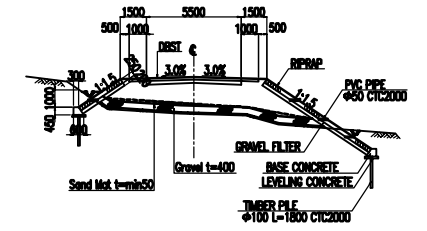
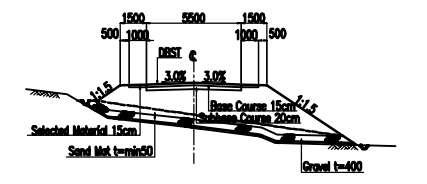
BR.NO.56 K'ONG K'MAR BRIDGE
GENERAL VIEW OF THE SITE

| | | | |
|------------|---|--------|--------|
| SCALE: | 1/200 | 1/1000 | 1/1 |
| SHEET NO.: | S-1 | | 1 OF 1 |
| PROJECT: | TECHNICAL DESIGN OF CONSTRUCTION OF BRIDGE AND APPROACH ROADS | | |
| DATE: | | | |
| | | | |
| | | | |



| GRADE | 10.297 | 10.185 | $i=6.000\%$ $L=79.467m$ | 14.953 | $i=0.300\%$ $L=29.500m$ | 14.864 | $i=0.300\%$ $L=71.300m$ | 14.650 | $i=0.300\%$ $L=25.000m$ | 14.575 | $i=6.000\%$ $L=74.265m$ | 10.119 | 10.440 | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|--------|---------|----------------------------|--------------------|----------------------------|---------|----------------------------|----------|----------------------------|----------|----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------------|----------|----------|----------|----------|----------|----------|----------|----------|-----------------------|----------|----------|----------|----------|----------|
| PROPOSED HEIGHT | 10.689 | 10.449 | 10.309 10.287 | 10.438 10.336 | 11.581 | 12.219 | 12.781 | 13.958 | 14.608 | 14.733 | 14.883 | 14.864 | 14.862 | 14.842 | 14.823 | 14.804 | 14.785 | 14.767 | 14.751 | 14.733 | 14.716 | 14.689 | 14.650 | 14.633 | 14.602 | 14.583 | 14.575 | 13.894 | 13.493 | 12.491 | 12.285 | 11.096 | 10.456 | 10.392 | 10.440 |
| GROUND HEIGHT | 10.670 | 10.450 | 10.310 | 10.160 | 10.360 | 9.940 | 10.270 | 10.240 | 9.200 | 9.200 | 9.280 | 9.020 | 8.790 | 8.790 | 8.790 | 8.790 | 8.790 | 8.790 | 8.790 | 8.790 | 8.790 | 8.540 | 9.230 | 9.100 | 8.690 | 8.150 | 7.730 | 7.320 | 7.280 | 6.700 | 6.610 | 9.610 | 9.610 | 10.440 | 10.440 |
| STATION | 0+0.00 | 0+20.00 | 0+40.00 0+41.753 | 0+60.00 0+60.00 | 0+80.00 | 0+80.63 | 0+100.00 | 0+120.00 | 0+136.200 0+141.24 | 0+159.47 | 0+165.700 0+166.34 | 0+172.96 | 0+179.29 | 0+185.63 | 0+191.93 | 0+197.99 | 0+203.35 | 0+209.46 | 0+215.16 | 0+224.01 | 0+237.00 0+239.30 | 0+247.11 | 0+260.00 | 0+262.00 | 0+272.25 | 0+280.00 | 0+290.00 | 0+300.00 | 0+320.00 | 0+336.265 0+340.00 | 0+350.00 | 0+350.00 | 0+350.00 | 0+350.00 | 0+350.00 |

TYPICAL CROSS SECTION OF APPROACH ROAD
S=1/200

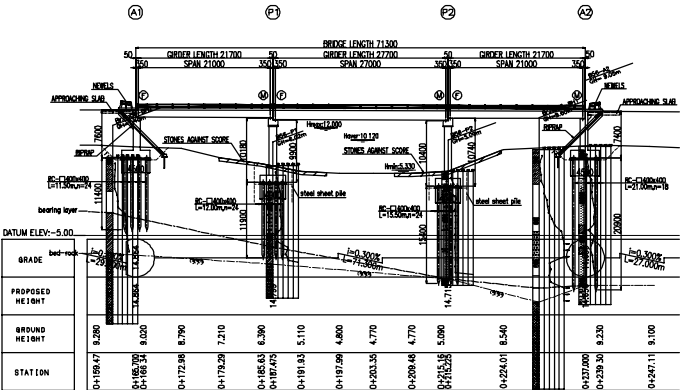


| | | |
|-------------|------------|---------|
| PROJECT NO. | BRIDGE NO. | SCALE |
| DATE | DESIGNER | CHECKER |
| APPROVED | REVISIONS | |

| | | |
|-----|------|-------------|
| NO. | DATE | DESCRIPTION |
| 1 | | |
| 2 | | |

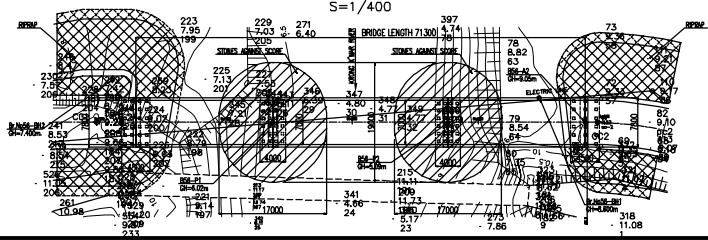
BR NO.56 KRONG K'MAR BRIDGE
GENERAL VIEW OF THE BRIDGE

PROFILE
S=1/400

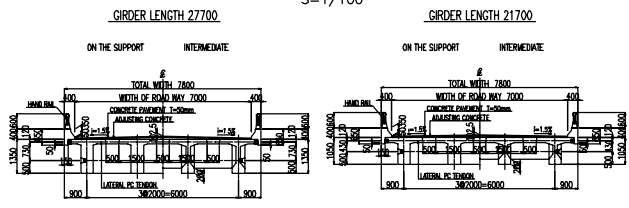


| | | | | | | | | | | | | | |
|--------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| DATUM ELEV. - 5.00 | | | | | | | | | | | | | |
| GRADE | | | | | | | | | | | | | |
| PROPOSED HEIGHT | | | | | | | | | | | | | |
| GROUND HEIGHT | 8.28 | 8.00 | 8.79 | 7.20 | 8.30 | 5.10 | 4.80 | 4.70 | 5.00 | 6.50 | 8.20 | 8.00 | |
| STATION | 0+156.67 | 0+162.50 | 0+172.86 | 0+179.26 | 0+185.65 | 0+191.95 | 0+200.35 | 0+208.46 | 0+216.55 | 0+224.01 | 0+232.00 | 0+239.30 | 0+247.11 |

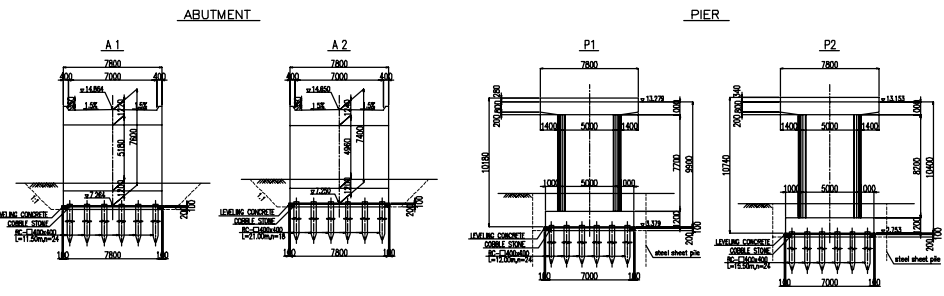
PLAN
S=1/400



CROSS SECTION
S=1/100



FRONT VIEW
S=1/200

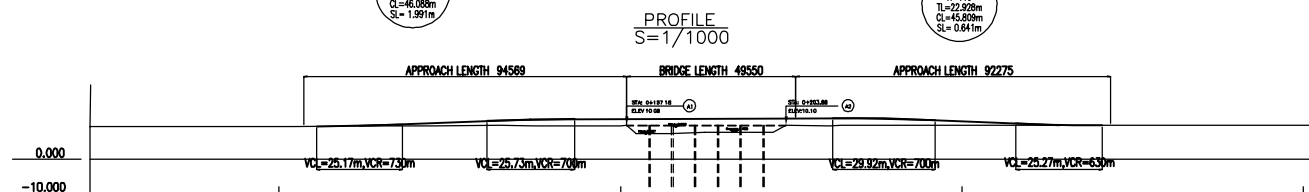
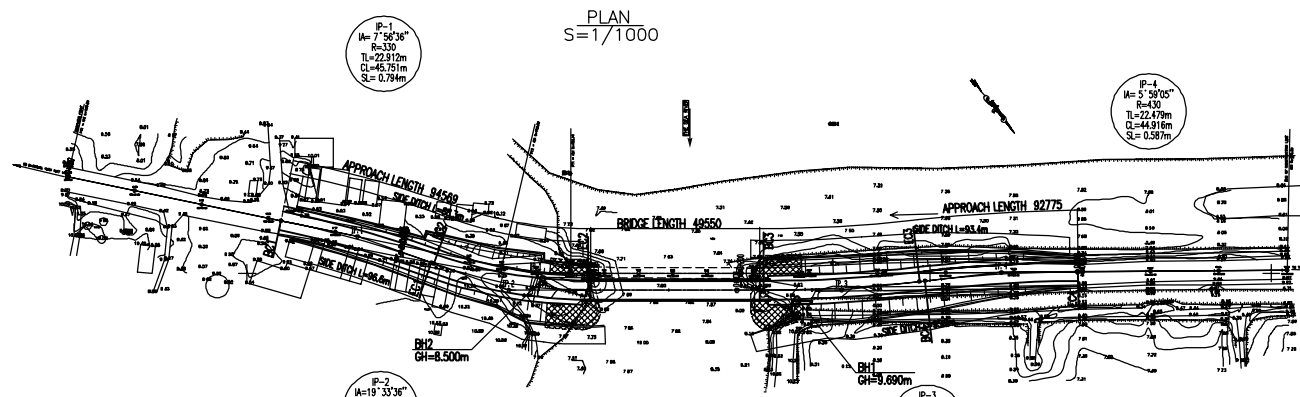


| DESIGN CRITERIA | |
|--------------------------|------------------------------|
| General Estimation | |
| Design Life (year) | 100 Year |
| Design Speed | 90 Km/h |
| Water Level (from level) | 71.5m (21.0m + 27.0m + 3.5m) |
| Exposure | C |
| Length of Corridor | 0.35 Km |
| Clearance of Corridor | 13.5 m |
| Sub Structure Type | Reinforced Concrete |
| Sub Structure Type | Abutment |
| Sub Structure Type | Pier |
| Foundation Type | Abutment |
| Foundation Type | Pier |
| Material Specification | |
| Super Structure Type | Concrete |
| Sub Structure Type | Concrete |
| Foundation | Concrete |
| Sub Structure Type | Concrete |
| Foundation | Concrete |

| | | | |
|--|-------------|------------|-------------|
| THE SOCIALIST REPUBLIC OF VIETNAM PROJECT: RECONSTRUCTION AND MAINTENANCE OF TRANSPORTS | | | |
| SUBJECT: THE PROJECT FOR RECONSTRUCTION AND MAINTENANCE OF THE CENTRAL HIGHWAY (Phase II) | | | |
| DESIGNER: GENERAL ENGINEERING CO., LTD | | | |
| DATE | REVIEWED BY | CHECKED BY | APPROVED BY |
| | | | |
| | | | |
| | | | |

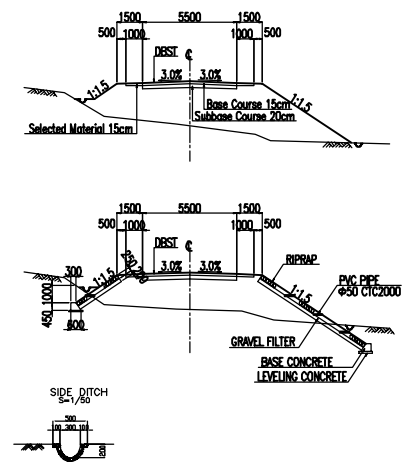
BR.NO.83_NGOL_NGAN_BRIDGE
GENERAL VIEW OF THE SITE

| | | |
|----------------------|-------------|--------|
| SCALE | SECTION NO. | DATE |
| 1:500 (PLAN) | 01 | 1/8/11 |
| 1:200 (PROFILE) | 02 | 1/8/11 |
| 1:20 (CROSS SECTION) | 03 | 1/8/11 |
| | | |
| | | |
| | | |



| GRADE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|----------|----------|-----------|----------|----------|----------|----------|-----------|-----------|----------|----------|----------|----------|--------|--------|--------|--------|
| PROPOSED HEIGHT | 9.570 | 9.590 | 9.590 | 9.660 | 9.694 | 9.761 | 9.879 | 9.886 | 10.606 | 11.395 | 11.655 | 11.795 | 11.825 | 11.825 | 11.845 | 11.850 | 11.859 | 11.889 | 11.919 | 11.949 | 11.969 | 11.979 | 11.999 | 12.029 | 12.035 | 11.916 | 12.077 | 10.979 | 10.239 | 10.150 | 10.024 | 10.022 | 10.060 | 10.020 | 10.020 | 10.020 |
| GROUND HEIGHT | 9.57 | 9.58 | 9.58 | 9.66 | 9.694 | 9.77 | 9.879 | 9.886 | 9.91 | 9.95 | 9.90 | 9.85 | 9.90 | 9.90 | 9.89 | 9.88 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | 9.89 | |
| STATION | 0+000.00 | 0+020.00 | 0+040.00 | 0+060.00 | 0+066.289 | 0+088.75 | 0+088.00 | 0+100.00 | 0+120.00 | 0+125.00 | 0+140.00 | 0+150.14 | 0+153.77 | 0+158.00 | 0+160.00 | 0+170.00 | 0+180.00 | 0+190.00 | 0+205.714 | 0+216.64 | 0+220.00 | 0+232.550 | 0+240.00 | 0+244.73 | 0+260.00 | 0+280.00 | 0+285.653 | 0+296.488 | 0+300.00 | 0+320.00 | 0+340.00 | 0+360.00 | | | | |

TYPICAL CROSS SECTION OF APPROACH ROAD
S=1/200

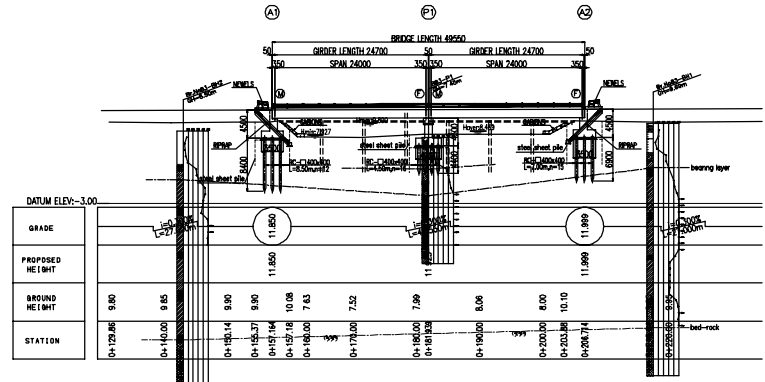


| | |
|--------------|-------------------------------|
| Project Name | BR. NO. B.3. NGOI NGAN BRIDGE |
| Scale | S=1/400 |
| Sheet No. | |
| Revision | |

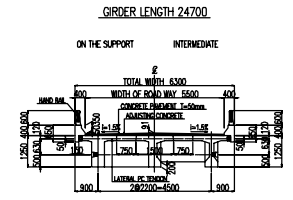
BR. NO. B.3. NGOI NGAN BRIDGE
GENERAL VIEW OF THE BRIDGE

| | |
|-----------|---------|
| Scale | S=1/400 |
| Sheet No. | |
| Revision | |

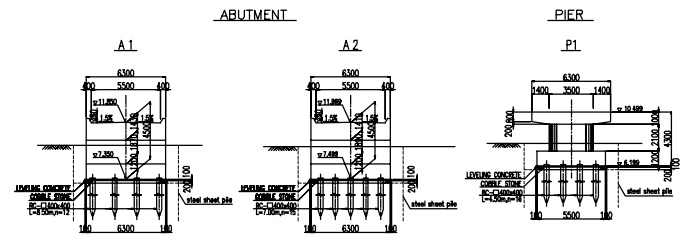
PROFILE
S=1/400



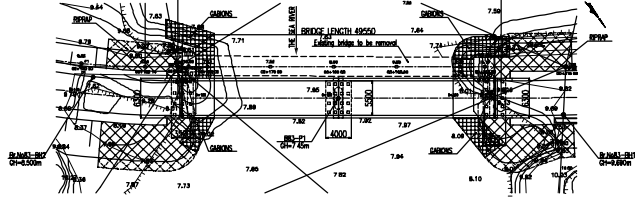
CROSS SECTION
S=1/100



FRONT VIEW
S=1/200



PLAN
S=1/400



| DESIGN CRITERIA | |
|----------------------------|-----------------|
| General Condition | |
| Design Life (year) | 100 years |
| Design Speed | 40 km/h |
| Water Level (Normal level) | 24.50m (24.50m) |
| Swallow | 24.50m |
| Load Factor | 1.25 |
| Clearance of Carriage way | 1.50m |
| Clearance of Carriage way | 1.50m |
| Sub Structure Type | Abutment |
| Sub Structure Type | Pier |
| Foundation Type | Abutment |
| Foundation Type | Pier |
| Material Strength | |
| Concrete | C20 |
| Steel | S275 |
| Sub Structure Type | Abutment |
| Sub Structure Type | Pier |
| Foundation Type | Abutment |
| Foundation Type | Pier |

2.2.4 Implementation Plan

2.2.4.1 Implementation Policy

(1) Basic Concept

This Project is to construct the seven proposed bridges, which are located in five different provinces in the central region of Vietnam, and is to be implemented by a Japanese contractor under Japan's Grant Aid Scheme. In consideration of this, the following describes the basic implementation concept of the Project:

- MOT's PMU 18 will implement the Project from the tendering stage throughout the construction stage. However, the operation and maintenance of all the proposed facilities will be transferred to the relevant provincial DOTs. Accordingly, close communication between PMU18 and the provincial DOTs will be required for Project implementation.
- The construction plan should be set taking into consideration the difference in the characteristics of the rainy season between the mountainous and coastal areas, including the duration, rainfall volume and intensity.
- The seven proposed bridges are categorized into four groups depending on their location and one site office will be established for each group. In order to manage all site offices, a Central Office shall be set up in Phan Rang of Ninh Thuan Province. Furthermore, a liaison office will be established in Hanoi in order to ensure close communication with PMU18's headquarters.
- The number of Japanese engineers for construction management shall be minimized given the previous abundant experience of Term 1 and 2 of the Project. However, Japanese engineers shall occupy key positions to ensure smooth implementation, quality of facilities, and safety during construction. These positions include the Project Manager, Office Manager in charge of administration, and site manager for the four site offices. In addition, a bridge expert to supervise PC tensioning and girder erection shall be dispatched from Japan to compensate for the lack of experienced bridge engineers in Vietnam. Furthermore, a Japanese mechanical and electric engineer shall be assigned to the Central Office to manage equipment and machinery at the initial stages of the Project, as this can have a significant impact on construction time.
- Basically, PC post-tensioned girders manufactured in the construction yard are to be applied for the superstructure of the proposed bridges.
- A crane erection method to shorten erection time at a reasonable cost should be applied as much as possible, since it was confirmed in the Study that cranes with more than 50 tons of lift are available.

- In order to minimize construction costs, construction equipment and temporary construction materials should be reused for other bridges. Furthermore, materials and equipment shall be procured from the domestic market to the greatest extent possible, as long as the quality and quantity is acceptable.
- In the cases where an existing bridge is located near a new bridge and its removal is indispensable for new bridge construction, the construction of diversion roads, temporary bridges, and the removal of the existing bridge will be included in the tasks of the Japanese side in order to realize smooth Project implementation.

(2) Review of BD Construction Plan

The construction method for both the substructure and foundation, including the excavation method, was reviewed on the basis of additional boring results at some of the proposed bridges. The review results are as indicated in Table 2.2.22. A review of the erection method was also carried out in the Study and the results are as shown in Table 2.2.23.

Table 2.2.22 Construction Method for Foundation Work

| Bridge Name | Sub-structure | Foundation | Construction Method | | Reason for Change |
|--------------------|---------------|------------|----------------------|----------------------|--|
| | | | BD | This Study | |
| Da Dung Bridge | A1 | Spread | Open excavation | Same as left | |
| | P1 | ditto | Dike surrounding | ditto | |
| | P2 | ditto | Sheet pile cofferdam | Dike surrounding | Exposure of bed-rock |
| | A2 | ditto | Open excavation | Same as left | |
| Tran Bridge | A1 | ditto | Open excavation | Open excavation | |
| | P1 | ditto | Dike surrounding | Sheet pile cofferdam | Excavation of sand gravel layer 5-6m deep |
| | P2 | ditto | Dike surrounding | Sheet pile cofferdam | Excavation of sand gravel layer 5-6m deep |
| | A2 | ditto | Open excavation | Sheet pile cofferdam | Excavation of sand gravel layer 8m deep and necessity of securing detour route space |
| Tam Ngan Bridge | A1 | ditto | Open excavation | Same as left | |
| | P1 | ditto | Dike surrounding | ditto | |
| | P2 | ditto | Dike surrounding | Sheet pile cofferdam | Excavation of sand layer 7m deep |
| | A2 | ditto | Open excavation | Same as left | |
| Tan Van Bridge | A1 | ditto | Open excavation | ditto | |
| | P1 | ditto | Sheet pile cofferdam | Dike surrounding | Bedrock is situated 1m deep from the riverbed |
| | P2 | ditto | Sheet pile cofferdam | Dike surrounding | Exposure of bed-rock |
| | A2 | ditto | Open excavation | Same as left | |
| Ea Soup Bridge | A1 | ditto | Open excavation | ditto | |
| | P1 | ditto | Sheet pile cofferdam | Dike surrounding | Bedrock is situated 1m deep from the riverbed |
| | P2 | ditto | Sheet pile cofferdam | Dike surrounding | Exposure of bed-rock |
| | A2 | ditto | Open excavation | Same as left | |
| Krong K'mar Bridge | A1 | RC Pile | Open excavation | ditto | |
| | P1 | ditto | Dike surrounding | Sheet pile cofferdam | Excavation of sand layer 3m deep |
| | P2 | ditto | Dike surrounding | Sheet pile cofferdam | Excavation of sand layer 2.5m deep |
| | A2 | ditto | Open excavation | Same as left | |
| Ngoi Ngan Bridge | A1 | ditto | Sheet pile cofferdam | ditto | |
| | P1 | ditto | Sheet pile cofferdam | Ditto | |
| | A2 | ditto | Sheet pile cofferdam | ditto | |

Table 2.2.23 Review of Erection Method

| Bridge Name | Super-structure | Span(m) | Erection Method | | Reason for Change |
|-----------------|-----------------|-------------|------------------------------------|------------------------------------|--|
| | | | BD | This Study | |
| Da Dung Bridge | PC-T girder | 30+30+30 | Erection girder | Same as left | |
| Trang Bridge | PC-T girder | 21+21+21 | Erection Girder | Crane erection | It should be done before rainy season |
| Tam Ngan Bridge | PC-T girder | 21+27+21 | Erection by using temporary bridge | Erection Girder | A review of construction time for each enables application of this erection method |
| Tan Van Bridge | PC-T girder | 24+30+24 | Ditto | Erection by using temporary bridge | Platform will be built for girder fabrication and it can be utilized for erection |
| Ea Soup Bridge | PC-T girder | 18+21+18 | Erection girder | Same as left | |
| Krong Bridge | K'mar | PC-T girder | 21+27+21 | Erection girder | Ditto |
| Ngoi Bridge | Ngan | PC-T girder | 24+24 | Erection by using temporary bridge | Ditto |

2.2.4.2 Implementation Conditions

The Project comprises mainly bridgework, approach roadwork and other necessary works. All sub-work items, including PC girders, RC substructures with spread or RC piles, and DBST for road surfacing, have been carried out before in Vietnam and there is no work item that requires high technical or supervisory skills. Accordingly, quality, safety and environmental considerations during the construction shall be the areas of major concern.

- It is important for the contractor to establish a well-organized management system for the construction schedule, quality, equipment, materials and labor in order to smoothly complete all of the bridges, which are widely dispersed, within the planned period of time. Furthermore, careful supervision and close communication with PMU18 and the Consultant is also vital.
- Any river work during the rainy season shall be carefully executed because there is a possibility of a sudden flood.
- Erection work shall be carefully undertaken and include safety education for laborers in order to prevent accidents before they happen.
- It is important to take the necessary safety measures to protect local residents, which includes the proper handling of wastewater and dust caused by construction work.

2.2.4.3 Scope of Works

To implement the Project under Japan's Grant Aid Scheme, there shall be some works to be shared by both the Japanese and Vietnamese Governments (see Table 2.2.24).

Table 2.2.24 Joint Tasks for the Japanese and Vietnamese Sides

| Responsibilities of Japanese Side | Responsibilities of Vietnamese Side |
|---|--|
| -Construction of bridges, approach roads, revetment and protection works, and other necessary facilities. | -Land acquisition for the construction sites and the securing of lands necessary for temporary facilities such as PC girder manufacturing yards, stockpile areas for materials and equipment, etc. |
| -Removal of existing bridges and construction of temporary detour bridges in the case of existing bridges being on the same alignment | -Compensation for relocation of houses |
| -Construction and removal of temporary roads and bridges for construction works | -Removal or relocation of public utilities, such as electricity and telephone poles, water pipes, etc. |
| -Procurement of materials, equipment and labor required for the above construction work | -Removal of an existing bridge when the proposed bridge is constructed away from existing bridge (Bridge Da Dung, Tan Van, Ea Soup and Krong M'Mar Bridge) |
| -Supervision of the above construction works | -Exemption from tax on materials and equipment imported for the Project and from custom clearance expenditures |
| -Consultancy services required for implementation of the Project | -Exemption from custom fees and taxation for Japanese and third party nationals entering Vietnam to work for the Project, as well as exemptions from any other financial obligations. |

2.2.4.4 Construction Supervision

(1) Scope of Works for Consultancy Services

There shall be an Exchange of Notes (EN) between the Japanese and Vietnamese Governments before the commencement of the Project. Followed by the EN, a contract for consultancy services between a Consultant, who shall possess a recommendation letter from JICA, and the MOT of Vietnam shall be signed and the Consultant shall assist with the preparation of tendering documents and the supervision of construction work. The major scope of the works for the consultancy services is described below.

① Assistance with Preparation of Tender Documents

The tender documents provided on the basis of the Study output shall be reviewed and submitted to MOT for approval. The major contents of this work are as follows:

- Review of drawings
- Review of quantities of facilities to be built and cost estimates

- Review of construction plans
- Provision of “Instruction to Bidders” and contract documents for contractor

② Assistance for Bidding

The Consultant will assist MOT in executing the bidding for the Project. The major items where assistance will be provided are as follows:

- “Notice of Tender”
- Pre-qualification evaluation
- Pre-bid meeting and site visit, if necessary
- Evaluation of bidders
- Contract negotiation

③ Construction Supervision

After obtaining approval for the contract documents for the construction works from the Japanese Government, the Consultant will issue the “Notice to Proceed” to the Contractor and start its supervision work. During the construction period, the Consultant will oversee the quality and safety of the works, execute the administrative work for payment, and make recommendations on working methods to the Contractor. Furthermore, the Consultant will coordinate as necessary with the relevant organizations, including JICA, the Embassy of Japan in Vietnam, and the Vietnamese Government. The contents of the major activities of the Consultant are as described in Table 2.2.25.

Table 2.2.25 Supervision Items during Construction Stage

| Supervision Items | Contents |
|--|---|
| ① Approval of construction schedule & drawings | -To inspect and approve the construction schedule and shop drawings submitted by the Contractor. -To check if submitted documents are in accordance with contract documents and drawings, specifications, etc. |
| ② Schedule control | -To receive progress reports from the Contractor and to give instructions to ensure completion of the Project on schedule. |
| ③ Quality control | -To examine the quality of works and approve construction materials and construction methods by making reference to the contract drawings and specifications. |
| ④ Inspection of completed construction works | -To inspect and give approval for completed work and final quantities for payment by checking as-built drawings. |
| ⑤ Issuing of certification | -To issue the necessary certificates for payment for completion of construction and for the expiry of the warranty period to the Contractor. |
| ⑥ Submission of reports | -To inspect monthly reports and as-built drawings and photographs prepared by the Contractor for submittal to the Vietnamese authorities, JICA, etc. -To prepare a final report at the completion of construction and to submit to JICA. |

(2) Organization of Consultancy Services

① Consultant Organization at Assistance to Tendering Process

Since the Project is to be implemented as a Japan Grant Aid Scheme, the following shall be required in the tender process:

- To provide “Instruction to Bidders” and draft contractual documents in accordance with the guidelines of Japan’s Grant Aid Scheme.
- To prepare technical specifications that reflect the results of the review of specifications used in Term 1 and 2 of the Project.
- To allocate engineers who were involved in the BD or this Study for this work.

Two experts shall be allocated for the work of preparing tender documents and supporting the Client in the bidding process.

Table 2.2.26 Experts for Preparation of Bidding Documentation & Bidding Process Assistance

| Name | Roles |
|---------------------|---|
| Project Manager | To manage & supervise all activities of the Consultant in the tendering process |
| Document Specialist | To finalize the tendering documents on the basis of the Study results and to support the Client in the bidding process. |

② Consultant’s Organization during Construction Supervision

A resident engineer, who has experience with both bridge projects and Japan's Grant Aid Scheme, shall be assigned throughout the entirety of the construction in order to ensure the quality of work for all of the proposed bridges. On the other hand, a chief Consultant shall visit the site when required in order to check the progress of the Project as well as to coordinate the relevant organizations.

A bridge engineer shall be assigned to support the resident engineer because: (1) the 7 bridges are widely dispersed, and (2) tensioning of PC cables and erecting girders have a significant impact on the quality and safety of work. In addition, a soil engineer shall be dispatched for a short time in order to supervise the soft ground treatment work. Table 2.2.28 shows the role of each of the engineers mentioned above.

Table 2.2.27 Consultant's Organization for Construction Supervision

| Name | Roles & Activities |
|-----------------------|---|
| Project Manger | -To confirm the progress of major work items and coordinate the relevant organizations, including JICA, the Embassy of Japan, and the Vietnamese Government |
| Resident Engineer | -To supervise all seven bridges and carry out daily supervision works jointly with the bridge engineer. |
| Bridge Engineer | -To supervise the daily works of the Contractor and give instructions as necessary - To supervise the tensioning PC cables and girder erection work. |
| Geotechnical Engineer | To supervise the procedures and methods of soft ground treatment |

2.2.4.5 Procurement Plan

(1) Materials

The BD procurement plan was reviewed and the review results are as shown in Table 2.2.28. A concrete plant, steel formwork and temporary houses, which were used in Term 1 and 2, shall be re-used for Term 3. However, temporary steel shall be newly procured, as the time since the completion of Term 2 work has been relatively long.

Table 2.2.28 Review of Procurement Plan for Materials

| Name | Procurement Source | | Specification | Remarks |
|--------------------------|--------------------|--------------|----------------------|---|
| | BD | Review | | |
| Embank, fill | Vietnam | Same as left | | Source in each province |
| Upper-sub-base materials | Ditto | " | Graded crusher-run | Ditto |
| Lower sub-base material | Ditto | " | Crasher-run | Ditto |
| Coarse aggregate | Ditto | " | Ditto | Ditto |
| Fine aggregate | Ditto | " | Sand | Ditto |
| Quarry stone | Ditto | " | 25~30cm | Ditto |
| Asphalt emulsion | Ditto | " | | Imported but available in HCM |
| Cement | Ditto | " | Portland cement | Ditto |
| Admixture | Ditto | " | | Ditto |
| Re-bar | Ditto | " | Deformed bar | Available in HCM |
| PC strand | Japan | Indonesia | 1S21.8 12S12.7 | To HCM port |
| Sheath | Ditto | Vietnam | φ 38mm φ 65mm | Available from agent in HCM |
| Anchorage | Ditto | Ditto | 1T22 12T13M220 | Ditto |
| PC girder | Vietnam | Ditto | | Manufactured on site |
| RC pile | Ditto | Ditto | | Ditto |
| Rubber bearing | Japan | Vietnam | | Available in HCM |
| Expansion joint | Ditto | Vietnam | 25mm | Ditto |
| Signboard | Vietnam | Same as left | Speed & Weight limit | Available in provincial capitals |
| Plywood | Ditto | Ditto | | Steel formwork shall be used from previous work |
| Wood | Ditto | Ditto | | Available in provincial capitals |
| Falsework, Scaffolding | Third country | Ditto | | To HCM port |
| Sheet pile | Ditto | Ditto | III or IV type | Ditto |
| H-shape steel | Vietnam | Ditto | | Imported but available in HCM |
| Steel cover plate | Third country | Ditto | 1*2*0.2m | To HCM port |
| Angle | Ditto | Ditto | H village, other | Ditto |
| Fuel | Vietnam | Ditto | | Available in provincial capitals |

(2) Construction Machinery & Equipment

Table 2.2.29 Review of Procurement Source for Equipment

| Name | Specification | Procurement Source | | Reasons for Change |
|--------------------------|----------------------|-----------------------------|---------------------|--|
| | | BD | Review | |
| Bulldozer | 15t | Lease in Vietnam | Purchase in Vietnam | Depreciation shall be calculated based on previous use |
| Back hoe | 0.6m ³ | Ditto | Ditto | Ditto |
| Back hoe | 0.06m ³ | Ditto | Ditto | Ditto |
| Dump truck | 10t | Ditto | Ditto | Ditto |
| Macadam roller | 10-12t | Ditto | Ditto | Ditto |
| Vibration roller | 0.8-1.0t | Ditto | Ditto | Ditto |
| Tamping machine | 60-100kg | Purchase in Vietnam | Same as BD | |
| Wheel loader | 1.3m ³ | Lease in Vietnam | Purchase in Vietnam | Depreciation shall be calculated based on previous use |
| Concrete plant | 0.5m ³ | Purchase from third country | Ditto | Available in HCM |
| Cement silo | 30t | Ditto | Ditto | Ditto |
| Aggregate hopper | | Purchase in Vietnam | Same as BD | |
| Truck mixer | 4.5m ³ | Lease in Vietnam | Purchase in Vietnam | Depreciation shall be calculated based on previous use |
| Concrete pumping vehicle | 30m ³ /h | Ditto | Same as BD | |
| Re-bar cutter and bender | | Ditto | Same as BD | |
| Vibrator | | Purchase in Vietnam | Same as BD | |
| Crawler crane | 40t | Lease in Vietnam | Same as BD | |
| Crawler crane | 50,65t | Purchase in third country | Lease in Vietnam | Available in HCM |
| Vibrating hammer | 46,60kw | Ditto | Purchase in Vietnam | Depreciation shall be calculated based on previous use |
| Generator | 150kva | Ditto | Ditto | Ditto |
| Grout mixer, pump | 15-30l/min | Lease in Vietnam | Purchase in Vietnam | Available in HCM |
| Tension jack, pump | | Lease in Japan | Lease in Vietnam | Available in Vietnam |
| PC erection girder | | Purchase in third country | Same as BD | |
| Gantry crane | | Lease in Vietnam | Purchase in Vietnam | Available in Vietnam |
| Truck | 2,3,5,11t | Ditto | Ditto | Ditto |
| Truck with crane | 2.9t | Ditto | Ditto | Ditto |
| Trailer | 20t | Ditto | Ditto | Ditto |
| Truck crane | 15, 25,45t | Ditto | Same as BD | |
| Drilling machine | 20kg | Purchase in Vietnam | Same as BD | |
| Air compressor | 5m ³ /min | Purchase in third country | Purchase in Vietnam | Available in Vietnam |
| Water pump | H: 10m | Lease in Vietnam | Ditto | Ditto |
| Generator | 10,100,45kVA | Ditto | Ditto | Ditto |
| Welding machine | | Purchase in Vietnam | Same as BD | |

The BD study assumed that much of the construction equipment and machinery would be leased from the domestic market. However, the major equipment and machinery used by the Contractor in Term 1 and 2 of the Project belonged to a local sub-contractor. Accordingly, equipment and machinery cost shall be calculated as its depreciation, except for a crane. The review results are shown in Table 2.2.29.

2.2.4.7 Implementation Plan

Table 2.2.30 shows a tentative project implementation schedule based on the Study's results. Since Study outputs consist of detailed level of design drawings, the preparation of tender documents will be done first followed by the Exchange of Notes, and then tendering will be carried out that to be followed by construction.

Table 2.2.30 Tentative Project Implementation Schedule for Term 3

| Items | | Mon. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | |
|---------------------------------|----------------------------------|------|---|---|---|---|-----------------|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|--|--|
| Preparation of Tender Documents | Site Survey | | ■ | | | | | | | | | | | | | | | | | | | | | |
| | Preparation of bidding documents | | □ | | | | | | | | | | | | | | | | | | | | | |
| | Approval of bidding documents | | ▲ | | | | | | | | | | | | | | | | | | | | | |
| Tender Process | Tender notice/PQ | | Δ | | | | | | | | | | | | | | | | | | | | | |
| | Bid Meeting | | □ | | | | | | | | | | | | | | | | | | | | | |
| | Bidding | | | | ▲ | | | | | | | | | | | | | | | | | | | |
| | Evaluation of Bidders | | | | ■ | | | | | | | | | | | | | | | | | | | |
| Contract Negotiation/Contract | | | | Δ | | | | | | | | | | | | | | | | | | | | |
| Total Period | | | ← | | → | | Total:3.0month | | | | | | | | | | | | | | | | | |
| Construction Work | Material Trasport | | ■ | | | | | | | | | | | | | | | | | | | | | |
| | Preparation Work | | ■ | | | | | | | | | | | | | | | | | | | | | |
| | Temporary Works | | ■ | | | | | | | | | | | | | | | | | | | | | |
| | Earth Work | | ■ | | | ■ | | | | | | | | | | | | | | | | | | |
| | Subsutructure Work | | ■ | | ■ | | | | | | | | | | | | | | | | | | | |
| | Gider Manufactureing | | ■ | | | ■ | | | | | | | | | | | | | | | | | | |
| | Girder Erection | | ■ | | | | ■ | | | | | | | | | | | | | | | | | |
| | Approach Road Work | | ■ | | | ■ | | | ■ | | | ■ | | | | | | | | | | | | |
| | Miscellaneous | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | | | | | | | |
| | Cleaning up | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | | | | |
| Total Constuction Period | | | ← | | → | | Total:18.5month | | | | | | | | | | | | | | | | | |

2.3 Obligations of Recipient Country

The obligations of the Vietnamese Government are listed below, and were confirmed in the exchange of the Technical Memorandum between the Study Team and the Vietnamese Government (including MoT's PMU18).

- Acquisition of construction sites and lands necessary to perform temporary works (PC girder manufacturing, stockpiling of materials and equipment, and repairing of equipment and materials such as formwork & re-bars)
- Compensation for relocation of houses from construction sites
- Removal or relocation of utilities, such as electric cables, telephone cables and water pipes
- Removal of existing bridges when the proposed bridge is built away from the existing one.
- Exemption of tax on materials and equipment imported for the Project and prompt customs clearance
- Exemption from custom fees and taxation for Japanese and third party nationals entering Vietnam to work for the Project, and exemption from any other financial obligations

It was confirmed through discussions with the Vietnamese side that land acquisition and compensation negotiations are properly progressing, and it is expected that all land acquisition and resettlement activities will be properly completed in due date.

Removal of the existing bridge is a concern of the Japanese side because it was observed that some existing bridges have not removed after completion of the new bridges constructed in the Term 1 and 2 of the Phase 2 Project. Since the existence of the old bridge may give an adverse effect to new bridge at flood, it is necessary to remove the existing one as described a subject to be undertaken by the Vietnamese side once a new bridge is completed.

2.4 Project Operation & Maintenance Plan

2.4.1 Operation & Maintenance System

Large-scale repair work will not be required until 20 to 30 years after the completion of the bridges, if inspection and routine maintenance (see Table 2.4.1) are properly executed. Accordingly, it is possible for the provincial DOTs to carry out the inspection and maintenance work for the proposed bridges by following the present maintenance system under the control of the provincial DOT.

2.4.2 Inspection & Maintenance Method

(1) Periodic Inspection & Maintenance

Bridge structures, approach roads and revetments around sub-structures shall be maintained by the provincial DOTs. Table 2.4.1 indicates the recommended intervention levels for the inspection and maintenance of the proposed bridges. Note that it is recommended to execute inspections before and after the rainy season.

Table 2.4.1 Maintenance & Inspection Schedule

| | Item | Maintenance & Repair Works | Inspection Interval |
|------------|---------------------|---|----------------------|
| Bridge | ① Drainage pipe | Clearing of sediment | 3 months |
| | ② Expansion joint | Repairing of metal & seal rubber | 3 months |
| | ③ Railing | Repairing damage from collisions | 3 months |
| | ④ Bearing | Removal of soil deposits | 6 months |
| | ⑤ Concrete pavement | Repairing of cracks | 6 months |
| | ⑥ Substructure | Removal of debris Inspection of scouring | 6 months 6 months |
| Road | ① Pavement | Patching, smoothing | 3 months |
| | ② Shoulder/slope | Planting turf, reinforcement of soils, repairing riprap | 3 months |
| River bank | ① Around abutment | Repairing of riprap/gabion | 6 months |
| | ② Riverbank | Repairing of riprap/gabion, planting turf | 6 months |

It is important to keep records of the periodic inspections of the provincial DOTs and to assess the conditions of the facilities in order to establish a repair schedule. Accordingly, a proper inspection system including checking methods, intervals and reporting should be established from the outset.

(2) Maintenance of Approach Roads

Although minor maintenance activities, including patching and leveling, shall be executed periodically, an overlay shall be executed approximately every 10 years taking into consideration the life span of DBST. For the approach roads to Da Dung Bridge, Tran Bridge, and Ea Soup Bridge, there is some anxiety that consolidation settlement might occur because of the height of the abutments, which exceeds more than 10m, although an approach slab is planned for the backside of these bridges. In the construction stage, attentive supervision shall be undertaken in the material selection and compaction work and be in accordance with the technical specifications. However, based on the embankment materials used, advice on future maintenance will be given to the Vietnamese side after the construction of the approach roads.

2.5 Project Cost Estimation

2.5.1 Construction Cost

(1) Cost Estimate

The total costs of the Project are estimated at 1,149 million JPY, with the GOJ to bear JY1,098 million and the GOV JP51.3 million. This cost estimate is provisional and will be further refined by the Government of Japan when approving the Grant. In addition, these approximate Project costs represent the maximum amount of Japan's Grant Aid to be contained in the Exchange of Notes.

Table 2.5.1 Approximate Project Costs Borne by Japanese Side(unit: Japanese Yen)

Approximate Project Costs : 1,098 Million Japanese Yen

For 7 Bridges in 5 Provinces of the Central Region
(total bridge length: 490m)

| Project Costs | | | Million Japanese Yen |
|--|--------|---|----------------------|
| Facility | Bridge | Substructure Superstructure Revetment Approach roads Other facilities | 996.3 |
| Tendering Support & Construction Supervision | | | 102.3 |

(2) Premises of Estimation

① Time of estimate : December 2005

- ② Exchange rate : 1US\$ = JPY113.53, 1US\$= 15,864VND
(at the above-mentioned time)
- ③ Implementation period : Tendering process and construction period are shown in the Implementation Schedule
- ④ Others : On the condition that the Project is implemented under the Japan's Grant Aid Scheme. The above-mentioned exchange rate is to be reviewed by the Government of Japan.

(3) Cost Borne by Vietnamese Government

The approximate costs required for the tasks to be undertaken by the Government of Vietnam are as shown in Table 2.5.2.

Table 2.5.2 Approximate Costs to be Borne by Vietnamese Government

| Items | Cost: Million VND (Million JPY) |
|--|---------------------------------|
| Land acquisition | 3,795(2,710) |
| Resettlement | 2,597(1,860) |
| Removal/relocation of public utilities | 305(220) |
| Removal of existing bridge | 470(340) |
| Total amount | 7,167(51.3) |

* The above-mentioned costs are estimates subject to review.

2.5.2 Operation & Maintenance Cost

Inspection and daily maintenance costs are estimated below after the beginning of the operation of the proposed bridges.

(1) Daily Maintenance Activities

Periodic inspection and minor repair/maintenance works shall be executed under the direct management of the provincial DOTs. The cost for annual inspection and maintenance per province is estimated as shown below:

| | | |
|------------------------------|------------------------|--------------|
| Personal expenses | : 40 Mil VND | = 40 Mil VND |
| Materials | : 50% of above | = 20 Mil VND |
| Equipment including vehicles | : 25 Mil VND | = 25 Mil VND |
| Total | 85 Mil VND (US\$ 5300) | |

(2) Periodic Maintenance for Pavement

Periodic maintenance, mainly the overlay of the DBST for the approach roads, shall be entrusted to a local maintenance company and be carried out approximately every 7 years. The cost of the overlay is as shown below.

$$1,234 \text{ m}^2 \times 1 \text{ Bridge} \times 90 \text{ Thousand VND} = 111 \text{ Mil. VND}$$

Total 111Mil. VND (US\$ 7000)

(3) Annual Operation & Maintenance Cost

The average annual operation and maintenance cost by province shall be summarized the table below based on the assumptions mentioned above.

Table 2.5.3 Approximate Costs to be Borne by Vietnamese Government

(Unit: Million VND)

| Province Name | BINH THUANG | NINH THUANG | LAM DONG | DAC LAC | KANHN HOA |
|---|-------------|-------------|-----------|------------|-----------|
| Maintenance Budget | 10,000 | 8,000 | 6,000 | 5,000 | 16,000 |
| Necessary maintenance cost for the proposed bridges | | | | | |
| Labor cost | 40 | 40 | 40 | 40 | 40 |
| Material cost | 20 | 20 | 20 | 20 | 20 |
| Machinery cost | 25 | 25 | 25 | 25 | 25 |
| Repair cost(average) | 22 | 22 | 11 | 22 | 11 |
| Total Cost | 107 | 107 | 96 | 107 | 96 |
| Share in the maintenance budget (%) | 1.1 | 1.3 | 1.6 | 2.1 | 0.6 |

The total operation and maintenance cost per province is estimated at VND 96Mil. To 107Mil(US\$ 6,000-7,000) and accounts approximately for 2% of the maintenance budget of each province at maximum, which can be easily covered by the maintenance budget of each province.

CHAPTER 3

PROJECT EVALUATION & RECOMMENDATIONS

Chapter 3 Project Evaluation and Recommendations

3.1 Project Impacts

The Project aims to ensure the safe and smooth passage of road traffic for small- and medium-sized bridges on rural roads in the central districts of Vietnam, as many of these bridges were damaged in the war and only have temporary structures due to the lack of a sufficient budget. These bridges are characterized by a narrow formation width, insufficient capacity for handling heavy vehicles, and relatively low bridge height, which sometimes results in flooding and closure. The proposed 7 bridges will be improved with all-weather permanent structures having a 2-lane carriageway capable of handling heavy vehicles of at least up to 16 tons all-year round. This improvement is expected to achieve one of the objectives of the Project as well as one of the goals of the national development, which aims to narrow difference in the standard of living between the central area and other areas in the country by stimulating economic activity and improving access to social services and markets. The following describes both the direct and indirect positive impacts of the Project.

(1) Direct Positive Impacts

① Improvement of Access to Services

| | |
|---|---|
| Present Situation & Issues to be Solved | Frequent flooding in the rainy season sometimes causes the closure of bridges from a few days to a week. |
| Countermeasures Provided by Project | The height of the new bridge is set so there will be no overflows from floods with approximately twenty to fifty years of the return period based on the previous flood record and providing freeboard under the girders. |
| Positive Impacts from Project | Improvement of access to social services, including public offices, hospitals, schools and markets by securing all-year passage with all-weather bridges. |

The beneficiaries of the Project are expected to consist of people living within the districts where the proposed bridges are located. The table shows the expected number of the beneficiaries for each proposed bridge.

| Province Name | Binh Thuan | Ninh Thuan | | Lam Dong | Dac Lak | | Khanh Hoa |
|-----------------------|------------|------------|----------|----------|---------|-------------|-----------|
| Bridge Name | Da Dung | Tran | Tam Ngan | Tan Vang | Ea Soup | Krong K'Mar | Ngoi Ngan |
| Population to Benefit | 169,000 | 156,400 | 73,800 | 132,200 | 39,100 | 80,200 | 26,400 |

② Strengthening & Stabilization of Transport Capacity

| | |
|---|--|
| Present Situation & Issues to be Solved | The proposed seven bridges can only handle vehicles less than 13 tons, which is lower than the Vietnamese standard. Accordingly, vehicles exceeding this limit have had either to take a detour or pass through the rivers, which is not possible in the rainy season. |
| Countermeasures Provided by Project | In accordance with the Vietnamese standard, one bridge was designed to have a capacity to handle vehicles up to 30 tons, while others were designed to have a capacity of up to 16 tons. |
| Positive Impacts from Project | An increase in vehicle weight limit capacity will enable heavy vehicles to use the bridges. |

Further details on the level of improvement for the bridges are shown below.

| Province | Binh Thuan | Ninh Thuan | | Lam Dong | Dac Lak | | Khanh Hoa |
|--------------------------------|-------------|-------------|-----------------|-------------|-------------|-------------|-------------|
| Bridge Name | Da Dung | Tran | Tam Ngan | Tan Vang | Ea Soup | Krong K'Mar | Ngoi Ngan |
| Existing Weight Limit | 13t one way | 13t one way | Only pedestrian | 8t one way | 8t one way | 13t one way | 13t one way |
| Weight Limit After Improvement | 16t two way | 16t two way | 16t two way | 16t two way | 30t two way | 16t two way | 16t two way |

③ Ensuring Smooth & Safe Passage of Vehicles

| | |
|---|---|
| Present Situation & Issues to be Solved | Existing bridge width is insufficient for two-way traffic and results in long waiting times at bridge entrances. In addition, there is a mix of traffic consisting of motor vehicles, pedestrians, bicycles and motorbikes that sometimes results in accidents during busy times. |
| Countermeasures Provided by Project | Widen bridge width to 7m (3m dual-carriageway with 0.5m shoulder on either side) for the Da Dung, Tan Vang, Ea Soup and Krong K'Mar bridges and to 5.5m for the remaining 3 bridges. |
| Positive Impacts from Project | For the 4 bridges to have a 7m formation width, which also have large traffic volumes, widening will enable vehicles to pass each other and will result in the elimination of waiting times at bridge approaches. It will also ensure the smooth and safe passage of vehicles. In addition, pedestrians can walk along the shoulders and this will contribute further to safety. For the remaining 3 bridges, widening to 5.5m will enable sedans and trucks to safely pass each other. |

④ Reduction in Bridge Maintenance Cost & Improvement of Usage

| | |
|---|---|
| Present Situation & Issues to be Solved | Except for the Tran Bridge, wooden slabs are used and it is necessary to replace them regularly, which results in temporary bridge closure and costs money. |
| Countermeasures Provided by Project | Concrete slabs will be utilized to reduce costs. |
| Positive Impacts from Project | There is no need to replace the slabs and only minor repairs will be required. This will eliminate the frequent temporary bridge closures. |



(2) Indirect Positive Impacts

① Stimulation of Local Economic Activity

| | |
|---|--|
| Present Situation & Issues to be Solved | Bridge transport capacity is unstable and insufficient due to narrow width, low vehicle weight restrictions, and temporary closures from flooding. |
| Countermeasures Provided by Project | Raising bridge heights to improve discharge capacity capable of handling 20- to 50-year return period flooding, and increasing the capacity to handle larger vehicles weighing up to 16 tons or 30 tons. |
| Positive Impacts from Project | Stimulation of economic activity in the agricultural and forestry sectors, which are major industries in the area, by providing stable and reinforced transport capacity for bridges. Furthermore, it is expected that the living standard of minorities will be promoted as well. |

② Improvement of Access by Utilizing Existing Bailey Bridges

| | |
|---|--|
| Present Situation & Issues to be Solved | Many crossing points have no crossing structure in the central area, which prevents access to markets and social services for rural villages |
| Countermeasures Provided by Project | After completion of the new bridges at the Da Dung, Tan Vang, Ea Soup and Krong K'Mar bridge sites, the existing Bailey bridges can be removed and used at crossing points having no crossing structure. |
| Positive Impacts from Project | Improvement in access of villages to services and market. |

3.2 Recommendations

There are some activities that should be carried out in order to maximize and sustain the positive impacts of the Project and these are explained below.

① Removal or Transfer of Existing Bridges after Completion of New Bridges

The site reconnaissance of the Study Team found that existing Bailey bridges had not been removed after the completion of bridges built via steel girder supply type work under Japan's Grant Aid Scheme. An interview with a local officer reveals that the removal of old bridges would be undertaken with next year's budget. Note that the existence of old bridges can cause swirling flows that result in adverse impacts on new bridges such as scouring. Accordingly, the prompt removal or re-utilizing of these old bridges at other crossing points should be executed by the Vietnamese side as quickly as possible.

② Execution of Proper Maintenance for New Bridges & Their Approach Roads

Maintenance for bridges constructed in the first and second term of the Project will start from this year, as the defect and liability period just ended last year. It is anticipated that proper maintenance will be executed by the Vietnamese side, as the necessary budget for road maintenance has been secured and the appropriate maintenance systems established at the provincial level according to interviews with the PDOTs. However, it is recommended that the Japanese side occasionally monitor the operation and maintenance activities for these bridges.