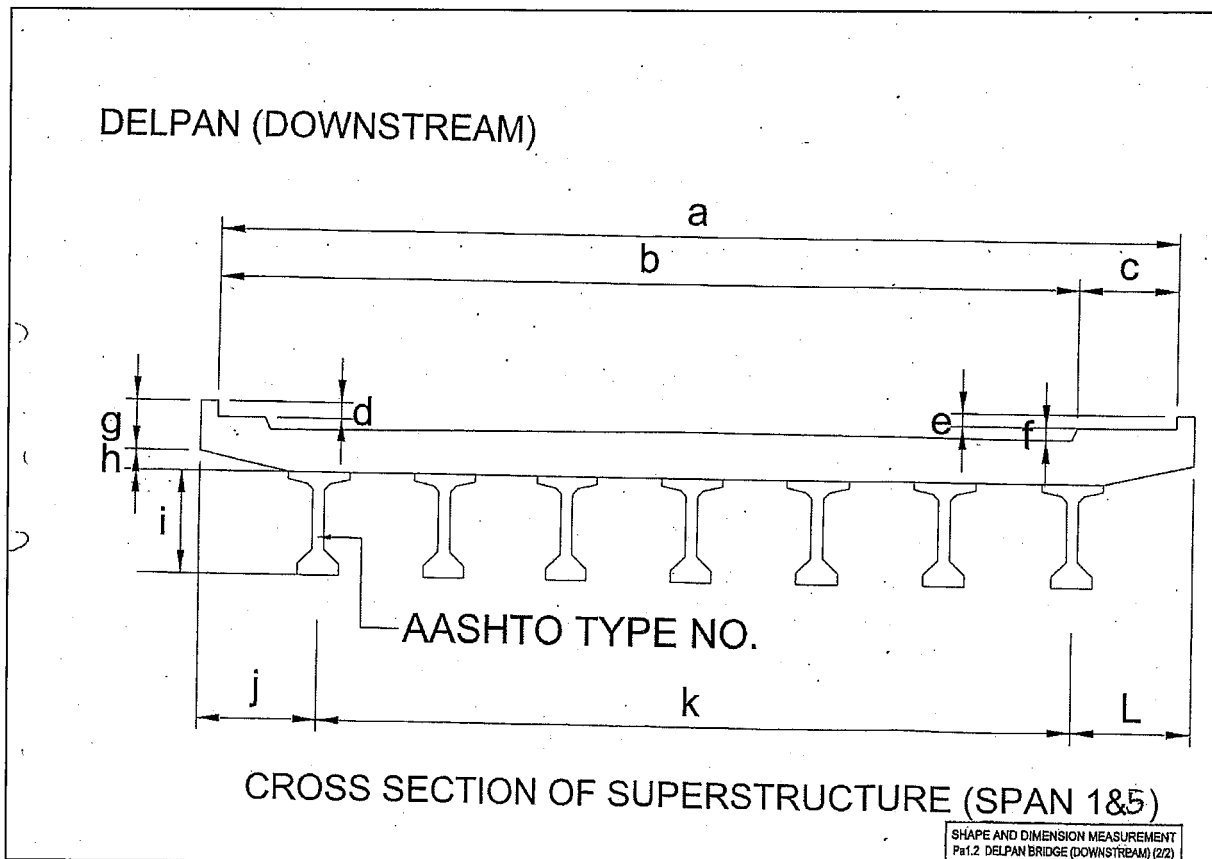
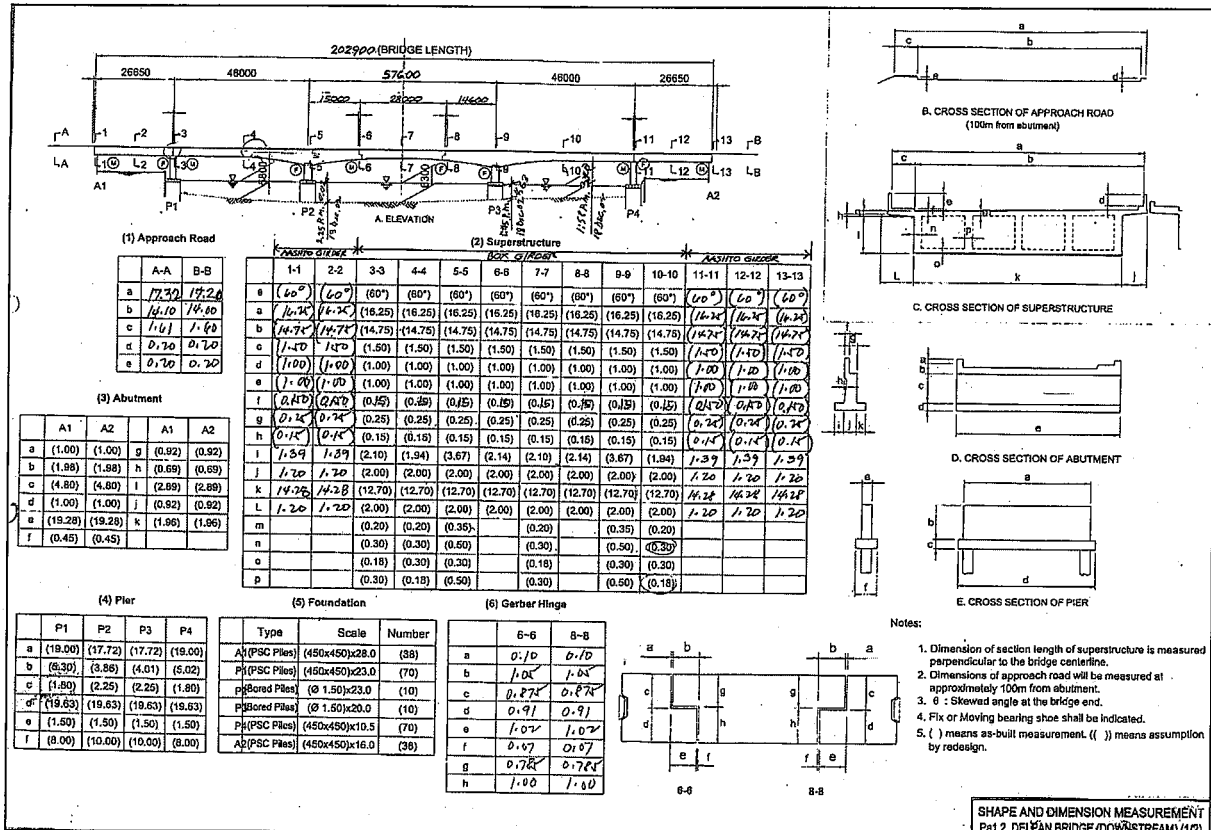
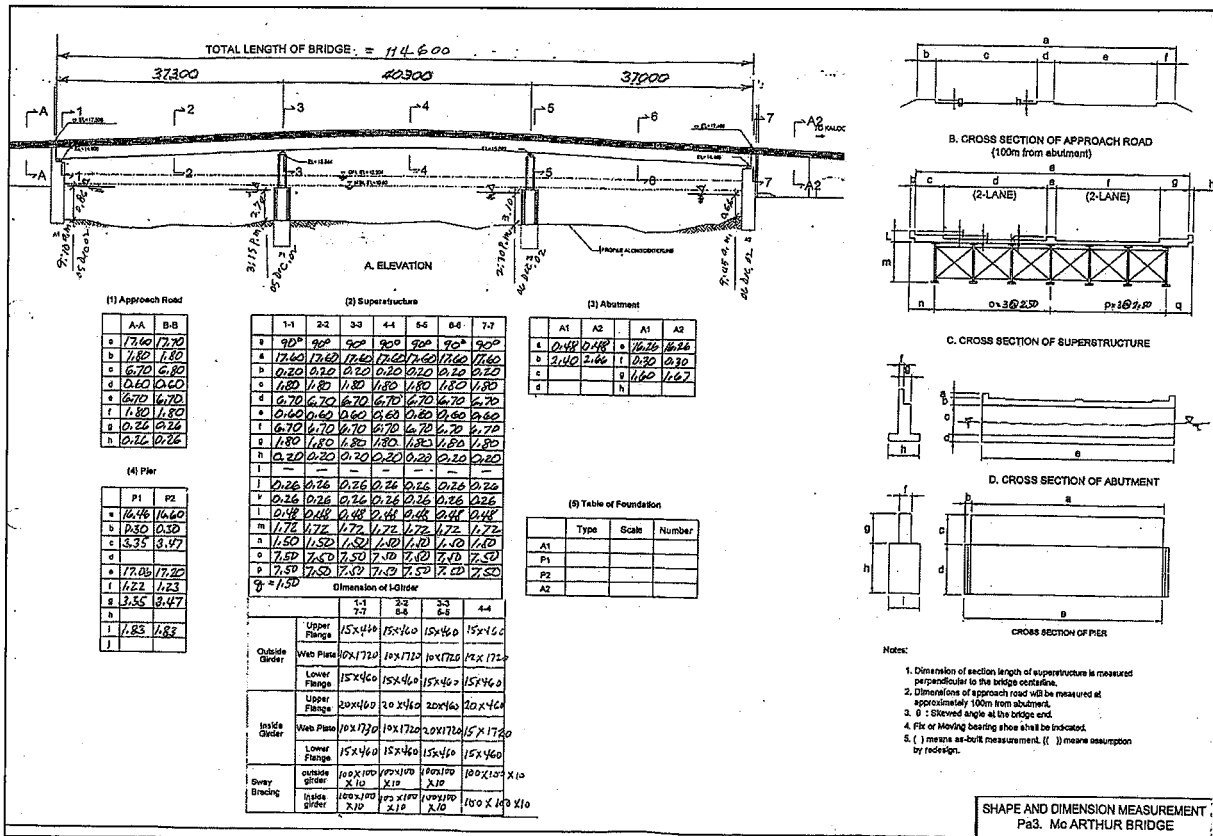
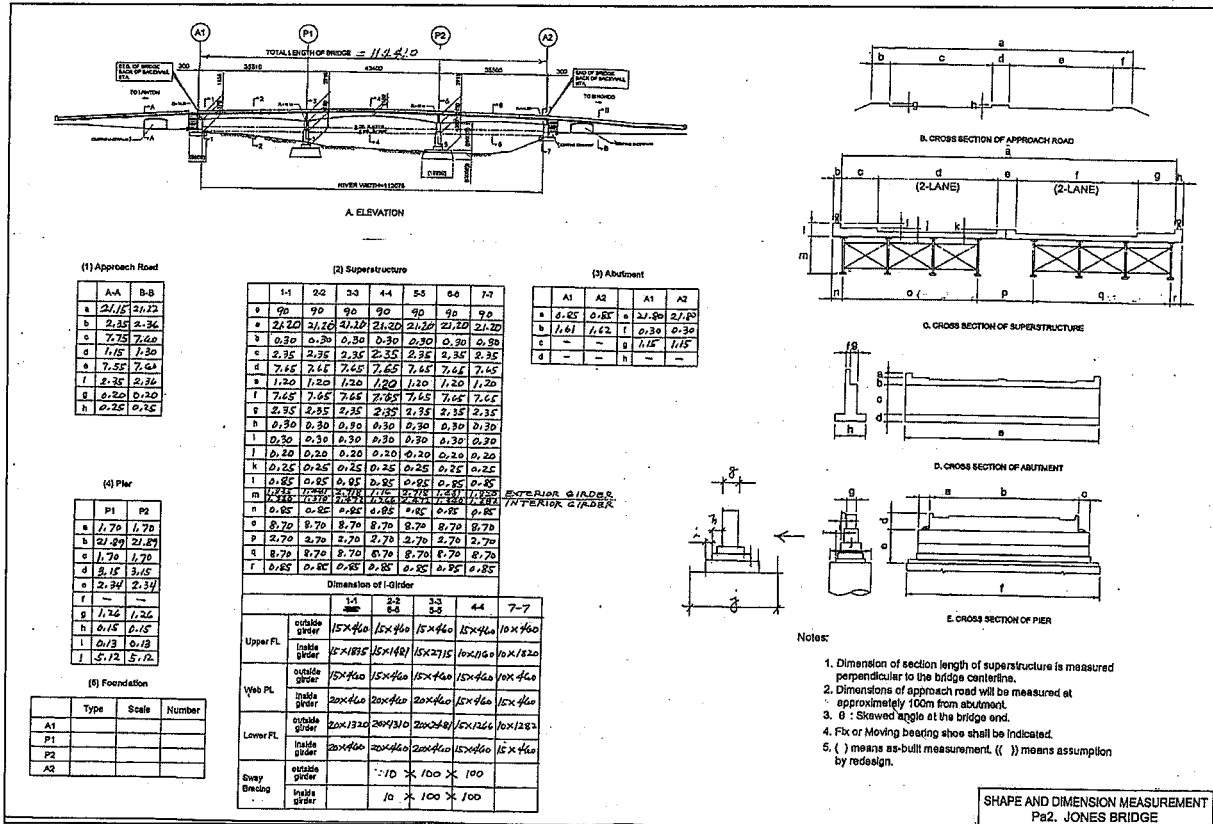


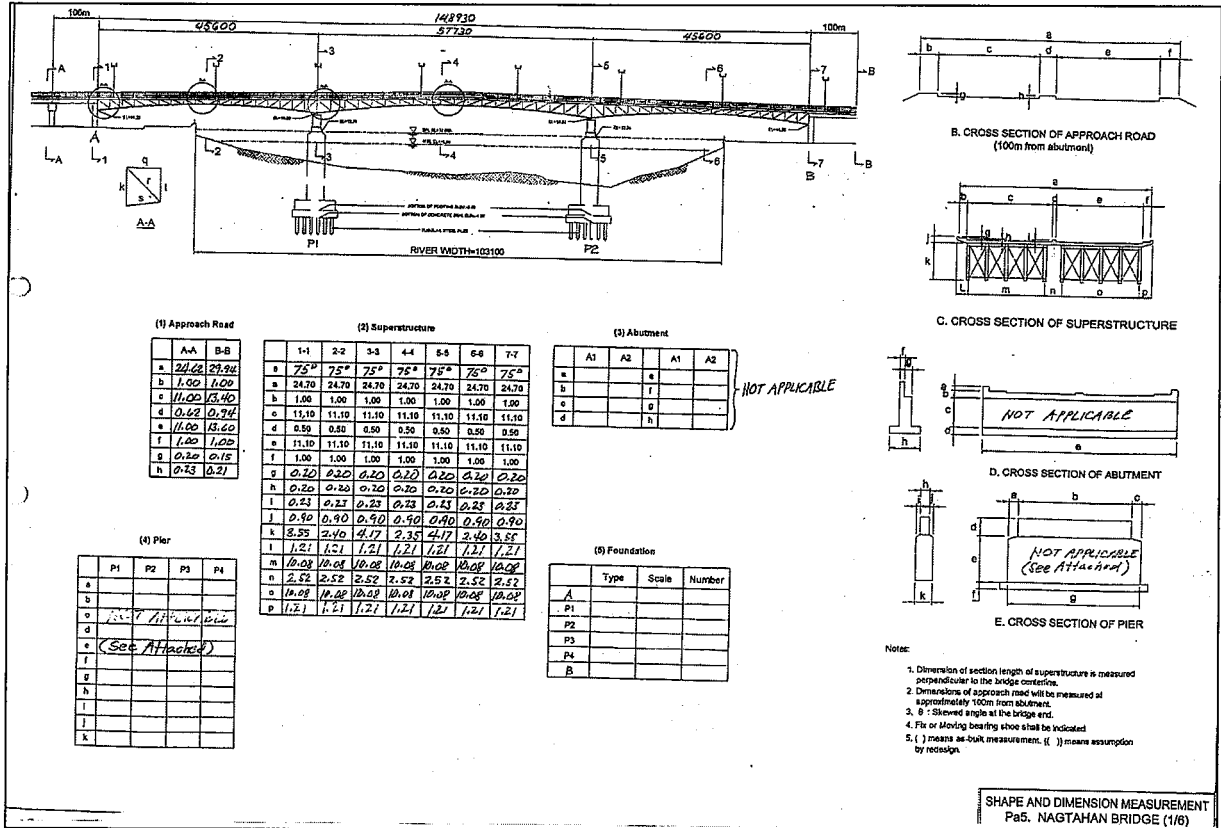
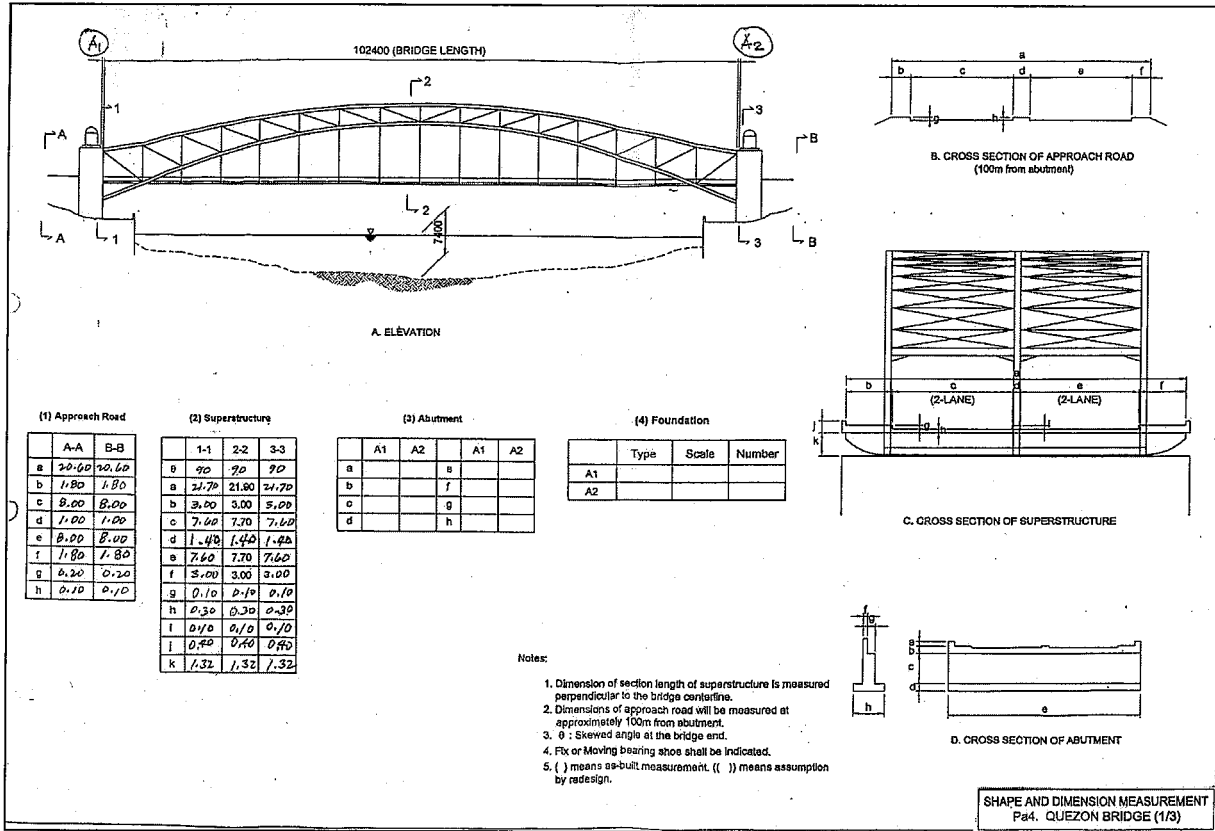
Appendix 7.1.2-2 (1/14)



Appendix 7.1.2-2 (2/14)



Appendix 7.1.2-2 (3/14)



Appendix 7.1.2-2 (4/14)

| SHAPE AND DIMENSION OF NAGTAHAN BRIDGE | | | | | | | | | | |
|--|--|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| NAME OF MEMBER | CROSS SECTION SHAPE, DIMENSION AND THICKNESS | | | | | | | | | |
| | SHAPE | DIMENSION | 1-1 | 2-2 | 3-3 | 4-4 | 5-5 | 6-6 | 7-7 | |
| UPPER CHORD | | TOP FLANGE | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | |
| | | WEB | 25x550 | 25x550 | 25x550 | 25x550 | 25x550 | 25x550 | 25x550 | |
| | | BOT. FLANGE | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 |
| LOWER CHORD | | TOP FLANGE | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | |
| | | WEB | 25x550 | 25x550 | 25x550 | 25x550 | 25x550 | 25x550 | 25x550 | |
| | | BOT. FLANGE | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 | 25x190 |
| DIAGONAL | | TOP FLANGE | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | |
| | | WEB | 12x206 | 12x206 | 12x206 | 12x206 | 12x206 | 12x206 | 12x206 | |
| | | BOT. FLANGE | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 |
| VERTICAL MEMBER | | TOP FLANGE | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | |
| | | WEB | 12x206 | 12x206 | 12x206 | 12x206 | 12x206 | 12x206 | 12x206 | |
| | | BOT. FLANGE | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x206 | 12x206 | 12x206 |
| CROSS BEAM | | TOP FLANGE | 25x190 | - | - | - | - | - | 25x190 | |
| | | WEB | 25x550 | - | - | - | - | - | - | 25x550 |
| | | BOT. FLANGE | 25x190 | - | - | - | - | - | - | 25x190 |
| SWAY BRACING | | TOP FLANGE | 25x190 | - | - | - | - | - | 25x190 | |
| | | WEB | 25x550 | - | - | - | - | - | - | 25x550 |
| | | BOT. FLANGE | 25x190 | - | - | - | - | - | - | 25x190 |
| | | TOP FLANGE | - | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | - |
| | | WEB | - | 12x206 | 12x206 | 12x206 | 12x206 | 12x206 | 12x206 | - |
| | | BOT. FLANGE | - | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | 12x180 | - |
| | | WIDTH | 100 | 100 | 100 | - | 100 | 100 | 100 | - |
| | | DEPTH | 100 | 100 | 100 | - | 100 | 100 | 100 | - |
| | | THICKNESS | 12 | 12 | 12 | - | 12 | 12 | 12 | - |
| | | WIDTH | - | - | - | 100 | - | - | - | - |
| | | DEPTH | - | - | - | 100 | - | - | - | - |
| | | THICKNESS | - | - | - | 16 | - | - | - | - |
| | WIDTH | - | - | - | 200 | - | - | - | - | |
| | DEPTH | - | - | - | 200 | - | - | - | - | |
| | THICKNESS | - | - | - | 9 | - | - | - | - | |

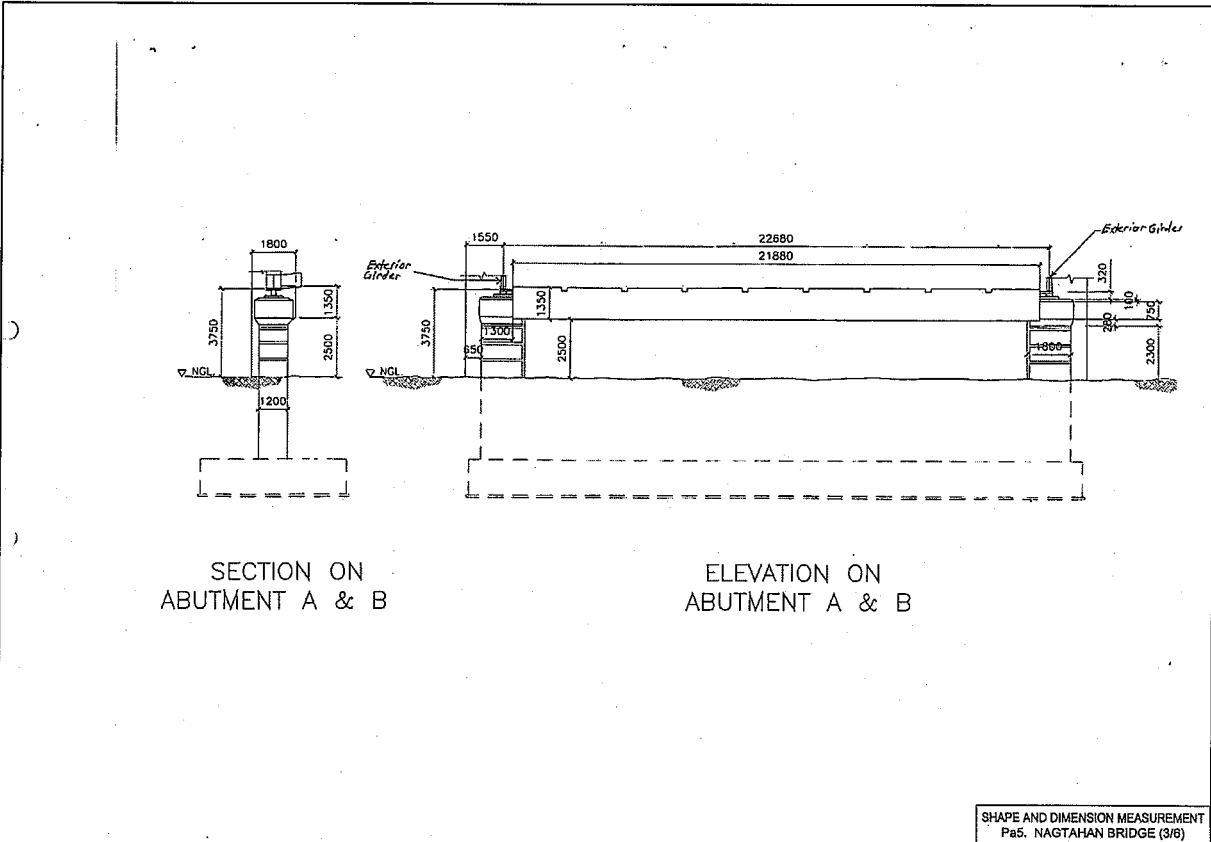
SECTIONS: 1-1, 7-7

SECTIONS: 2-2, 3-3, 5-5

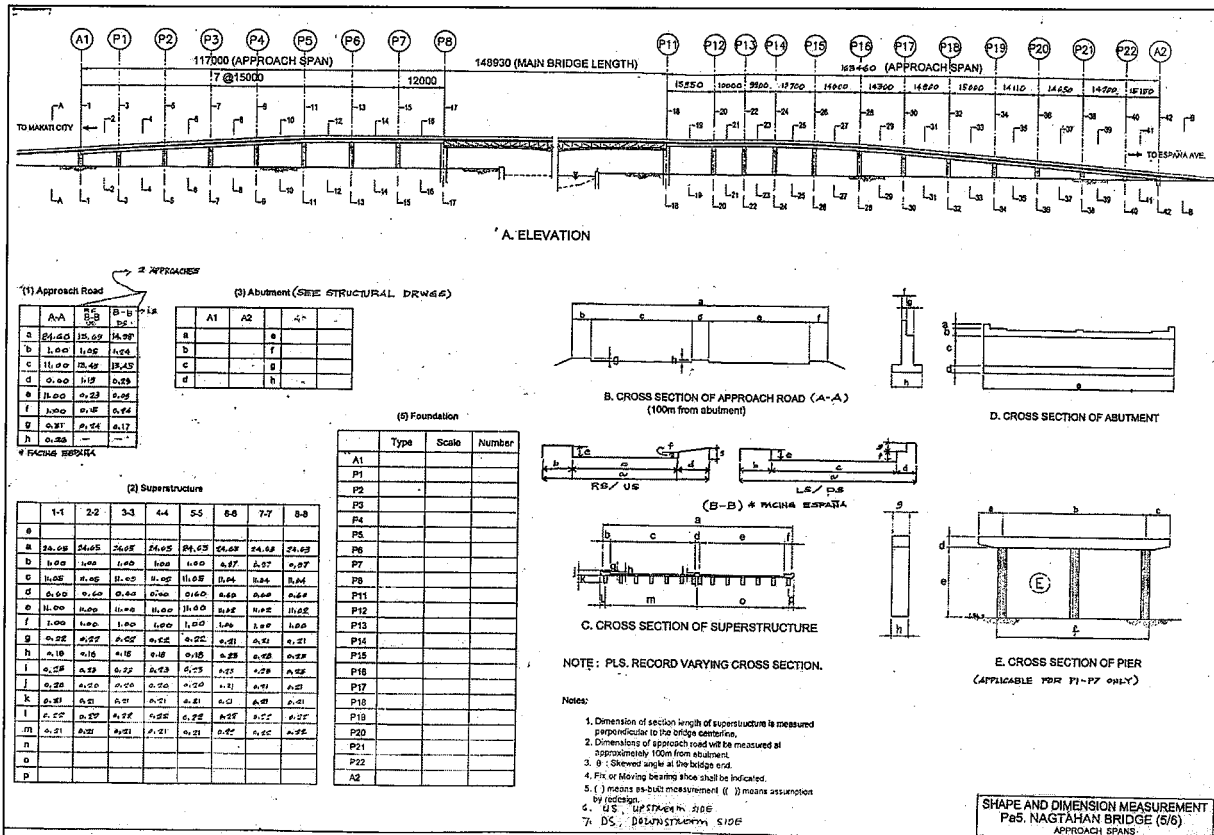
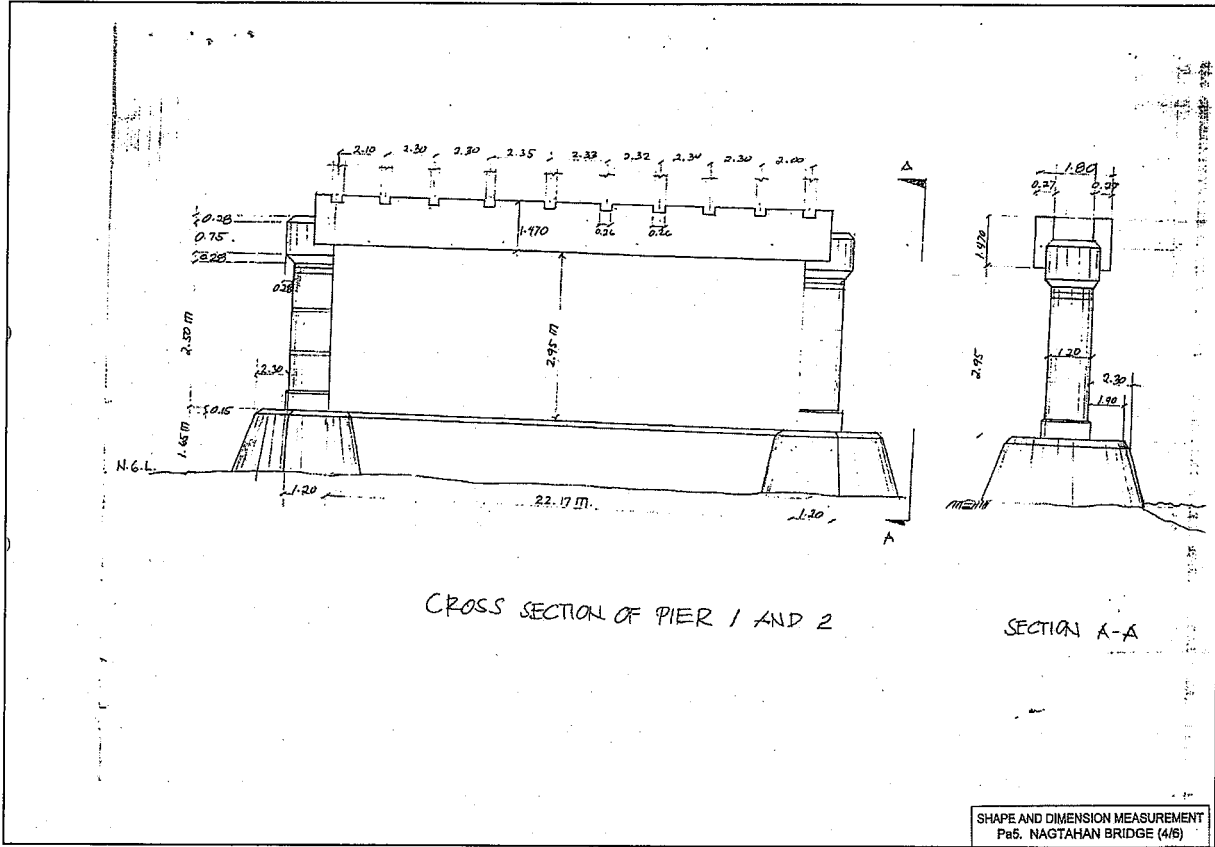
SECTION: 4-4

NOTE: ALL DIMENSIONS SHOWN ARE IN MILLIMETERS

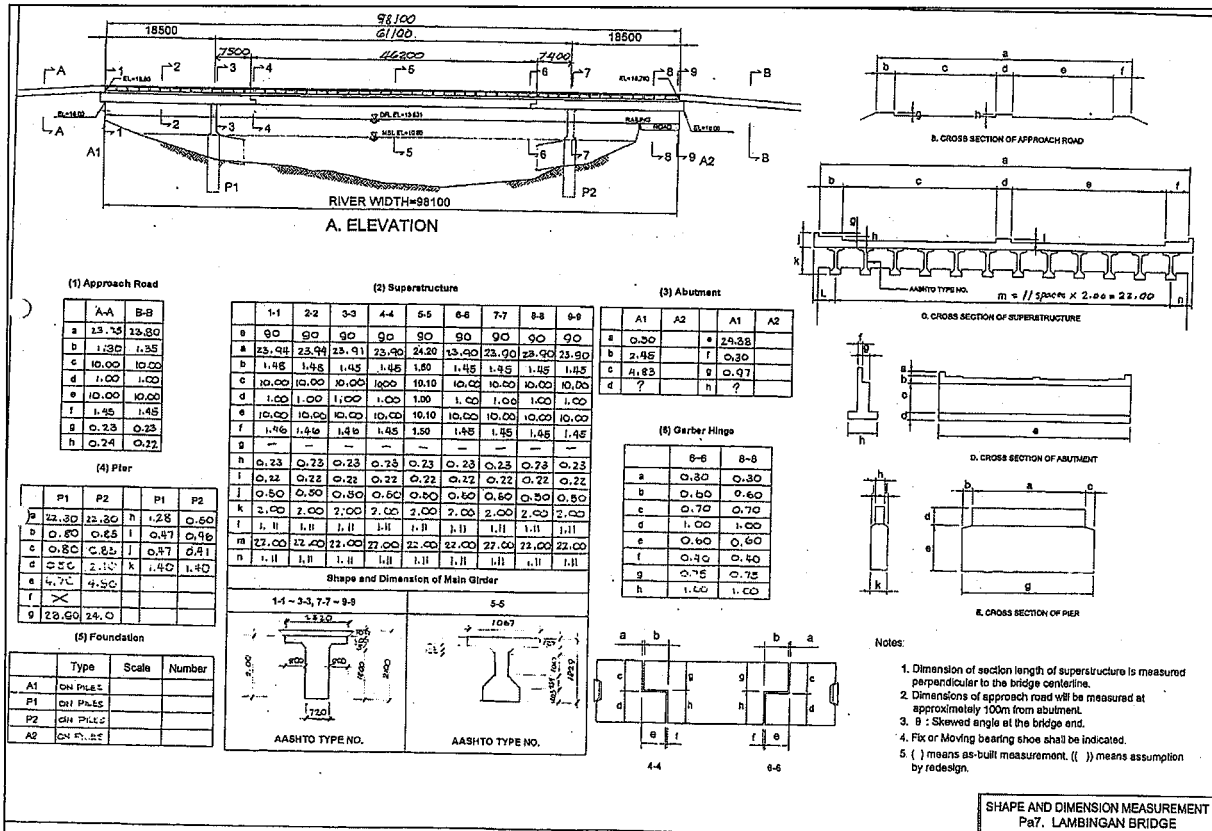
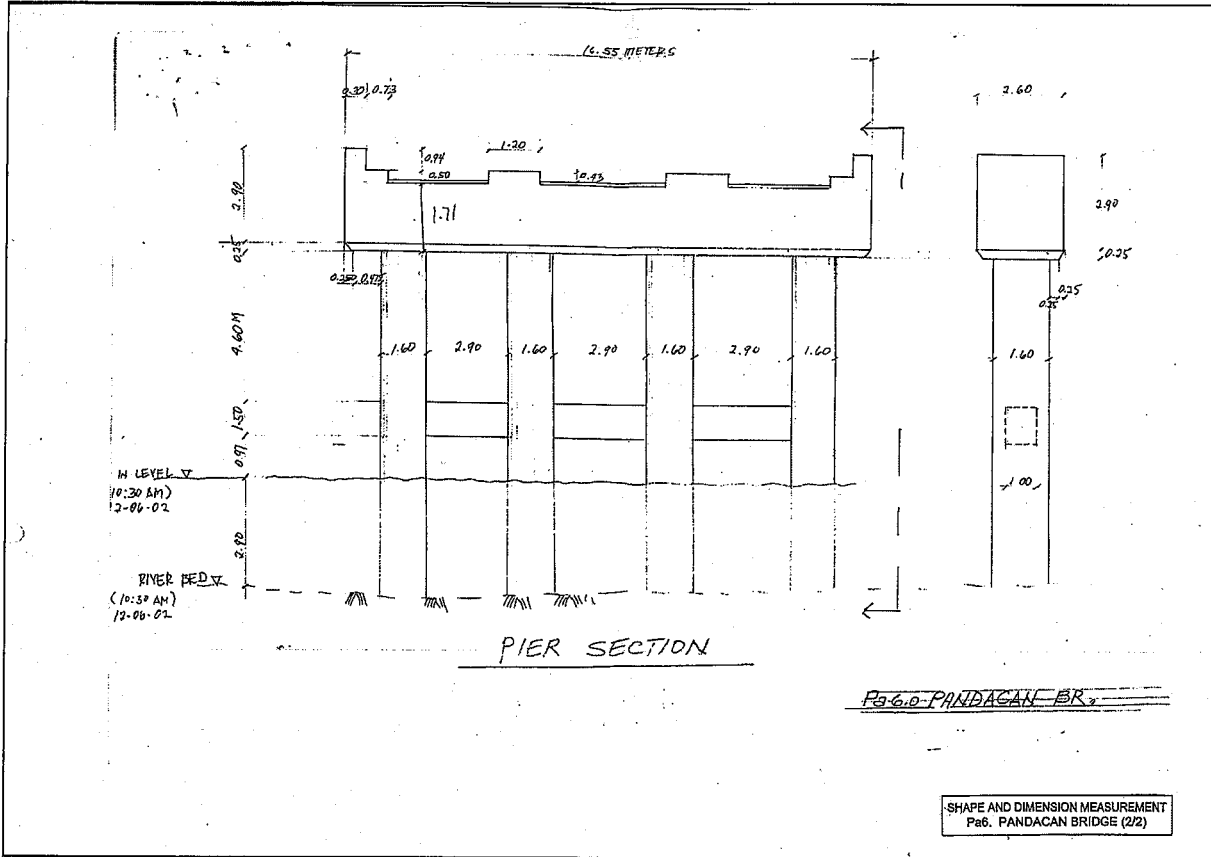
SHAPE AND DIMENSION MEASUREMENT
Pa5. NAGTAHAN BRIDGE (2/6)



Appendix 7.1.2-2 (5/14)



Appendix 7.1.2-2 (7/14)



Shape and Dimension of Main Girder

1-1 - 3-3, 7-7 - 9-9

AASHTO TYPE NO.

5-5

AASHTO TYPE NO.

(6) Garber Hinge

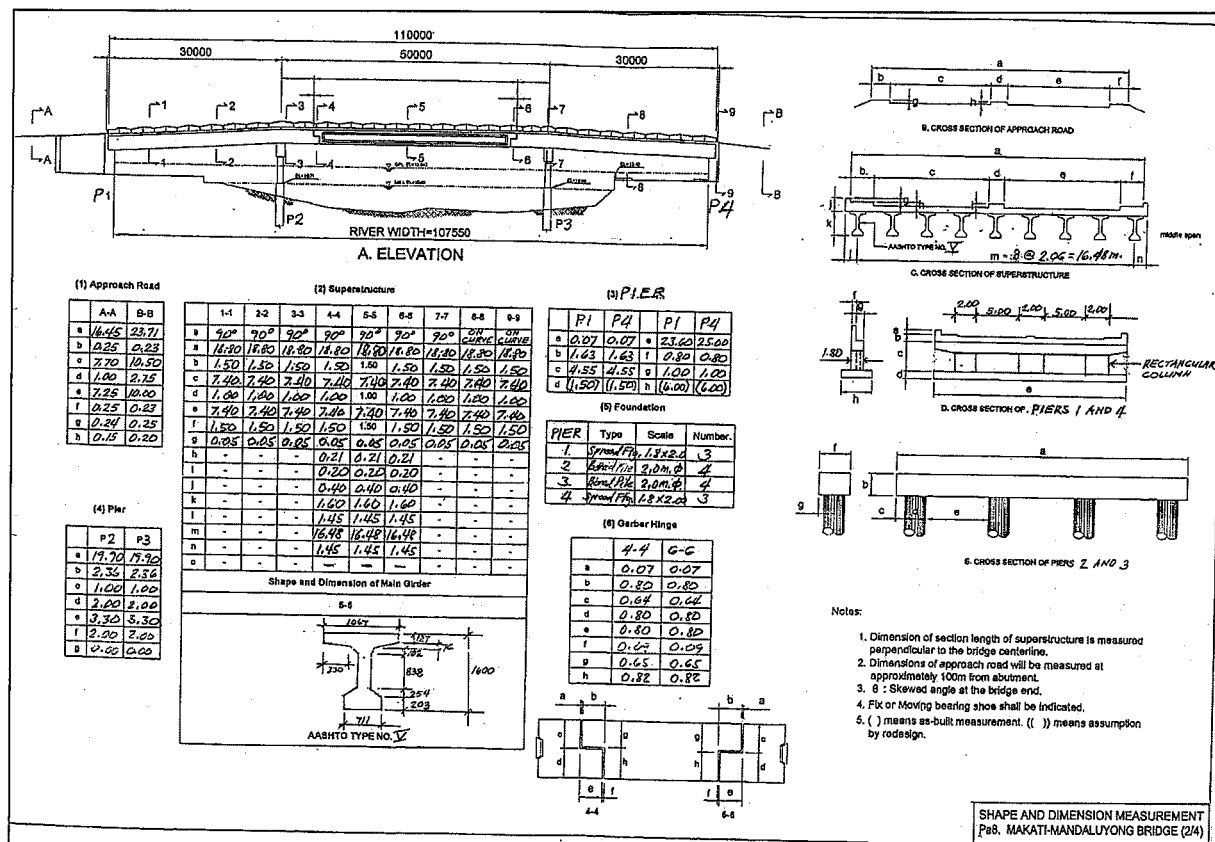
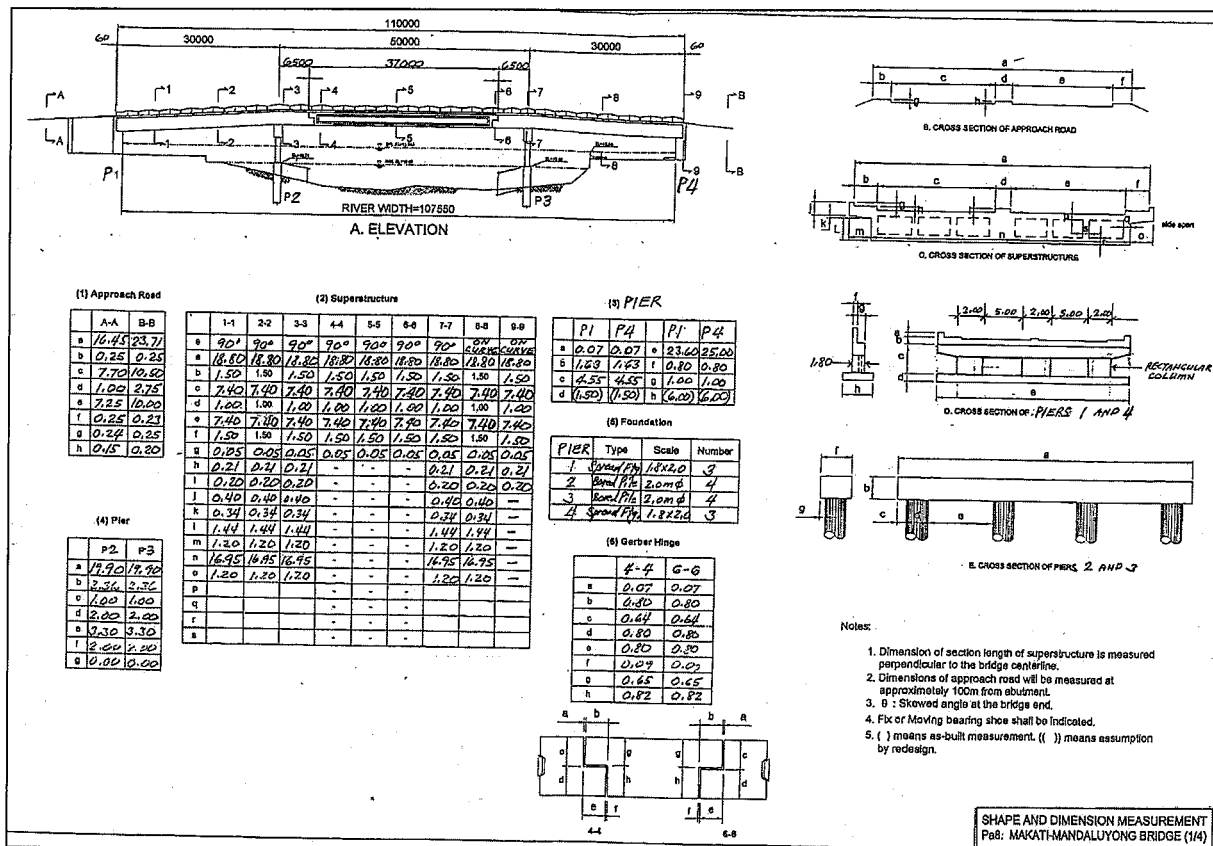
| | 8-8 | 8-8 |
|---|------|------|
| a | 0.80 | 0.30 |
| b | 0.60 | 0.60 |
| c | 0.70 | 0.70 |
| d | 1.00 | 1.00 |
| e | 0.60 | 0.60 |
| f | 0.40 | 0.40 |
| g | 0.75 | 0.75 |
| h | 1.00 | 1.00 |

Notes:

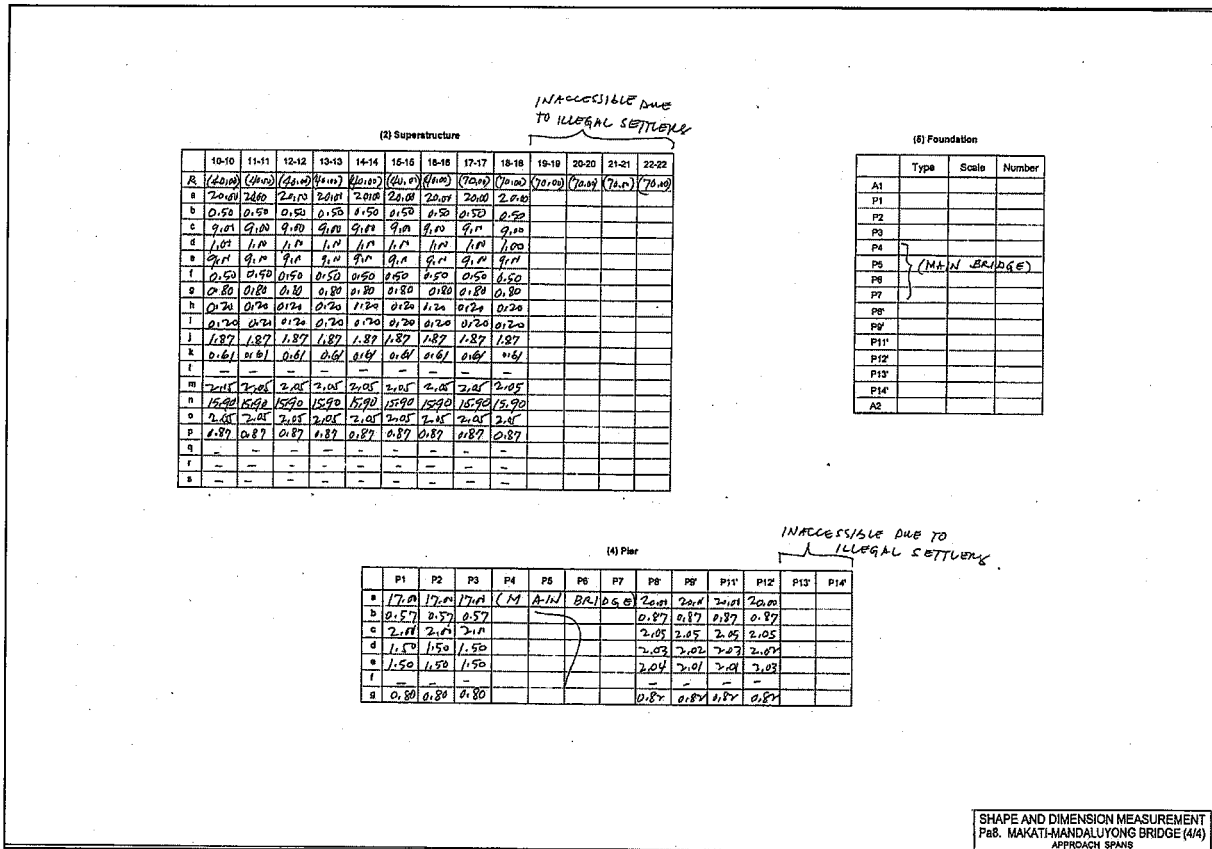
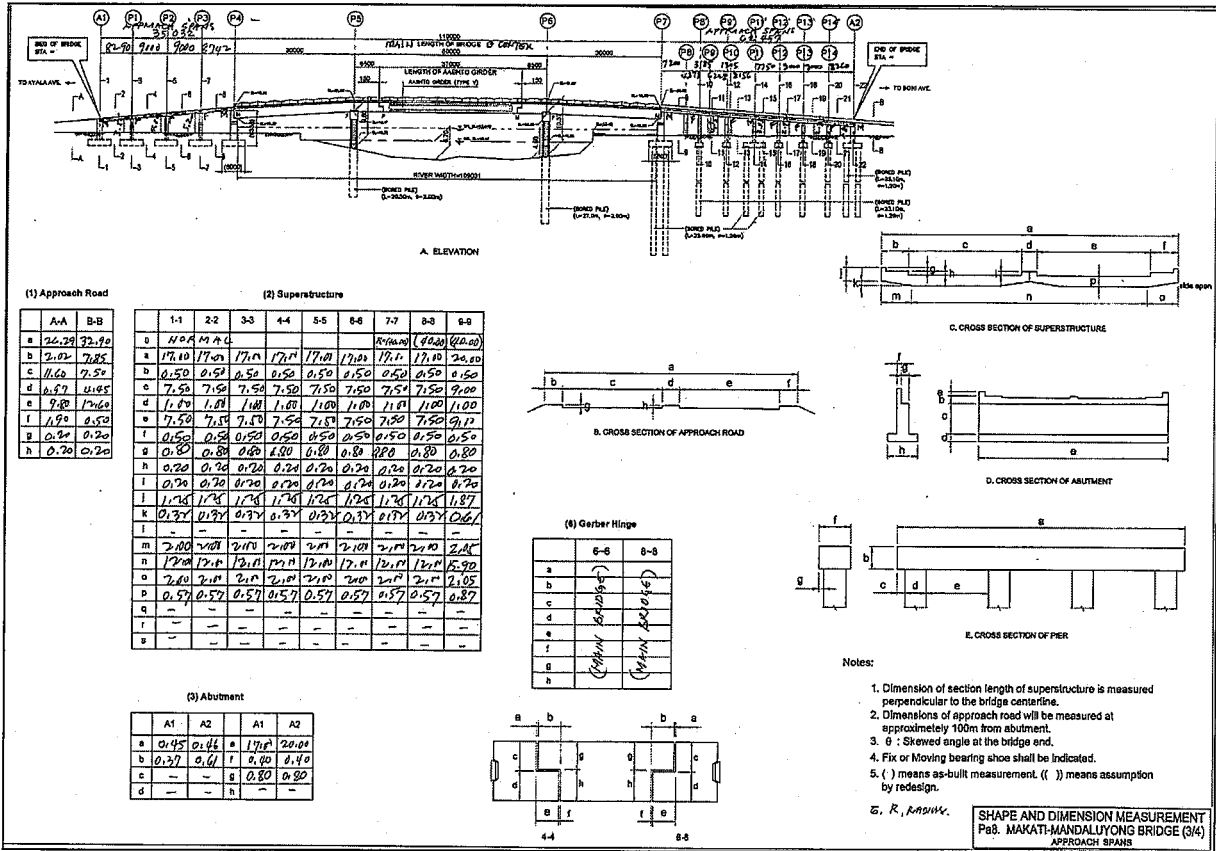
1. Dimension of section length of superstructure is measured perpendicular to the bridge centerline.
2. Dimensions of approach road will be measured at approximately 100m from abutment.
3. θ : Skewed angle at the bridge end.
4. Fix or Moving bearing shoe shall be indicated.
5. () means as-built measurement. () means assumption by redesign.

 SHAPE AND DIMENSION MEASUREMENT
 Pa7. LAMBINGAN BRIDGE

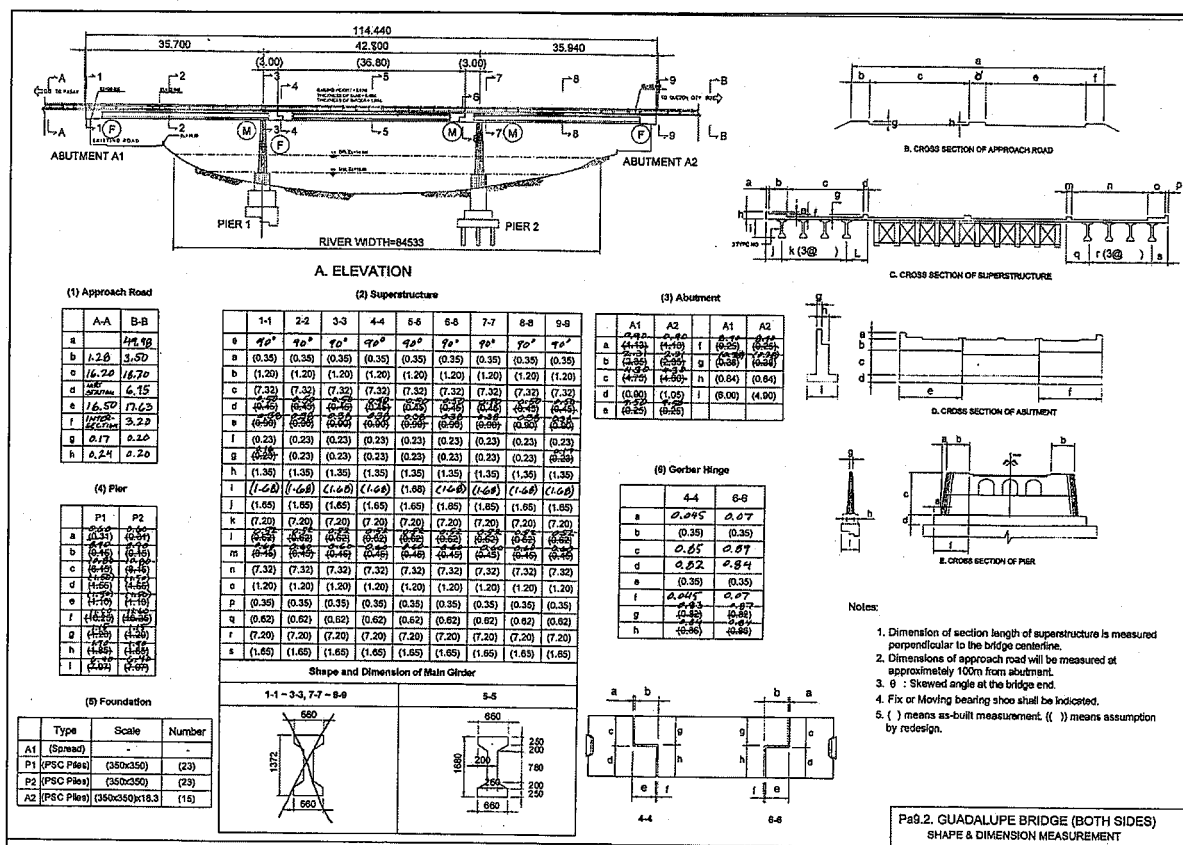
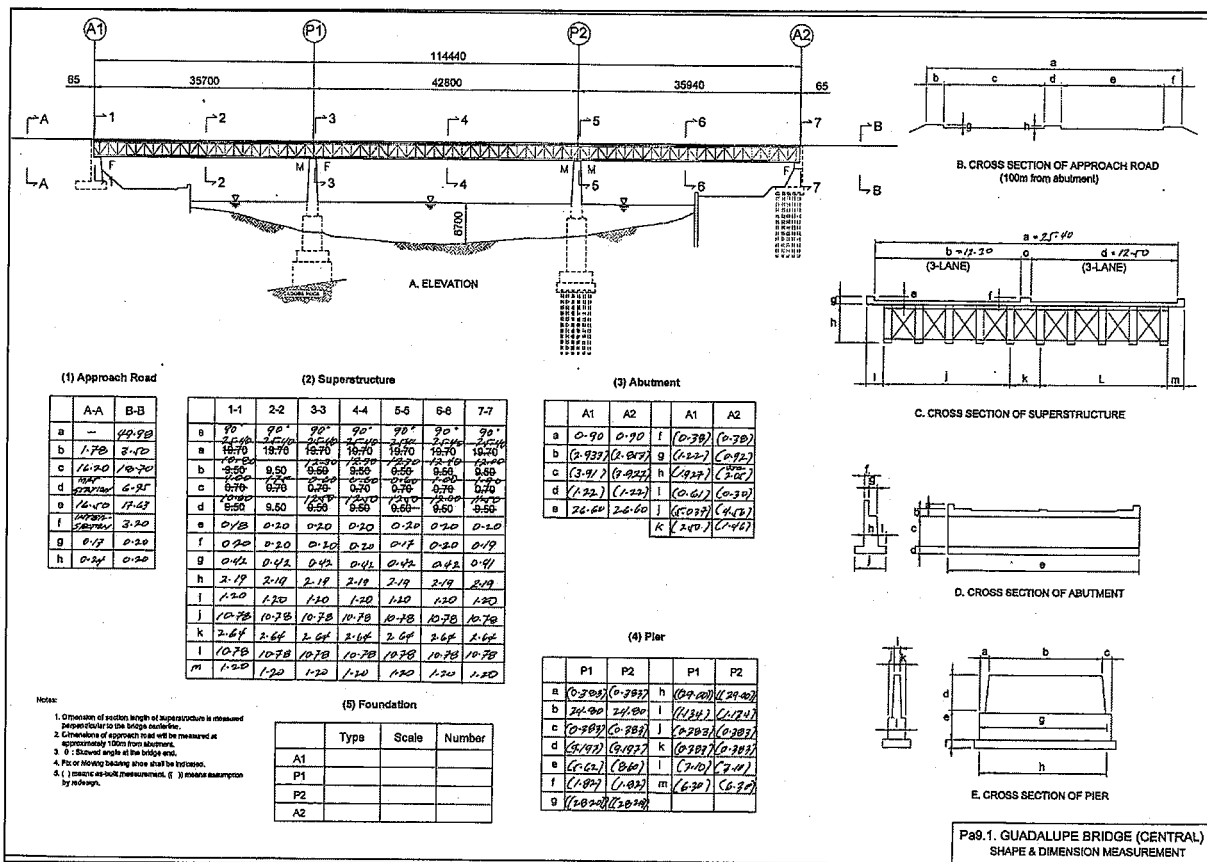
Appendix 7.1.2-2 (8/14)



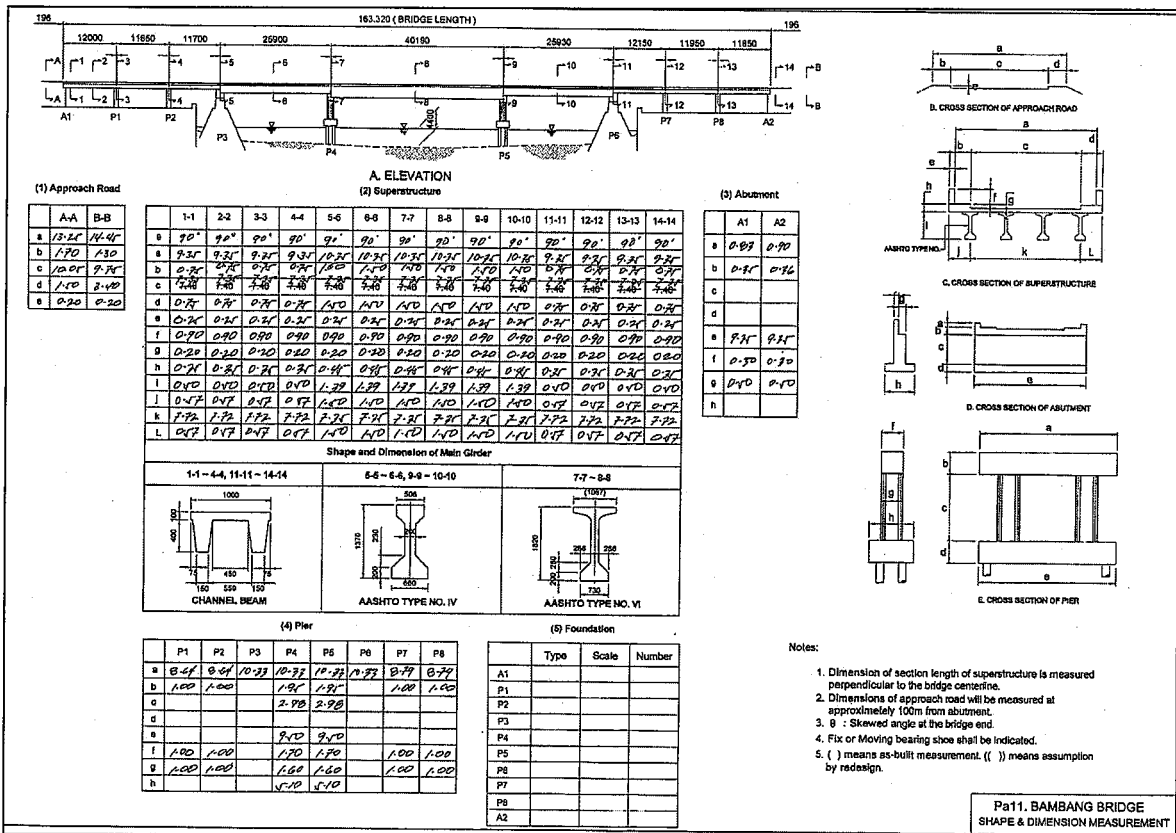
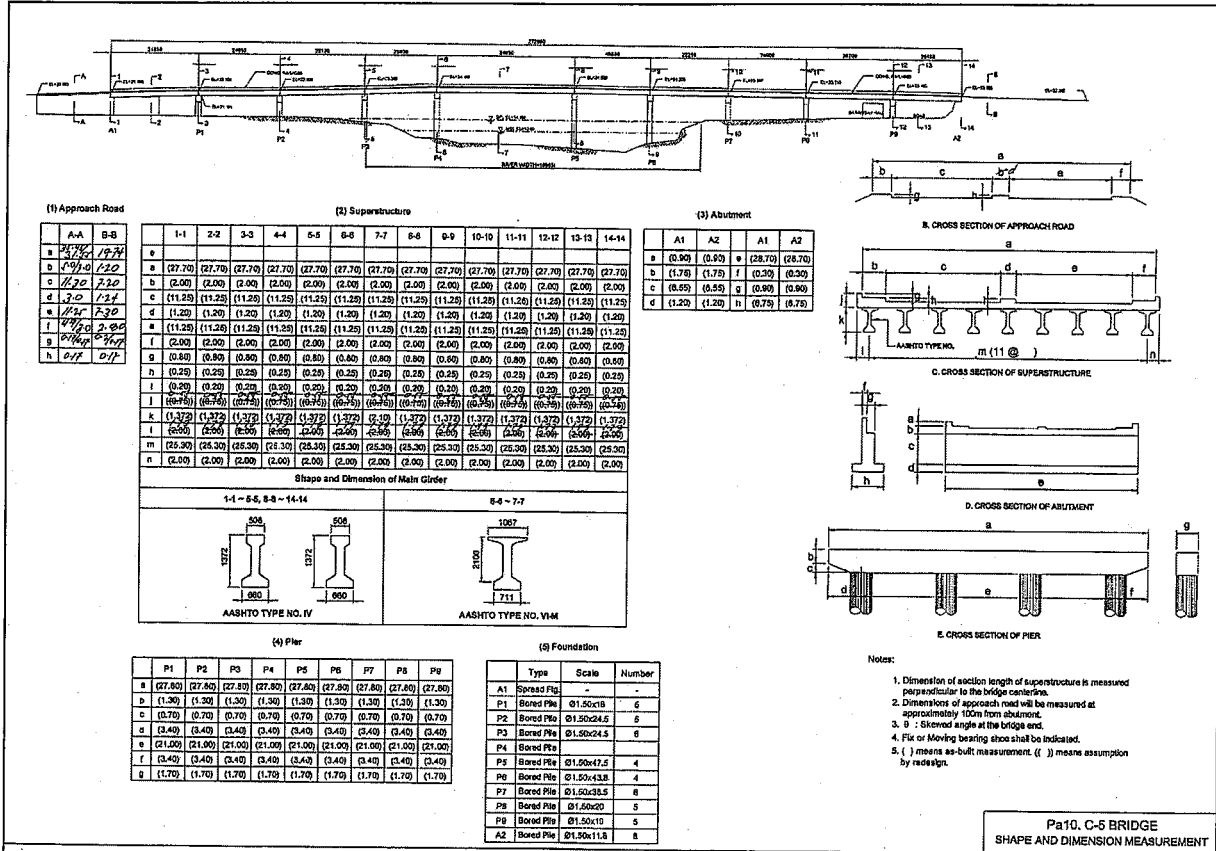
Appendix 7.1.2-2 (9/14)



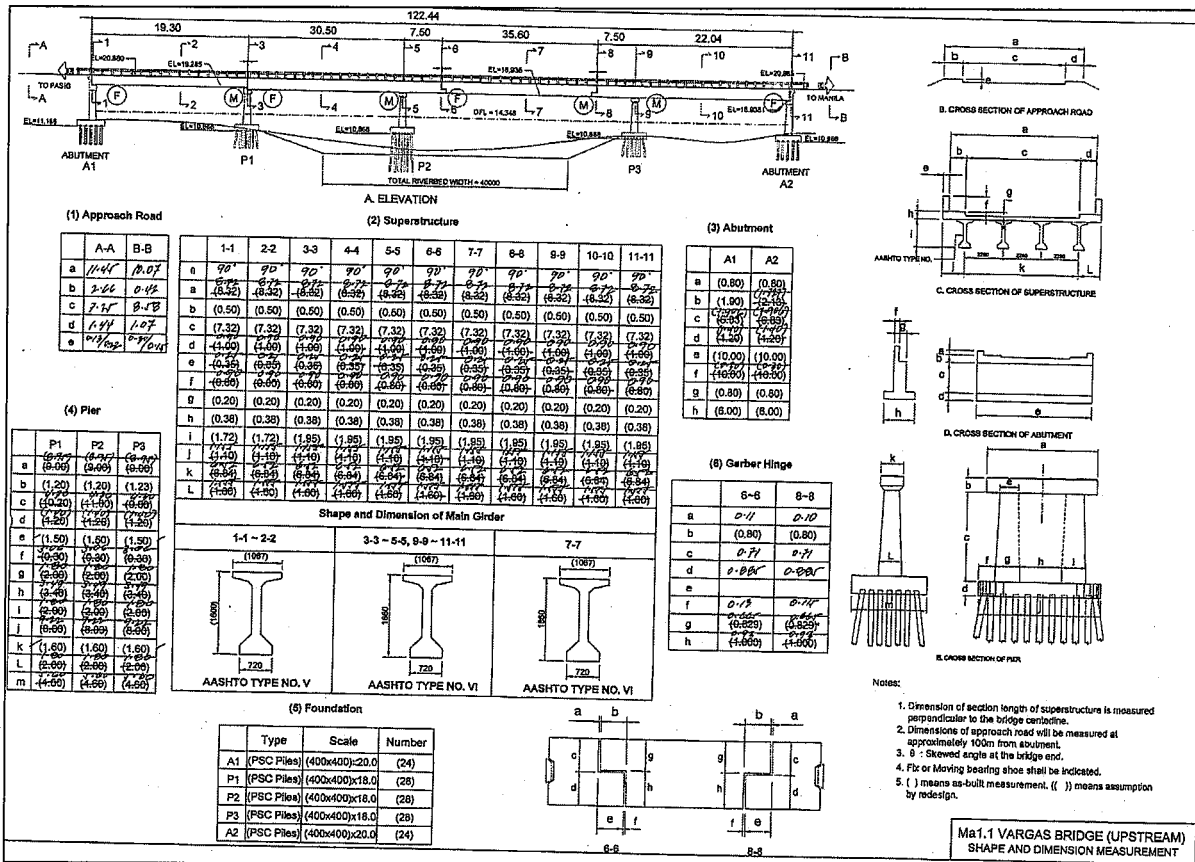
Appendix 7.1.2-2 (10/14)



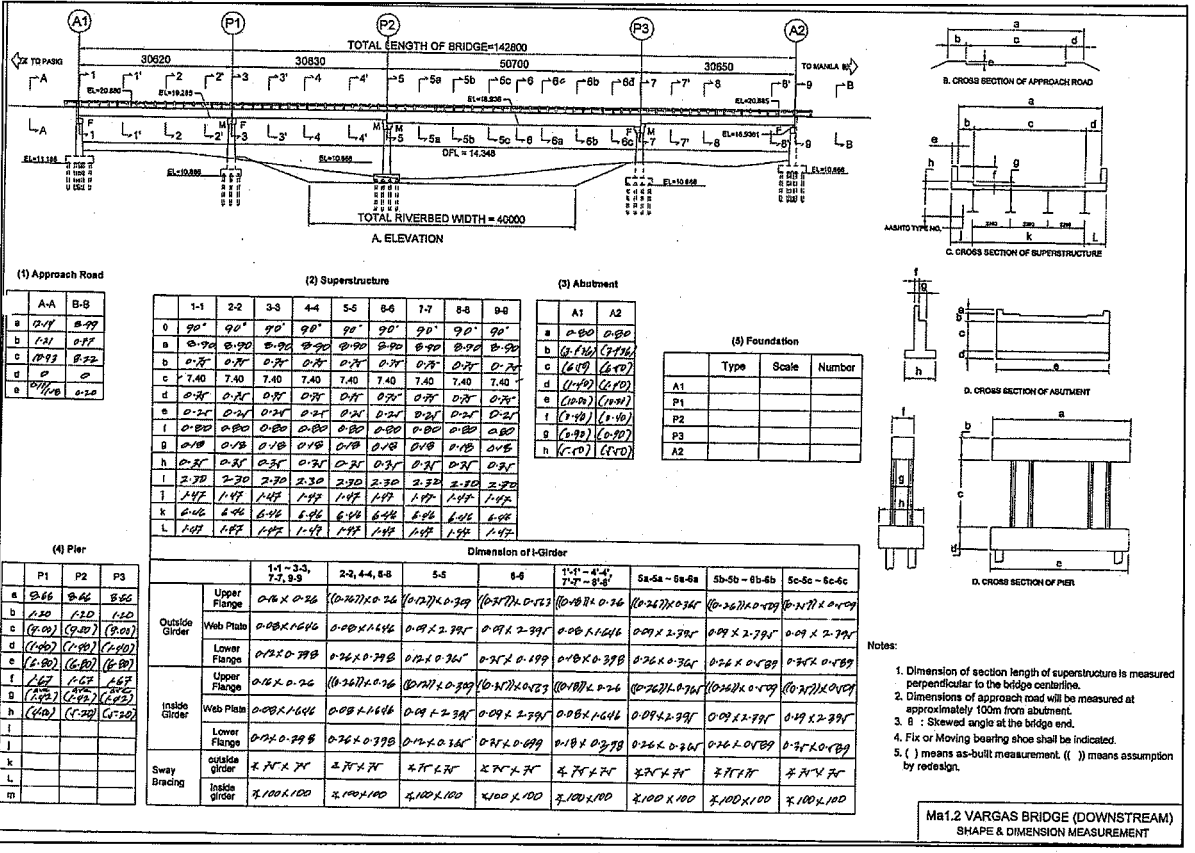
Appendix 7.1.2-2 (11/14)



Appendix 7.1.2-2 (12/14)

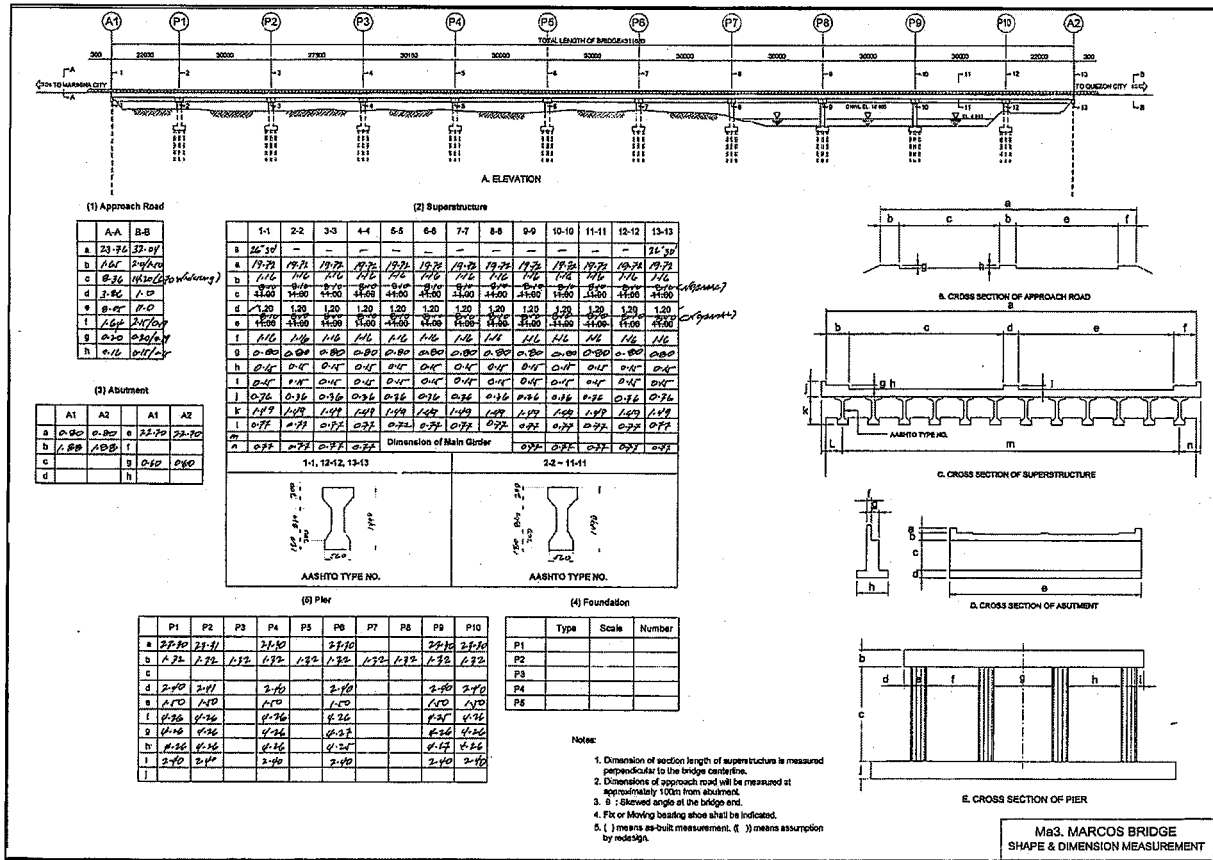
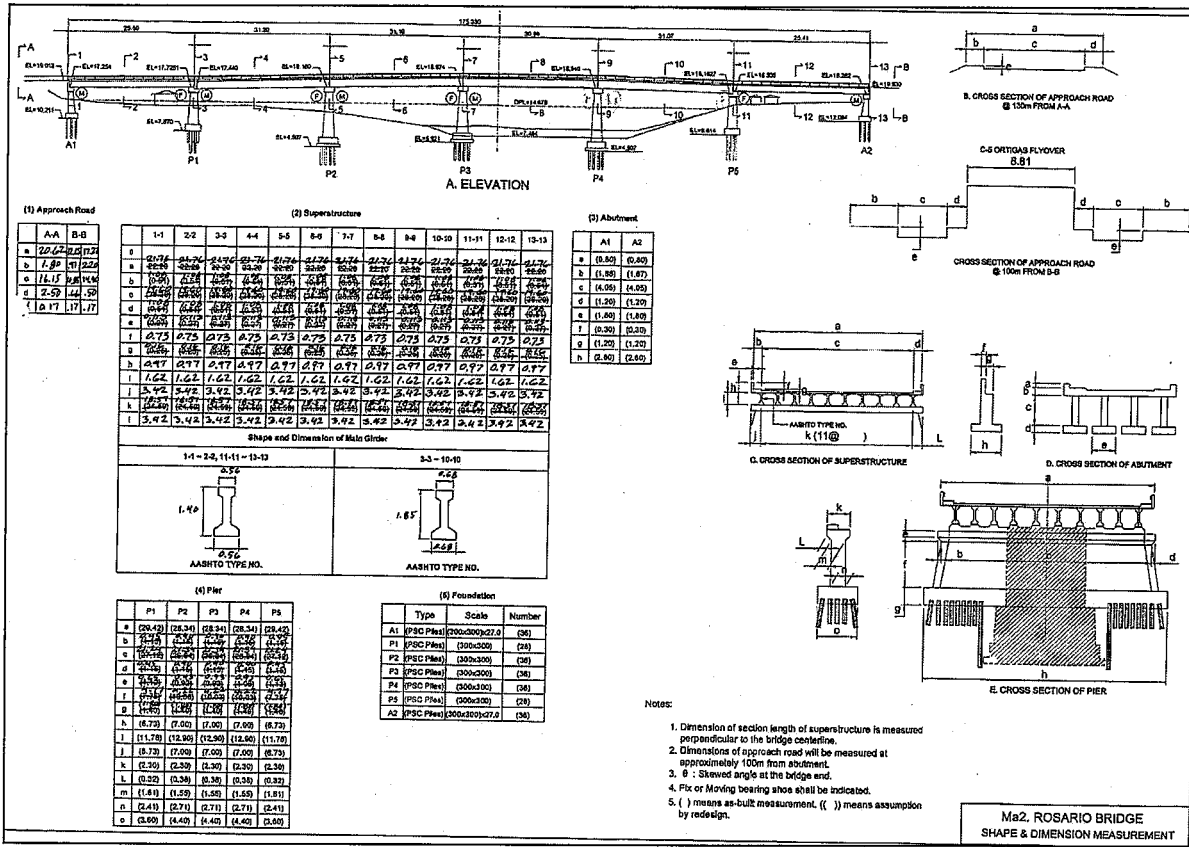


Ma1.1 VARGAS BRIDGE (UPSTREAM) SHAPE AND DIMENSION MEASUREMENT

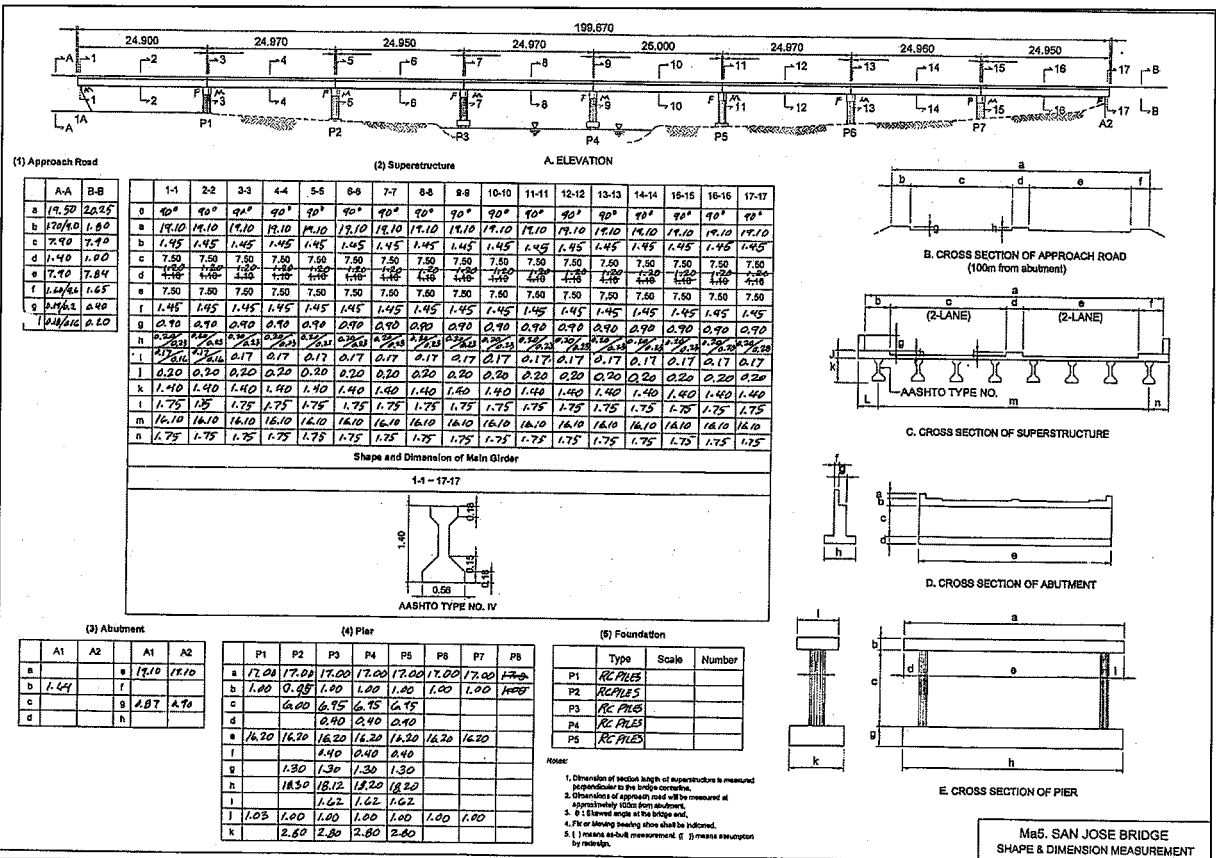
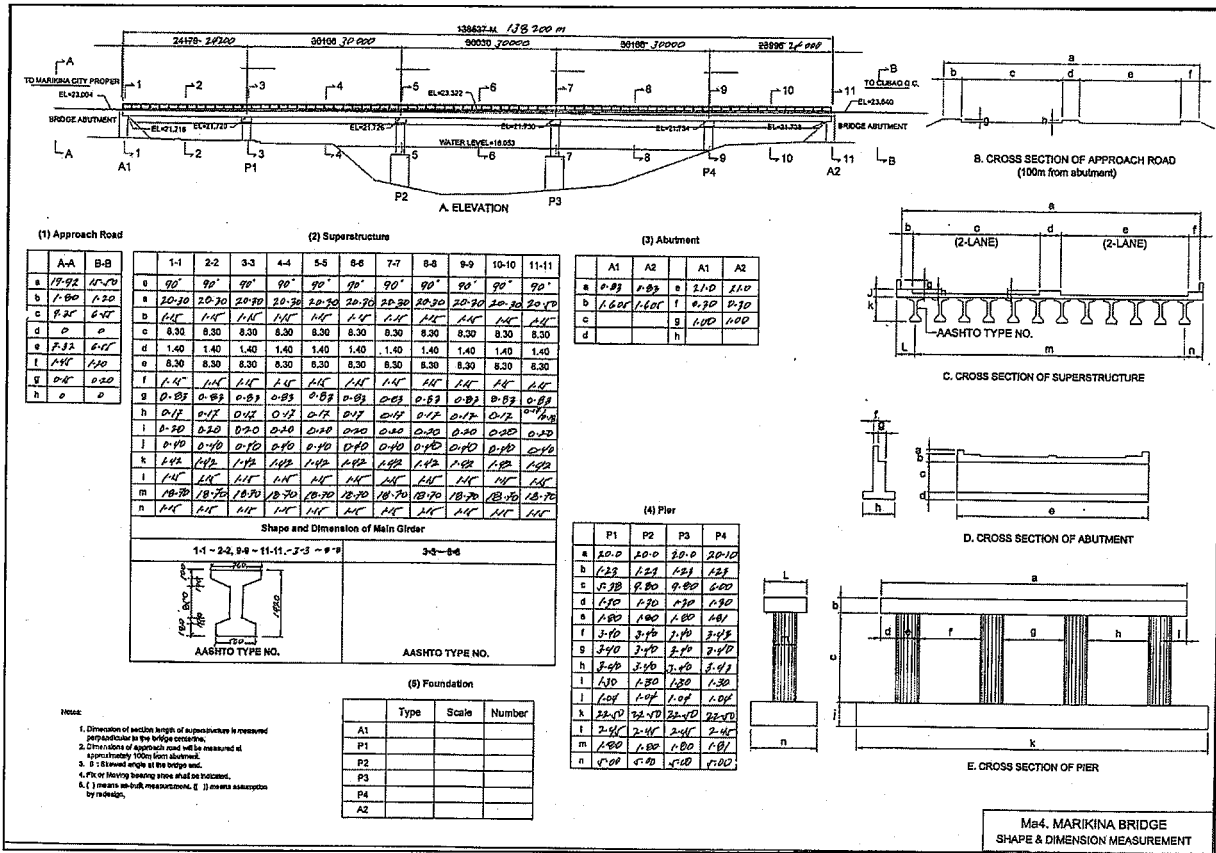


Ma1.2 VARGAS BRIDGE (DOWNSTREAM) SHAPE AND DIMENSION MEASUREMENT

Appendix 7.1.2-2 (13/14)



Appendix 7.1.2-2 (14/14)

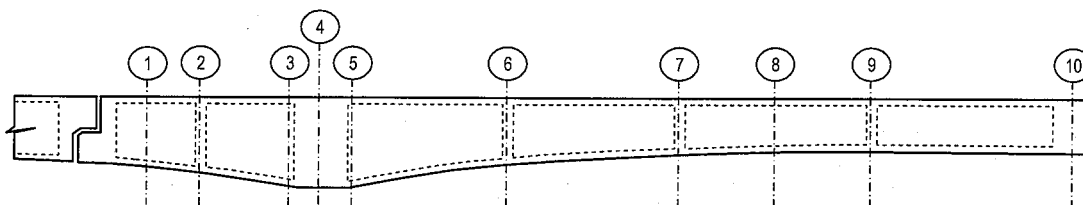


APPENDIX 7.4.3-1 (1/14)

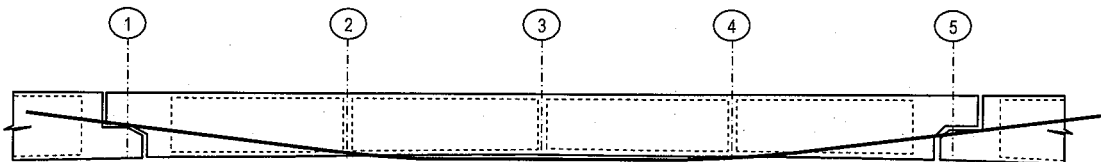
MATERIAL AND SECTION PROPERTIES

BRIDGE NAME : DELPAN BRIDGE (UPSTREAM)

| Member | Location | SECTION PROPERTIES | | | | | MATERIAL | |
|---------------|---------------|-------------------------------|-------------------------------------|-------------------------------------|-------------------------|----------------------------|-------------------------|-------------------------|
| | | Area, Ax (m ²) | I _x (m ⁴) | I _y (m ⁴) | Y _{top} (m) | Y _{bottom} (m) | f _c (Mpa) | f _y (Mpa) |
| Pier 1 & 4 | Upper | 33.850 | 7.650 | 1174.480 | 0.830 | 0.830 | 21 | 275 |
| Pier 2 & 3 | Upper | 36.590 | 8.280 | 1483.030 | 0.830 | 0.830 | 21 | 275 |
| Pier 1 to 4 | Lower | 49.750 | 20.750 | 2012.615 | 1.130 | 1.130 | 21 | 275 |
| PC Box Girder | Section 1-1 | 4.843 | 1.287 | 36.578 | 0.714 | 0.926 | 27.98 | 275 |
| PC Box Girder | Section 2-2 | 4.843 | 1.287 | 36.578 | 0.714 | 0.926 | 27.98 | 275 |
| PC Box Girder | Section 3-3 | 5.814 | 1.993 | 39.407 | 0.882 | 1.138 | 27.98 | 275 |
| PC Box Girder | Section 4-4 | 14.675 | 4.495 | 76.594 | 0.903 | 0.987 | 27.98 | 275 |
| PC Box Girder | Section 5-5 | 11.576 | 33.753 | 82.634 | 2.131 | 2.529 | 27.98 | 275 |
| PC Box Girder | Section 6-6 | 5.697 | 5.867 | 43.648 | 1.139 | 1.451 | 27.98 | 275 |
| PC Box Girder | Section 7-7 | 4.933 | 2.269 | 37.322 | 0.757 | 0.983 | 27.98 | 275 |
| PC Box Girder | Section 8-8 | 4.933 | 2.269 | 37.322 | 0.757 | 0.983 | 27.98 | 275 |
| PC Box Girder | Section 8-9 | 4.933 | 2.269 | 37.322 | 0.757 | 0.983 | 27.98 | 275 |
| PC Box Girder | Section 10-10 | 13.574 | 3.602 | 71.640 | 0.829 | 0.911 | 27.98 | 275 |



| | | | | | | | | |
|------------|-------------|--------|--------|--------|-------|-------|-------|-----|
| Box Girder | Section 1-1 | 18.825 | 11.029 | 82.634 | 1.250 | 1.340 | 27.98 | 275 |
| Box Girder | Section 2-2 | 5.049 | 3.865 | 49.352 | 0.948 | 1.217 | 27.98 | 275 |
| Box Girder | Section 3-3 | 4.686 | 2.156 | 36.578 | 0.757 | 0.983 | 27.98 | 275 |
| Box Girder | Section 4-4 | 5.049 | 3.865 | 49.352 | 0.948 | 1.217 | 27.98 | 275 |
| Box Girder | Section 5-5 | 18.825 | 11.029 | 82.634 | 1.250 | 1.340 | 27.98 | 275 |

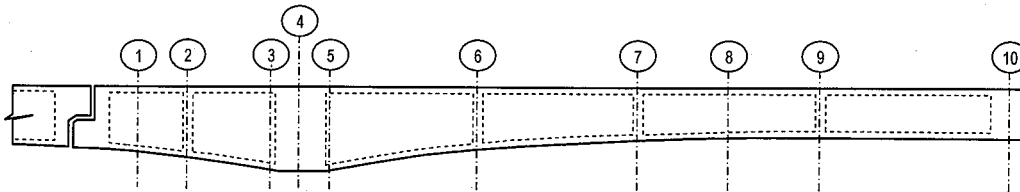


APPENDIX 7.4.3-1 (2/14)

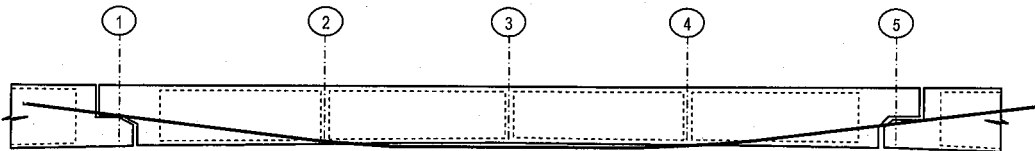
MATERIAL AND SECTION PROPERTIES

BRIDGE NAME : DELPAN BRIDGE (DOWNSTREAM)

| Member | Location | SECTION PROPERTIES | | | | | | MATERIAL | |
|------------|---------------|-------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|----------------------------|-------------------------|-------------------------|
| | | Area, Ax (m ²) | Ix (m ⁴) | Iy (m ⁴) | Iz (m ⁴) | Y _{top} (m) | Y _{bottom} (m) | f _c (Mpa) | f _y (Mpa) |
| Pier 1 | Upper | 35.009 | 11.522 | 896.720 | 908.250 | - | - | 21.676 | 275 |
| Pier 1 | Lower | 31.191 | 32.618 | 1092.298 | 1124.916 | - | - | 21.676 | 275 |
| Pier 2 | Upper | 30.906 | 8.249 | 761.320 | 769.570 | - | - | 21.676 | 275 |
| Pier 2 | Lower | 27.836 | 16.713 | 986.750 | 1003.465 | - | - | 21.676 | 275 |
| Box Girder | Section 1-1 | 9.724 | 9.688 | 201.400 | 211.090 | 1.084 | 1.476 | 27.983 | 275 |
| Box Girder | Section 2-2 | 10.394 | 14.204 | 214.290 | 228.490 | 1.275 | 1.725 | 27.983 | 275 |
| Box Girder | Section 3-3 | 18.433 | 42.052 | 344.740 | 386.790 | 1.787 | 2.233 | 27.983 | 275 |
| Box Girder | Section 4-4 | 52.989 | 75.797 | 763.940 | 839.730 | 1.939 | 2.081 | 27.983 | 275 |
| Box Girder | Section 5-5 | 18.433 | 42.052 | 344.740 | 386.790 | 1.787 | 2.233 | 27.983 | 275 |
| Box Girder | Section 6-6 | 10.106 | 12.142 | 208.750 | 220.900 | 1.197 | 1.618 | 27.983 | 275 |
| Box Girder | Section 7-7 | 8.905 | 5.465 | 185.650 | 191.120 | 0.846 | 1.168 | 27.983 | 275 |
| Box Girder | Section 8-8 | 8.693 | 4.591 | 181.580 | 186.180 | 0.785 | 1.088 | 27.983 | 275 |
| Box Girder | Section 9-9 | 9.034 | 6.040 | 188.130 | 194.170 | 0.883 | 1.217 | 27.983 | 275 |
| Box Girder | Section 10-10 | 33.558 | 18.880 | 502.770 | 521.650 | 1.177 | 1.313 | 27.983 | 275 |



| | | | | | | | | | |
|------------|-------------|--------|--------|---------|---------|-------|-------|--------|-----|
| Box Girder | Section 1-1 | 18.825 | 11.029 | | | 1.250 | 1.340 | 200000 | 275 |
| Box Girder | Section 2-2 | 9.034 | 6.040 | 188.130 | 194.170 | 0.883 | 1.217 | 27.983 | 275 |
| Box Girder | Section 3-3 | 9.034 | 6.040 | 188.130 | 194.170 | 0.883 | 1.217 | 27.983 | 275 |
| Box Girder | Section 4-4 | 9.034 | 6.040 | 188.130 | 194.170 | 0.883 | 1.217 | 27.983 | 275 |
| Box Girder | Section 5-5 | 18.825 | 11.029 | | | 1.250 | 1.340 | 200000 | 275 |

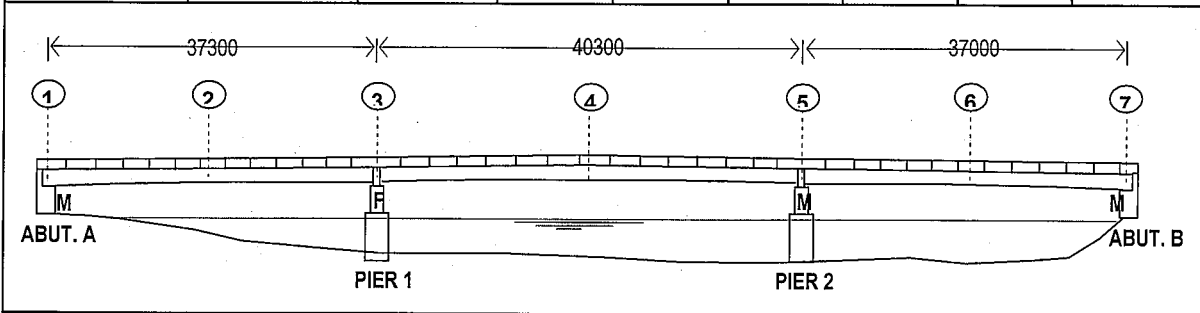


APPENDIX 7.4.3-1 (3/14)

MATERIAL AND SECTION PROPERTIES

BRIDGE NAME : MAC ARTHUR BRIDGE

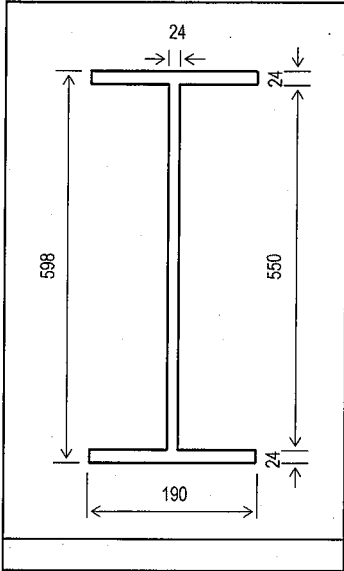
| Member | Location | SECTION PROPERTIES | | | | MATERIAL PROPERTIES | | |
|--------------------|-------------|-------------------------------|-------------------------|-------------------------|-------------------------|---------------------|-------------|-------------|
| | | Area, Ax (m ²) | Ix (m ⁴) | Iy (m ⁴) | Iz (m ⁴) | Es | fc (Mpa) | Fy (Mpa) |
| Pier 1 & 2 | Upper | 19.920 | 10.000 | 435.840 | 2.474 | 200000 | 21 | 275 |
| Pier 1 & 2 | Lower | 30.500 | 15.000 | 707.360 | 8.329 | 200000 | 21 | 275 |
| Steel Plate Girder | Section 1-1 | 0.959 | 0.018 | 11.613 | 0.486 | 200000 | - | 250 |
| Steel Plate Girder | Section 2-2 | 0.959 | 0.018 | 11.613 | 0.486 | 200000 | - | 250 |
| Steel Plate Girder | Section 3-3 | 0.959 | 0.018 | 11.613 | 0.486 | 200000 | - | 250 |
| Steel Plate Girder | Section 4-4 | 0.959 | 0.018 | 11.613 | 0.486 | 200000 | - | 250 |
| Steel Plate Girder | Section 5-5 | 0.959 | 0.018 | 11.613 | 0.486 | 200000 | - | 250 |
| Steel Plate Girder | Section 6-6 | 0.959 | 0.018 | 11.613 | 0.486 | 200000 | - | 250 |
| Steel Plate Girder | Section 7-7 | 0.959 | 0.018 | 11.613 | 0.486 | 200000 | - | 250 |



APPENDIX 7.4.3-1 (4/14)

BRIDGE NAME : NAGTAHAN BRIDGE

SECTION PROPERTIES - UPPER CHORD (REDUCED)



Torsional Moment of Inertia Formulas

For Square or Rectangular Section

$$I_x = [1/3 - 0.21 b/h (1 - b^4/12h^4)] h b^3 \quad \text{where } h > b$$

| Torsional Moment of Inertia about x-axis | | | |
|--|----|-----|-----------------------------------|
| Element | b | h | I _x (mm ⁴) |
| Top Flange | 24 | 190 | 805865 |
| Bottom Flange | 24 | 190 | 805865 |
| Girder Web | 24 | 550 | 2464727 |

$I_x = 4.076E+06 \text{ mm}^4$

| Moment of Inertia about z-axis | | | | | | |
|--------------------------------|----------------------|-----------------|-----------------------|-----------------------------------|--------|-------------------------------------|
| Element | A (mm ²) | Y (bottom) (mm) | AY (mm ³) | I _o (mm ⁴) | d (mm) | A d ² (mm ⁴) |
| Top Flange | 4560 | 586 | 2672160 | 218880 | 287 | 375602640 |
| Bottom Flange | 4560 | 12 | 54720 | 218880 | 287 | 375602640 |
| Girder Web | 13200 | 299 | 3946800 | 332750000 | 0 | 0 |

$Y' = \frac{\sum AY}{\sum A} = 299 \text{ mm.}$

$I_z = \sum I_o + \sum Ad^2 = 1.084E+09 \text{ mm}^4$

| Moment of Inertia about y-axis | | | | | | |
|--------------------------------|----------------------|-----------------|-----------------------|-----------------------------------|--------|-------------------------------------|
| Element | A (mm ²) | Y (bottom) (mm) | AY (mm ³) | I _o (mm ⁴) | d (mm) | A d ² (mm ⁴) |
| Top Flange | 4560 | 95 | 433200 | 13718000 | 0 | 0 |
| Bottom Flange | 4560 | 95 | 433200 | 13718000 | 0 | 0 |
| Girder Web | 13200 | 95 | 1254000 | 633600 | 0 | 0 |

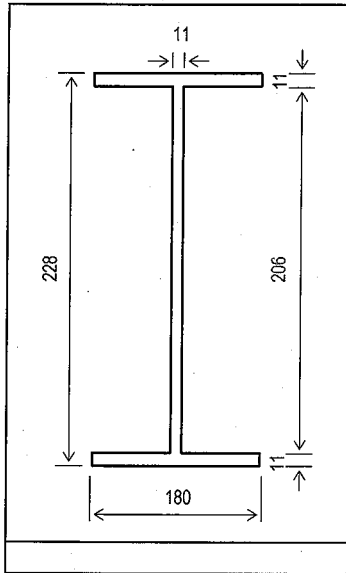
$Y' = \frac{\sum AY}{\sum A} = 95 \text{ mm.}$

$I_y = \sum I_o + \sum Ad^2 = 2.807E+07 \text{ mm}^4$

SUMMARY of PROPERTIES

| | |
|---|----------------------------|
| Total Area, A | 0.022320000 m ² |
| Torsional Moment of Inertia about x-axis | 0.000004076 m ⁴ |
| Moment of Inertia about y-axis, I _y | 0.000028070 m ⁴ |
| Moment of Inertia about z-axis, I _z | 0.001084393 m ⁴ |
| Centroid of Section from the bottom, Y _b | 0.299000000 m. |
| Centroid of Section from the top, Y _t | 0.299000000 m. |

SECTION PROPERTIES - DIAGONAL/VERTICAL MEMBER (REDUCED)



Torsional Moment of Inertia Formulas



For Square or Rectangular Section

$$I_x = [1/3 - 0.21 b/h (1 - b^4/12h^4)] h b^3 \quad \text{where } h > b$$

Torsional Moment of Inertia about x-axis

| Element | b | h | I_x (mm ⁴) |
|---------------|----|-----|--------------------------|
| Top Flange | 11 | 180 | 76785 |
| Bottom Flange | 11 | 180 | 76785 |
| Girder Web | 11 | 206 | 88321 |

$$\Rightarrow I_x = 2.419E+05 \text{ mm}^4$$

Moment of Inertia about z-axis

| Element | A (mm ²) | Y (bottom) (mm) | AY (mm ³) | I_o (mm ⁴) | d (mm) | A d ² (mm ⁴) |
|---------------|----------------------|-----------------|-----------------------|--------------------------|--------|-------------------------------------|
| Top Flange | 1980 | 223 | 440550 | 19965 | 109 | 23309055 |
| Bottom Flange | 1980 | 6 | 10890 | 19965 | 109 | 23309055 |
| Girder Web | 2266 | 114 | 258324 | 8013331 | 0 | 0 |

$$Y' = \frac{\sum AY}{\sum A} = 114 \text{ mm.}$$

$$\Rightarrow I_z = \sum I_o + \sum Ad^2 = 5.467E+07 \text{ mm}^4$$

Moment of Inertia about y-axis

| Element | A (mm ²) | Y (bottom) (mm) | AY (mm ³) | I_o (mm ⁴) | d (mm) | A d ² (mm ⁴) |
|---------------|----------------------|-----------------|-----------------------|--------------------------|--------|-------------------------------------|
| Top Flange | 1980 | 90 | 178200 | 5346000 | 0 | 0 |
| Bottom Flange | 1980 | 90 | 178200 | 5346000 | 0 | 0 |
| Girder Web | 2266 | 90 | 203940 | 22849 | 0 | 0 |

$$Y' = \frac{\sum AY}{\sum A} = 90 \text{ mm.}$$

$$\Rightarrow I_y = \sum I_o + \sum Ad^2 = 1.071E+07 \text{ mm}^4$$

SUMMARY of PROPERTIES

| | |
|--|----------------------------|
| Total Area, A | 0.006226000 m ² |
| Torsional Moment of Inertia about x-axis | 0.000000242 m ⁴ |
| Moment of Inertia about y-axis, I_y | 0.000010715 m ⁴ |
| Moment of Inertia about z-axis, I_z | 0.000054671 m ⁴ |
| Centroid of Section from the bottom, Y_b | 0.114000000 m. |
| Centroid of Section from the top, Y_t | 0.114000000 m. |

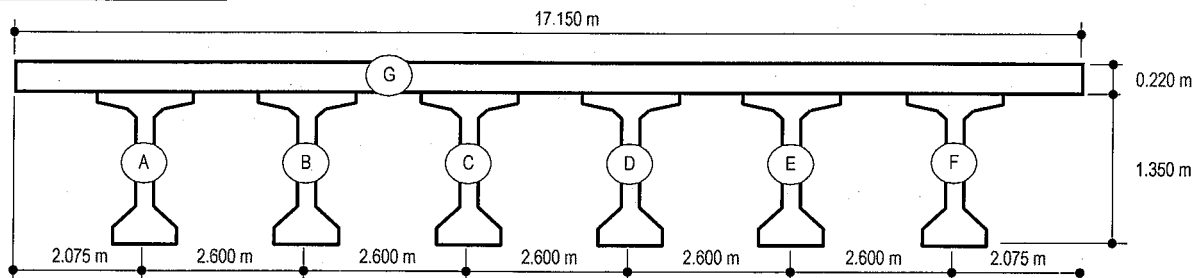
APPENDIX 7.4.3-1 (5/14)

BRIDGE NAME : PANDACAN BRIDGE

SECTION PROPERTIES

| | |
|---|----------------|
| Modulus of elasticity of prestressed concrete girder, E_c | = 27983.06 Mpa |
| Modulus of elasticity of reinforced concrete slab, E_{cs} | = 21675.58 Mpa |
| Modular ratio, $n = E_{cs} / E_c$ | = 0.774597 |

WHOLE STRUCTURE



A) Total Area (A_x) for Weight Computation

| | | | | | | | | |
|----------------|---|--------------------------------------|---|---|----------|-------|---|----------------------------|
| Girder | : | No. of girders \times A_{girder} | = | 6 | \times | 0.505 | = | 3.031 m ² |
| Slab | : | $bt = 17.150 \times 0.220$ | = | | \times | | = | 3.773 m ² |
| Haunch | : | No. of haunch \times A_{haun} | = | 6 | \times | 0.036 | = | 0.216 m ² |
| Total = | | | | | | | | 7.020 m² |

B) For I_x

| | | | | | | | | |
|----------------|---|---|---|---|----------|-------|---|----------------------------|
| Girder | : | No. of girders \times I_x | = | 6 | \times | 0.007 | = | 0.039 m ⁴ |
| Slab | : | $nbt^3 / 3 = 0.775 \times 17.150 \times 0.220^3 \div 3$ | = | | \div | 3 | = | 0.047 m ⁴ |
| Total = | | | | | | | | 0.087 m⁴ |

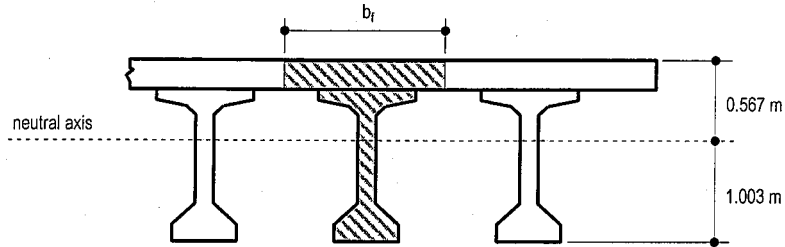
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------------|---------------------------|--------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.505 | 15.075 | 7.616 | 6.500 | 21.344 | 0.022 | 21.365 |
| B | 0.505 | 12.475 | 6.302 | 3.900 | 7.684 | 0.022 | 7.705 |
| C | 0.505 | 9.875 | 4.989 | 1.300 | 0.854 | 0.022 | 0.875 |
| D | 0.505 | 7.275 | 3.675 | 1.300 | 0.854 | 0.022 | 0.875 |
| E | 0.505 | 4.675 | 2.362 | 3.900 | 7.684 | 0.022 | 7.705 |
| F | 0.505 | 2.075 | 1.048 | 6.500 | 21.344 | 0.022 | 21.365 |
| G | 2.923 | 8.575 | 25.061 | 0.000 | 0.000 | 71.632 | 71.632 |
| Total | 5.954 | | 51.052 | | | | 131.524 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------------|---------------------------|-------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.505 | 0.603 | 0.305 | 0.421 | 0.089 | 0.102 | 0.192 |
| B | 0.505 | 0.603 | 0.305 | 0.421 | 0.089 | 0.102 | 0.192 |
| C | 0.505 | 0.603 | 0.305 | 0.421 | 0.089 | 0.102 | 0.192 |
| D | 0.505 | 0.603 | 0.305 | 0.421 | 0.089 | 0.102 | 0.192 |
| E | 0.505 | 0.603 | 0.305 | 0.421 | 0.089 | 0.102 | 0.192 |
| F | 0.505 | 0.603 | 0.305 | 0.421 | 0.089 | 0.102 | 0.192 |
| G | 2.923 | 1.460 | 4.267 | 0.436 | 0.556 | 0.012 | 0.568 |
| Total | 5.954 | | 6.095 | | | | 1.719 |

INTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned}
 \text{a) } 1/4 \text{ span length} &= 27.500 \div 4 &= 6.875 \text{ m} \\
 \text{b) Center-to-center spacing of girde} &= 2.600 &= 2.600 \text{ m} \\
 \text{c) Web width + 12 times slab thickr} &= 0.203 + 12 \times 0.220 &= 2.843 \text{ m} \\
 \text{Use } b_f &= 2.600 \text{ m}
 \end{aligned}$$

A) Total Area (A_x) for Weight Computation

$$\begin{aligned}
 \text{Girder} &: &= 0.505 \text{ m}^2 \\
 \text{Slab} &: b_f t = 2.600 \times 0.220 &= 0.572 \text{ m}^2 \\
 \text{Haunch} &: &= 0.036 \text{ m}^2 \\
 \text{Total} &= 1.113 \text{ m}^2
 \end{aligned}$$

B) For I_x

$$\begin{aligned}
 \text{Girder} &: &= 0.007 \text{ m}^4 \\
 \text{Slab} &: nb_f t^3 / 3 = 0.775 \times 2.600 \times 0.220^3 \div 3 &= 0.007 \text{ m}^4 \\
 \text{Total} &= 0.014 \text{ m}^4
 \end{aligned}$$

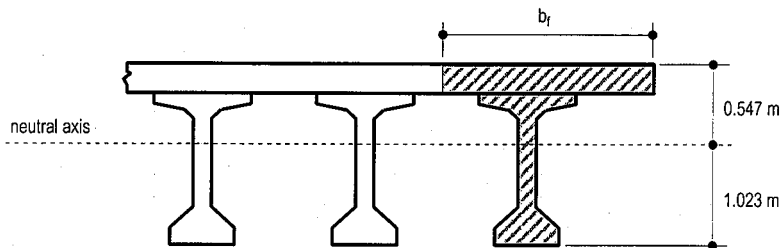
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.505 | 1.300 | 0.657 | 0.000 | 0.000 | 0.022 | 0.022 |
| Slab | 0.443 | 1.300 | 0.576 | 0.000 | 0.000 | 0.250 | 0.250 |
| Total | 0.948 | | 1.233 | | | | 0.271 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.505 | 0.603 | 0.305 | 0.400 | 0.081 | 0.102 | 0.183 |
| Slab | 0.443 | 1.460 | 0.647 | 0.457 | 0.092 | 0.002 | 0.094 |
| Total | 0.948 | | 0.951 | | | | 0.278 |

EXTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned}
 \text{a) } 1/4 \text{ span length} &= 27.500 \div 4 &= 6.875 \text{ m} \\
 \text{b) } 1/2 \text{ girder spacing + length of cantile} &= 1.300 + 2.075 &= 3.375 \text{ m} \\
 \text{c) Web width + 12 times slab thicknes:} &= 0.203 + 12 \times 0.220 &= 2.843 \text{ m} \\
 \text{Use } b_f &= 2.843 \text{ m}
 \end{aligned}$$

A) Total Area (A_x) for Weight Computation

Girder : = 0.505 m²
 Slab : $b_t t = 2.843 \times 0.220$ = 0.625 m²
 Haunch : = 0.036 m²
 Total = **1.167 m²**

B) For I_x

Girder : = 0.007 m⁴
 Slab : $nb_t^3 / 3 = 0.775 \times 2.843 \times 0.220^3 \div 3$ = 0.008 m⁴
 Total = **0.014 m⁴**

C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.505 | 2.075 | 1.048 | 0.320 | 0.052 | 0.022 | 0.073 |
| Slab | 0.484 | 1.422 | 0.689 | 0.334 | 0.054 | 0.326 | 0.380 |
| Total | 0.990 | | 1.737 | | | | 0.453 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.505 | 0.603 | 0.305 | 0.420 | 0.089 | 0.102 | 0.191 |
| Slab | 0.484 | 1.460 | 0.707 | 0.437 | 0.093 | 0.002 | 0.095 |
| Total | 0.990 | | 1.012 | | | | 0.286 |

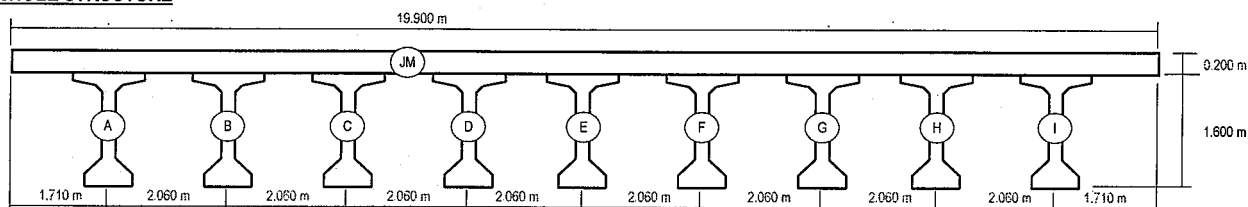
APPENDIX 7.4.3-1 (6/14)

BRIDGE NAME : MAKATI-MANDALUYONG BRIDGE

SECTION PROPERTIES (TYPE 5)

Modulus of elasticity of prestressed concrete girder, E_c = 27983.06 Mpa
 Modulus of elasticity of reinforced concrete slab, E_{cs} = 21675.58 Mpa
 Modular ratio, $n = E_{cs} / E_c$ = 0.774597

WHOLE STRUCTURE



A) Total Area (A_x) for Weight Computation

Girder : No. of girders $\times A_{girder}$ = 9 \times 0.653 = 5.878 m^2
 Slab : $bt = 19.900 \times 0.200$ = 3.980 m^2
 Haunch : No. of haunch $\times A_{hauc}$ = 9 \times 0.036 = 0.324 m^2
Total = 10.182 m^2

B) For I_x

Girder : No. of girders $\times I_x$ = 9 \times 0.007 = 0.062 m^4
 Slab : $nbt^3 / 3 = 0.775 \times 19.900 \times 0.200^3 \div 3$ = 0.041 m^4
Total = 0.103 m^4

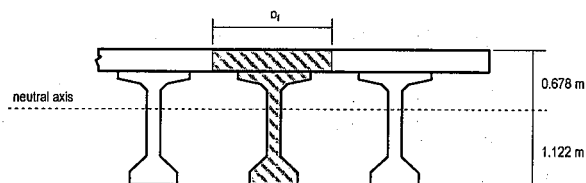
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------------|---------------------------|--------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.653 | 18.190 | 11.881 | 8.240 | 44.348 | 0.025 | 44.373 |
| B | 0.653 | 16.130 | 10.535 | 6.180 | 24.946 | 0.025 | 24.971 |
| C | 0.653 | 14.070 | 9.190 | 4.120 | 11.087 | 0.025 | 11.112 |
| D | 0.653 | 12.010 | 7.844 | 2.060 | 2.772 | 0.025 | 2.797 |
| E | 0.653 | 9.950 | 6.499 | 0.000 | 0.000 | 0.025 | 0.025 |
| F | 0.653 | 7.890 | 5.153 | 2.060 | 2.772 | 0.025 | 2.797 |
| G | 0.653 | 5.830 | 3.808 | 4.120 | 11.087 | 0.025 | 11.112 |
| H | 0.653 | 3.770 | 2.462 | 6.180 | 24.946 | 0.025 | 24.971 |
| I | 0.653 | 1.710 | 1.117 | 8.240 | 44.348 | 0.025 | 44.373 |
| J | 3.083 | 9.950 | 30.675 | 0.000 | 0.000 | 101.738 | 101.738 |
| Total | 8.961 | | 89.165 | | | | 268.271 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------------|---------------------------|-------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.653 | 0.840 | 0.549 | 0.296 | 0.057 | 0.217 | 0.274 |
| B | 0.653 | 0.840 | 0.549 | 0.296 | 0.057 | 0.217 | 0.274 |
| C | 0.653 | 0.840 | 0.549 | 0.296 | 0.057 | 0.217 | 0.274 |
| D | 0.653 | 0.840 | 0.549 | 0.296 | 0.057 | 0.217 | 0.274 |
| E | 0.653 | 0.840 | 0.549 | 0.296 | 0.057 | 0.217 | 0.274 |
| F | 0.653 | 0.840 | 0.549 | 0.296 | 0.057 | 0.217 | 0.274 |
| G | 0.653 | 0.840 | 0.549 | 0.296 | 0.057 | 0.217 | 0.274 |
| H | 0.653 | 0.840 | 0.549 | 0.296 | 0.057 | 0.217 | 0.274 |
| I | 0.653 | 0.840 | 0.549 | 0.296 | 0.057 | 0.217 | 0.274 |
| J | 3.083 | 1.700 | 5.241 | 0.564 | 0.981 | 0.010 | 0.992 |
| Total | 8.961 | | 10.179 | | | | 3.461 |

INTERIOR GIRDER



Effective flange width, b_f : (minimum)

a) 1/4 span length = 36.200 \div 4 = 9.050 m
 b) Center-to-center spacing of girde = 2.060 = 2.060 m
 c) Web width + 12 times slab thickr = 0.203 + 12 \times 0.200 = 2.603 m
Use b_f = 2.060 m

A) Total Area (A_x) for Weight Computation

Girder : = 0.653 m^2
 Slab : $b_f t = 2.060 \times 0.200$ = 0.412 m^2
 Haunch : = 0.036 m^2
Total = 1.101 m^2

B) For I_x

$$\begin{aligned} \text{Girder} & : & & = 0.007 \text{ m}^4 \\ \text{Slab} & : \quad nb_t^3 / 3 = 0.775 \times 2.060 \times 0.200^3 \div 3 & & = 0.004 \text{ m}^4 \\ & & \text{Total} & = \mathbf{0.011 \text{ m}^4} \end{aligned}$$

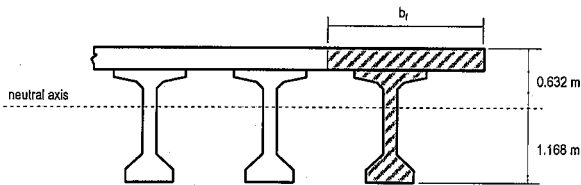
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.653 | 1.030 | 0.673 | 0.000 | 0.000 | 0.025 | 0.025 |
| Slab | 0.319 | 1.030 | 0.329 | 0.000 | 0.000 | 0.113 | 0.113 |
| Total | 0.972 | | 1.001 | | | | 0.138 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.653 | 0.840 | 0.549 | 0.282 | 0.052 | 0.217 | 0.269 |
| Slab | 0.319 | 1.700 | 0.543 | 0.578 | 0.107 | 0.001 | 0.108 |
| Total | 0.972 | | 1.091 | | | | 0.377 |

EXTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned} \text{a) } 1/4 \text{ span length} & = 36.200 \div 4 & = 9.050 \text{ m} \\ \text{b) } 1/2 \text{ girder spacing} + \text{length of cantilever} & = 1.030 + 2.060 & = 3.090 \text{ m} \\ \text{c) } \text{Web width} + 12 \text{ times slab thickness} & = 0.203 + 12 \times 0.200 & = 2.603 \text{ m} \\ & \text{Use } b_f & = \mathbf{2.603 \text{ m}} \end{aligned}$$

A) Total Area (A_x) for Weight Computation

$$\begin{aligned} \text{Girder} & : & & = 0.653 \text{ m}^2 \\ \text{Slab} & : \quad b_f t = 2.603 \times 0.200 & & = 0.521 \text{ m}^2 \\ \text{Haunch} & : & & = 0.036 \text{ m}^2 \\ & & \text{Total} & = \mathbf{1.210 \text{ m}^2} \end{aligned}$$

B) For I_x

$$\begin{aligned} \text{Girder} & : & & = 0.007 \text{ m}^4 \\ \text{Slab} & : \quad nb_t^3 / 3 = 0.775 \times 2.603 \times 0.200^3 \div 3 & & = 0.005 \text{ m}^4 \\ & & \text{Total} & = \mathbf{0.012 \text{ m}^4} \end{aligned}$$

C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.653 | 2.060 | 1.346 | 0.290 | 0.055 | 0.025 | 0.080 |
| Slab | 0.403 | 1.302 | 0.525 | 0.469 | 0.089 | 0.228 | 0.316 |
| Total | 1.056 | | 1.870 | | | | 0.397 |

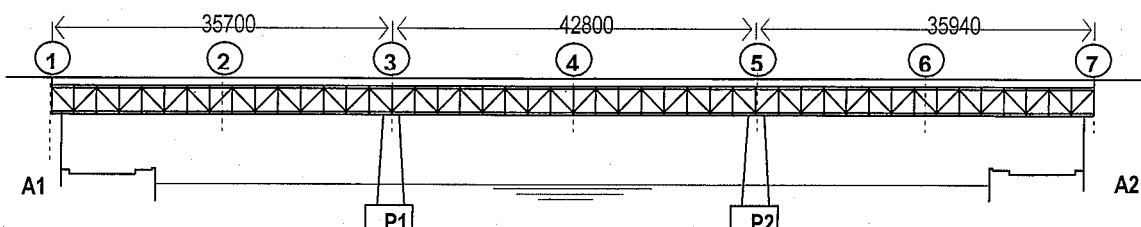
D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.653 | 0.840 | 0.549 | 0.328 | 0.070 | 0.217 | 0.288 |
| Slab | 0.403 | 1.700 | 0.686 | 0.532 | 0.114 | 0.001 | 0.115 |
| Total | 1.056 | | 1.234 | | | | 0.403 |

APPENDIX 7.4.3-1 (7/14)

BRIDGE NAME : GUADALUPE BRIDGE (CENTRAL)

SECTION PROPERTIES



| MEMBER I.D. | SECTION PROPERTIES | | | | ALLOWABLE STRESSES | | | | LOCATION |
|-------------|----------------------------------|----------------------------------|-------------------|------------------------------------|--------------------|-----------------------------|-----------------------------|-----------------------------|------------------|
| | A_{gross} (m ²) | A_{shear} (m ²) | $C_{n.a.}$ (m) | $I_{bending}$ (m ⁴) | f_y (MPa) | σ_a (allow) (MPa) | σ_b (allow) (MPa) | σ_v (allow) (MPa) | |
| UC - 1 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Top Arch Chord |
| UC - 2 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Top Arch Chord |
| UC - 3 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Top Arch Chord |
| UC - 4 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Top Arch Chord |
| UC - 5 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Top Arch Chord |
| UC - 6 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Top Arch Chord |
| UC - 7 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Top Arch Chord |
| LC - 1 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Lower Arch Chord |
| LC - 2 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Lower Arch Chord |
| LC - 3 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Lower Arch Chord |
| LC - 4 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Lower Arch Chord |
| LC - 5 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Lower Arch Chord |
| LC - 6 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Lower Arch Chord |
| LC - 7 | 0.0230949 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 136.4 | 136.4 | 81.84 | Lower Arch Chord |
| V - 1 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Vertical Member |
| V - 2 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Vertical Member |
| V - 3 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Vertical Member |
| V - 4 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Vertical Member |
| V - 5 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Vertical Member |
| V - 6 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Vertical Member |
| V - 7 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Vertical Member |
| D - 1 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Diagonal Member |
| D - 2 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Diagonal Member |
| D - 3 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Diagonal Member |
| D - 4 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Diagonal Member |
| D - 5 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Diagonal Member |
| D - 6 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Diagonal Member |
| D - 7 | 0.009099 | 0.003345 | 0.128 | 0.000111 | 248.00 | 136.4 | 136.4 | 81.84 | Diagonal Member |

| MEMBER I.D. | SECTION PROPERTIES | | | | ALLOWABLE STRESSES | | | | LOCATION |
|-------------|----------------------------------|----------------------------------|-------------------|------------------------------------|--------------------|-----------------------------|-----------------------------|-----------------------------|------------------|
| | A_{gross} (m ²) | A_{shear} (m ²) | $c_{n.a.}$ (m) | $I_{bending}$ (m ⁴) | f_y (MPa) | σ_a (allow) (MPa) | σ_b (allow) (MPa) | σ_v (allow) (MPa) | |
| UC - 1 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Top Arch Chord |
| UC - 2 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Top Arch Chord |
| UC - 3 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Top Arch Chord |
| UC - 4 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Top Arch Chord |
| UC - 5 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Top Arch Chord |
| UC - 6 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Top Arch Chord |
| UC - 7 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Top Arch Chord |
| LC - 1 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Lower Arch Chord |
| LC - 2 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Lower Arch Chord |
| LC - 3 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Lower Arch Chord |
| LC - 4 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Lower Arch Chord |
| LC - 5 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Lower Arch Chord |
| LC - 6 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Lower Arch Chord |
| LC - 7 | 0.025661 | 0.0154 | 0.25 | 0.0003703 | 248.00 | 186 | 186 | 111.6 | Lower Arch Chord |
| V - 1 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Vertical Member |
| V - 2 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Vertical Member |
| V - 3 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Vertical Member |
| V - 4 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Vertical Member |
| V - 5 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Vertical Member |
| V - 6 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Vertical Member |
| V - 7 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Vertical Member |
| D - 1 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Diagonal Member |
| D - 2 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Diagonal Member |
| D - 3 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Diagonal Member |
| D - 4 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Diagonal Member |
| D - 5 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Diagonal Member |
| D - 6 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Diagonal Member |
| D - 7 | 0.01011 | 0.003345 | 0.128 | 0.000111 | 248.00 | 186 | 186 | 111.6 | Diagonal Member |

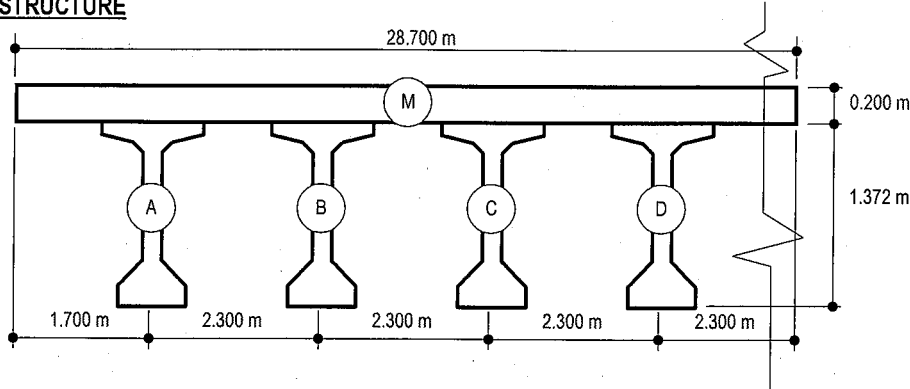
APPENDIX 7.4.3-1 (8/14)

BRIDGE NAME : C-5 BRIDGE

SECTION PROPERTIES - TYPE IV

| | | |
|---|---|--------------|
| Modulus of elasticity of prestressed concrete girder, E_c | = | 27983.06 Mpa |
| Modulus of elasticity of reinforced concrete slab, E_{cs} | = | 21675.58 Mpa |
| Modular ratio, $n = E_{cs} / E_c$ | = | 0.774597 |

WHOLE STRUCTURE



A) Total Area (A_x) for Weight Computation

| | | | | | | | | |
|--------------|---|----------------|---|-----------------------|---|-------------------|---|-------------------------------|
| Girder | : | No. of girders | x | A_{girder} | = | 12×0.509 | = | 6.102 m ² |
| Slab | : | bt | = | 28.700×0.200 | = | 5.740 | = | 5.740 m ² |
| Haunch | : | No. of haunch | x | A_{haun} | = | 12×0.500 | = | 6.000 m ² |
| Total | | | | | | | | = 17.842 m² |

B) For I_x

| | | | | | | | | |
|--------------|---|----------------|---|---|---|-------------------|---|------------------------------|
| Girder | : | No. of girders | x | I_x | = | 12×0.006 | = | 0.078 m ⁴ |
| Slab | : | $nbt^3 / 3$ | = | $0.775 \times 28.700 \times 0.200^3 \div 3$ | = | 0.059 | = | 0.059 m ⁴ |
| Total | | | | | | | | = 0.137 m⁴ |

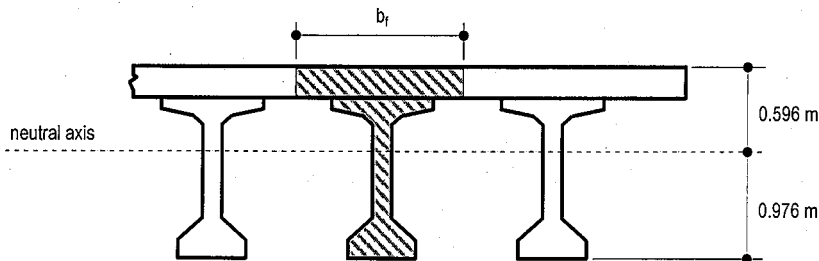
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------------|---------------------------|--------|----------------------|--------|-----------------------------------|-----------------------------|--|
| A | 0.509 | 27.000 | 13.730 | 12.650 | 81.374 | 0.021 | 81.395 |
| B | 0.509 | 24.700 | 12.560 | 10.350 | 54.474 | 0.021 | 54.494 |
| C | 0.509 | 22.400 | 11.391 | 8.050 | 32.953 | 0.021 | 32.974 |
| D | 0.509 | 20.100 | 10.221 | 5.750 | 16.813 | 0.021 | 16.834 |
| E | 0.509 | 17.800 | 9.052 | 3.450 | 6.053 | 0.021 | 6.073 |
| F | 0.509 | 15.500 | 7.882 | 1.150 | 0.673 | 0.021 | 0.693 |
| G | 0.509 | 13.200 | 6.712 | 1.150 | 0.673 | 0.021 | 0.693 |
| H | 0.509 | 10.900 | 5.543 | 3.450 | 6.053 | 0.021 | 6.073 |
| I | 0.509 | 8.600 | 4.373 | 5.750 | 16.813 | 0.021 | 16.834 |
| J | 0.509 | 6.300 | 3.204 | 8.050 | 32.953 | 0.021 | 32.974 |
| K | 0.509 | 4.000 | 2.034 | 10.350 | 54.474 | 0.021 | 54.494 |
| L | 0.509 | 1.700 | 0.864 | 12.650 | 81.374 | 0.021 | 81.395 |
| M | 4.446 | 14.350 | 63.803 | 0.000 | 0.000 | 305.190 | 305.190 |
| Total | 10.548 | | 151.370 | | | | 690.117 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{zz} (m ⁴) | $I_z = I_{zz} + Ad^2$ (m ⁴) |
|-------|------------------------------|----------|-------------------------|----------|--------------------------------------|-------------------------------|--|
| A | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| B | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| C | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| D | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| E | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| F | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| G | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| H | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| I | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| J | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| K | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| L | 0.509 | 0.628 | 0.320 | 0.356 | 0.064 | 0.109 | 0.173 |
| E | 4.446 | 1.472 | 6.545 | 0.488 | 1.059 | 0.015 | 1.074 |
| Total | 10.548 | | 10.380 | | | | 3.147 |

INTERIOR GIRDER



Effective flange width, b_f : (minimum)

- a) 1/4 span length = 24.950 ÷ 4 = 6.238 m
 - b) Center-to-center spacing of girde = 2.300 = 2.300 m
 - c) Web width + 12 times slab thickr = 0.508 + 12 × 0.200 = 2.908 m
- Use b_f = 2.300 m

A) Total Area (A_x) for Weight Computation

- Girder : = 0.509 m²
 - Slab : $b_f t = 2.300 \times 0.200$ = 0.460 m²
 - Haunch : = 0.500 m²
- Total = **1.469 m²**

B) For I_x

- Girder : = 0.006 m⁴
 - Slab : $nb_f t^3 / 3 = 0.775 \times 2.300 \times 0.200^3 \div 3$ = 0.005 m⁴
- Total = **0.011 m⁴**

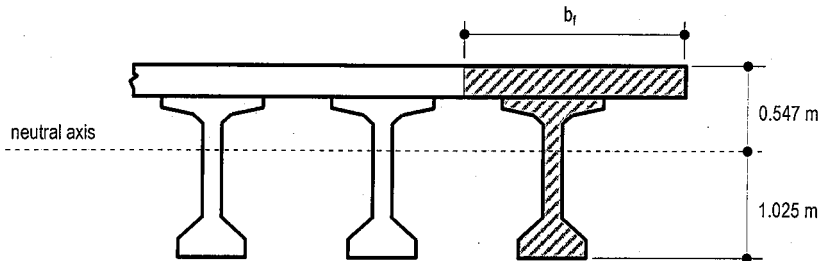
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | $I_{y,y}$ (m ⁴) | $I_y = I_{y,y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.509 | 1.150 | 0.585 | 0.000 | 0.000 | 0.021 | 0.021 |
| Slab | 0.356 | 1.150 | 0.410 | 0.000 | 0.000 | 0.157 | 0.157 |
| Total | 0.865 | | 0.995 | | | | 0.178 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.509 | 0.628 | 0.320 | 0.348 | 0.061 | 0.109 | 0.170 |
| Slab | 0.356 | 1.472 | 0.524 | 0.496 | 0.088 | 0.001 | 0.089 |
| Total | 0.865 | | 0.844 | | | | 0.259 |

EXTERIOR GIRDER



Effective flange width, b_f : (minimum)

a) 1/4 span length = 24.950 ÷ 4 = 6.238 m
 b) 1/2 girder spacing + length of cantile = 1.150 + 2.300 = 3.450 m
 c) Web width + 12 times slab thickness = 0.508 + 12 × 0.200 = 2.908 m
 Use b_f = 2.908 m

A) Total Area (A_x) for Weight Computation

Girder : = 0.509 m²
 Slab : $b_f t = 2.908 \times 0.200$ = 0.582 m²
 Haunch : = 0.500 m²
 Total = **1.590 m²**

B) For I_x

Girder : = 0.006 m⁴
 Slab : $nb_f t^3 / 3 = 0.775 \times 2.908 \times 0.200^3 \div 3$ = 0.006 m⁴
 Total = **0.013 m⁴**

C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.509 | 2.300 | 1.170 | 0.397 | 0.080 | 0.021 | 0.101 |
| Slab | 0.451 | 1.454 | 0.655 | 0.449 | 0.091 | 0.317 | 0.408 |
| Total | 0.959 | | 1.825 | | | | 0.509 |

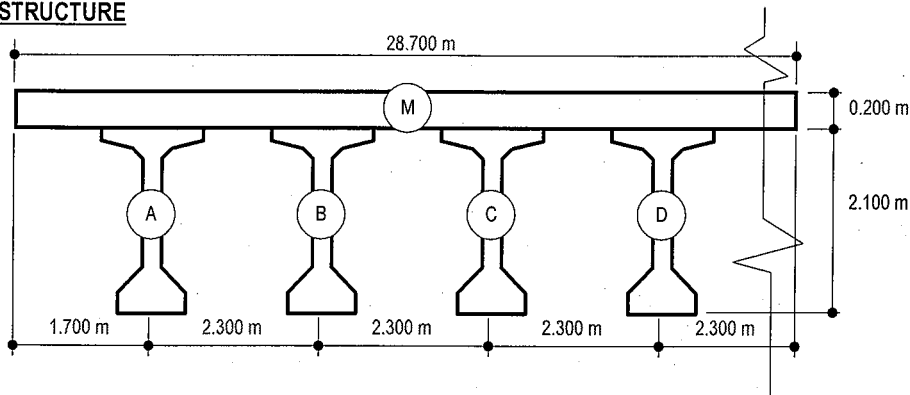
D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.509 | 0.628 | 0.320 | 0.396 | 0.080 | 0.109 | 0.188 |
| Slab | 0.451 | 1.472 | 0.663 | 0.447 | 0.090 | 0.002 | 0.092 |
| Total | 0.959 | | 0.983 | | | | 0.280 |

SECTION PROPERTIES - TYPE VI

Modulus of elasticity of prestressed concrete girder, E_c = 27983.06 Mpa
 Modulus of elasticity of reinforced concrete slab, E_{cs} = 21675.58 Mpa
 Modular ratio, $n = E_{cs} / E_c$ = 0.774597

WHOLE STRUCTURE



A) Total Area (A_x) for Weight Computation

Girder : No. of girders $\times A_{girder}$ = 12 \times 0.755 = 9.056 m²
 Slab : $bt = 28.700 \times 0.200$ = 5.740 m²
 Haunch : No. of haunch $\times A_{haun}$ = 12 \times 0.500 = 6.000 m²
Total = 20.796 m²

B) For I_x

Girder : No. of girders $\times I_x$ = 12 \times 0.008 = 0.099 m⁴
 Slab : $nbt^3 / 3 = 0.775 \times 28.700 \times 0.200^3 \div 3$ = 0.059 m⁴
Total = 0.158 m⁴

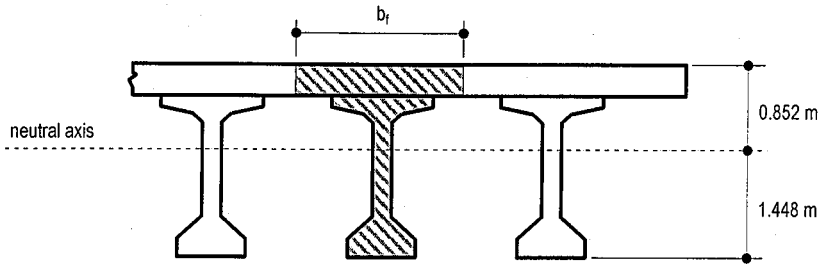
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | $I_{y,y}$ (m ⁴) | $I_y = I_{y,y} + Ad^2$ (m ⁴) |
|--------------|---------------------------|--------|----------------------|--------|-----------------------------------|-----------------------------|--|
| A | 0.755 | 27.000 | 20.376 | 12.650 | 120.762 | 0.026 | 120.788 |
| B | 0.755 | 24.700 | 18.640 | 10.350 | 80.841 | 0.026 | 80.866 |
| C | 0.755 | 22.400 | 16.904 | 8.050 | 48.904 | 0.026 | 48.929 |
| D | 0.755 | 20.100 | 15.169 | 5.750 | 24.951 | 0.026 | 24.977 |
| E | 0.755 | 17.800 | 13.433 | 3.450 | 8.982 | 0.026 | 9.008 |
| F | 0.755 | 15.500 | 11.697 | 1.150 | 0.998 | 0.026 | 1.024 |
| G | 0.755 | 13.200 | 9.961 | 1.150 | 0.998 | 0.026 | 1.024 |
| H | 0.755 | 10.900 | 8.226 | 3.450 | 8.982 | 0.026 | 9.008 |
| I | 0.755 | 8.600 | 6.490 | 5.750 | 24.951 | 0.026 | 24.977 |
| J | 0.755 | 6.300 | 4.754 | 8.050 | 48.904 | 0.026 | 48.929 |
| K | 0.755 | 4.000 | 3.019 | 10.350 | 80.841 | 0.026 | 80.866 |
| L | 0.755 | 1.700 | 1.283 | 12.650 | 120.762 | 0.026 | 120.788 |
| M | 4.446 | 14.350 | 63.803 | 0.000 | 0.000 | 305.190 | 305.190 |
| Total | 13.502 | | 193.755 | | | | 876.374 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | $I_{z,z}$ (m ⁴) | $I_z = I_{z,z} + Ad^2$ (m ⁴) |
|--------------|---------------------------|-------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| B | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| C | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| D | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| E | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| F | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| G | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| H | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| I | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| J | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| K | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| L | 0.755 | 1.093 | 0.824 | 0.365 | 0.100 | 0.434 | 0.535 |
| E | 4.446 | 2.200 | 9.782 | 0.743 | 2.453 | 0.015 | 2.468 |
| Total | 13.502 | | 19.675 | | | | 8.884 |

INTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned}
 \text{a) } 1/4 \text{ span length} &= 45.880 \div 4 &= 11.470 \text{ m} \\
 \text{b) Center-to-center spacing of girde} &= 2.300 &= 2.300 \text{ m} \\
 \text{c) Web width + 12 times slab thickr} &= 1.067 + 12 \times 0.200 &= 3.467 \text{ m} \\
 \text{Use } b_f &= 2.300 \text{ m}
 \end{aligned}$$

A) Total Area (A_x) for Weight Computation

$$\begin{aligned}
 \text{Girder} &: &= 0.755 \text{ m}^2 \\
 \text{Slab} &: b_f t = 2.300 \times 0.200 &= 0.460 \text{ m}^2 \\
 \text{Haunch} &: &= 0.500 \text{ m}^2 \\
 \text{Total} &= &= \mathbf{1.715 \text{ m}^2}
 \end{aligned}$$

B) For I_x

$$\begin{aligned}
 \text{Girder} &: &= 0.008 \text{ m}^4 \\
 \text{Slab} &: nb_f t^3 / 3 = 0.775 \times 2.300 \times 0.200^3 \div 3 &= 0.005 \text{ m}^4 \\
 \text{Total} &= &= \mathbf{0.013 \text{ m}^4}
 \end{aligned}$$

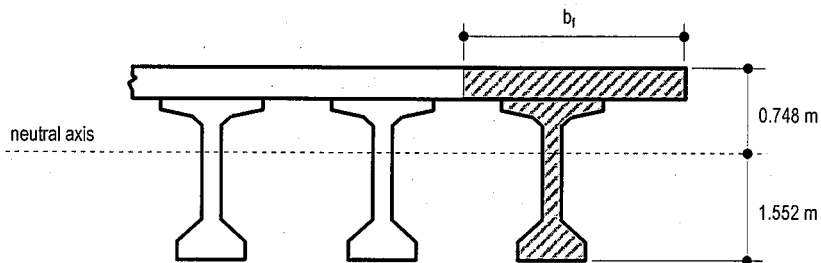
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.755 | 1.150 | 0.868 | 0.000 | 0.000 | 0.026 | 0.026 |
| Slab | 0.356 | 1.150 | 0.410 | 0.000 | 0.000 | 0.157 | 0.157 |
| Total | 1.111 | | 1.278 | | | | 0.183 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.755 | 1.093 | 0.824 | 0.355 | 0.095 | 0.434 | 0.530 |
| Slab | 0.356 | 2.200 | 0.784 | 0.752 | 0.202 | 0.001 | 0.203 |
| Total | 1.111 | | 1.608 | | | | 0.732 |

EXTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned}
 \text{a) } 1/4 \text{ span length} &= 45.880 \div 4 &= 11.470 \text{ m} \\
 \text{b) } 1/2 \text{ girder spacing + length of cantile} &= 1.150 + 2.300 &= 3.450 \text{ m} \\
 \text{c) Web width + 12 times slab thicknes} &= 1.067 + 12 \times 0.200 &= 3.467 \text{ m} \\
 \text{Use } b_f &= 3.450 \text{ m}
 \end{aligned}$$

A) Total Area (A_x) for Weight Computation

Girder : = 0.755 m²
 Slab : $b_t = 3.450 \times 0.200$ = 0.690 m²
 Haunch : = 0.500 m²
 Total = **1.945 m²**

B) For I_x

Girder : = 0.008 m⁴
 Slab : $nb_t^3 / 3 = 0.775 \times 3.450 \times 0.200^3 \div 3$ = 0.007 m⁴
 Total = **0.015 m⁴**

C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.755 | 2.300 | 1.736 | 0.238 | 0.043 | 0.026 | 0.069 |
| Slab | 0.534 | 1.725 | 0.922 | 0.337 | 0.061 | 0.530 | 0.591 |
| Total | 1.289 | | 2.658 | | | | 0.659 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.755 | 1.093 | 0.824 | 0.459 | 0.159 | 0.434 | 0.593 |
| Slab | 0.534 | 2.200 | 1.176 | 0.648 | 0.225 | 0.002 | 0.226 |
| Total | 1.289 | | 2.000 | | | | 0.820 |

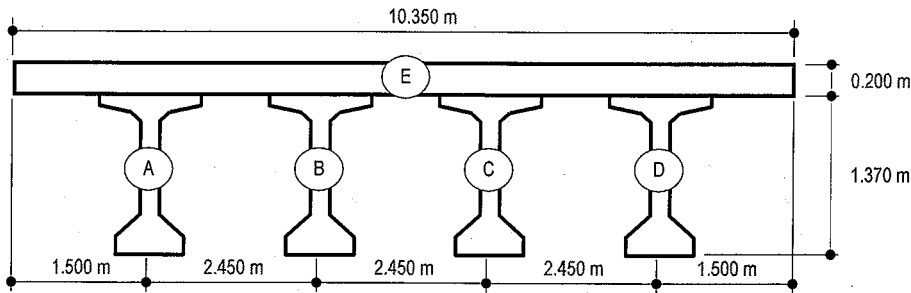
APPENDIX 7.4.3-1 (9/14)

BRIDGE NAME : BAMBANG BRIDGE

SECTION PROPERTIES - TYPE IV

| | |
|---|----------------|
| Modulus of elasticity of prestressed concrete girder, E_c | = 30653.90 Mpa |
| Modulus of elasticity of reinforced concrete slab, E_{cs} | = 21675.58 Mpa |
| Modular ratio, $n = E_{cs} / E_c$ | = 0.707107 |

WHOLE STRUCTURE



A) Total Area (A_x) for Weight Computation

| | | | | | | | | |
|--------|---|--------------------------------------|---|---|-------|--|---------|----------------------------|
| Girder | : | No. of girders $\times A_{girder} =$ | 4 | x | 0.508 | | = | 2.031 m ² |
| Slab | : | $bt = 10.350 \times 0.200$ | | | | | = | 2.070 m ² |
| Haunch | : | No. of haunch $\times A_{haun} =$ | 4 | x | 0.000 | | = | 0.000 m ² |
| | | | | | | | Total = | 4.101 m² |

B) For I_x

| | | | | | | | | |
|--------|---|---|---|---|-------|--|---------|----------------------------|
| Girder | : | No. of girders $\times I_x =$ | 4 | x | 0.006 | | = | 0.026 m ⁴ |
| Slab | : | $nbt^3 / 3 = 0.707 \times 10.350 \times 0.200^3 \div 3$ | | | | | = | 0.020 m ⁴ |
| | | | | | | | Total = | 0.045 m⁴ |

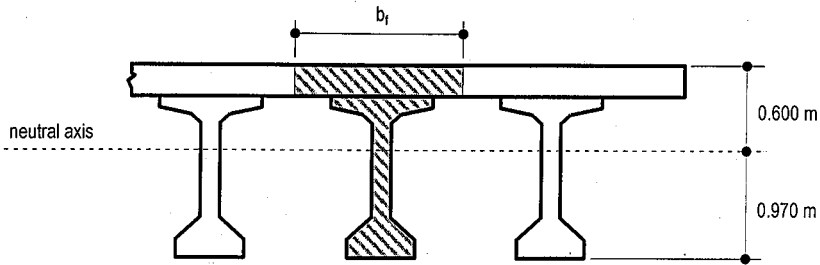
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------------|---------------------------|-------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.508 | 8.850 | 4.493 | 3.675 | 6.857 | 0.021 | 6.878 |
| B | 0.508 | 6.400 | 3.249 | 1.225 | 0.762 | 0.021 | 0.783 |
| C | 0.508 | 3.950 | 2.005 | 1.225 | 0.762 | 0.021 | 0.783 |
| D | 0.508 | 1.500 | 0.762 | 3.675 | 6.857 | 0.021 | 6.878 |
| E | 1.464 | 5.175 | 7.575 | 0.000 | 0.000 | 13.066 | 13.066 |
| Total | 3.495 | | 18.084 | | | | 28.387 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------------|---------------------------|-------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.508 | 0.629 | 0.319 | 0.352 | 0.063 | 0.108 | 0.171 |
| B | 0.508 | 0.629 | 0.319 | 0.352 | 0.063 | 0.108 | 0.171 |
| C | 0.508 | 0.629 | 0.319 | 0.352 | 0.063 | 0.108 | 0.171 |
| D | 0.508 | 0.629 | 0.319 | 0.352 | 0.063 | 0.108 | 0.171 |
| E | 1.464 | 1.470 | 2.152 | 0.489 | 0.350 | 0.005 | 0.355 |
| Total | 3.495 | | 3.429 | | | | 1.040 |

INTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned}
 \text{a) } 1/4 \text{ span length} &= 26.700 \div 4 = 6.675 \text{ m} \\
 \text{b) Center-to-center spacing of girde} &= 2.450 = 2.450 \text{ m} \\
 \text{c) Web width + 12 times slab thickr} &= 0.203 + 12 \times 0.200 = 2.603 \text{ m} \\
 \text{Use } b_f &= 2.450 \text{ m}
 \end{aligned}$$

A) Total Area (A_x) for Weight Computation

$$\begin{aligned}
 \text{Girder} &: &= & 0.508 \text{ m}^2 \\
 \text{Slab} &: b_f t = 2.450 \times 0.200 &= & 0.490 \text{ m}^2 \\
 \text{Haunch} &: &= & 0.000 \text{ m}^2 \\
 \text{Total} &= & \mathbf{0.998} \text{ m}^2
 \end{aligned}$$

B) For I_x

$$\begin{aligned}
 \text{Girder} &: &= & 0.006 \text{ m}^4 \\
 \text{Slab} &: nb_f t^3 / 3 = 0.707 \times 2.450 \times 0.200^3 \div 3 &= & 0.005 \text{ m}^4 \\
 \text{Total} &= & \mathbf{0.011} \text{ m}^4
 \end{aligned}$$

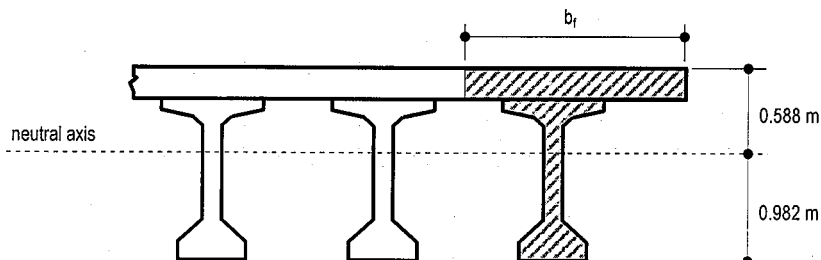
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.508 | 1.225 | 0.622 | 0.000 | 0.000 | 0.021 | 0.021 |
| Slab | 0.346 | 1.225 | 0.424 | 0.000 | 0.000 | 0.173 | 0.173 |
| Total | 0.854 | | 1.046 | | | | 0.194 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.508 | 0.629 | 0.319 | 0.341 | 0.059 | 0.108 | 0.167 |
| Slab | 0.346 | 1.470 | 0.509 | 0.500 | 0.087 | 0.001 | 0.088 |
| Total | 0.854 | | 0.829 | | | | 0.255 |

EXTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned}
 \text{a) } 1/4 \text{ span length} &= 26.700 \div 4 = 6.675 \text{ m} \\
 \text{b) } 1/2 \text{ girder spacing + length of cantile} &= 1.225 + 1.500 = 2.725 \text{ m} \\
 \text{c) Web width + 12 times slab thickness} &= 0.203 + 12 \times 0.200 = 2.603 \text{ m} \\
 \text{Use } b_f &= 2.603 \text{ m}
 \end{aligned}$$

A) Total Area (A_x) for Weight Computation

| | | | |
|----------|----------------------------|----------------|----------------------------|
| Girder : | | = | 0.508 m ² |
| Slab : | $b_t = 2.603 \times 0.200$ | = | 0.521 m ² |
| Haunch : | | = | 0.000 m ² |
| | | Total = | 1.028 m² |

B) For I_x

| | | | |
|----------|---|----------------|----------------------------|
| Girder : | | = | 0.006 m ⁴ |
| Slab : | $nb_t^3 / 3 = 0.707 \times 2.603 \times 0.200^3 \div 3$ | = | 0.005 m ⁴ |
| | | Total = | 0.011 m⁴ |

C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | $I_{y,y}$ (m ⁴) | $I_y = I_{y,y} + Ad^2$ (m ⁴) |
|--------------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.508 | 1.500 | 0.762 | 0.083 | 0.004 | 0.021 | 0.024 |
| Slab | 0.368 | 1.302 | 0.479 | 0.115 | 0.005 | 0.208 | 0.213 |
| Total | 0.876 | | 1.241 | | | | 0.237 |

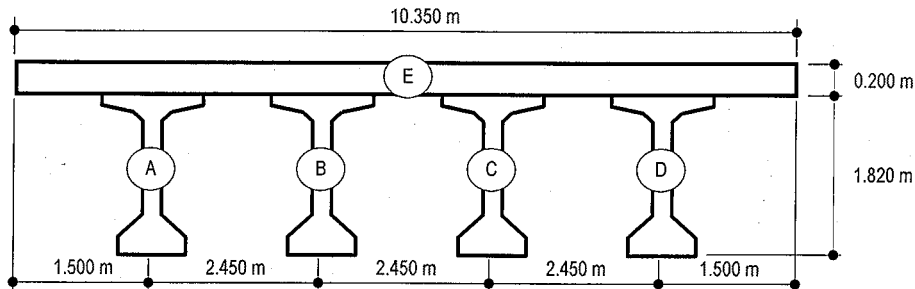
D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | $I_{z,z}$ (m ⁴) | $I_z = I_{z,z} + Ad^2$ (m ⁴) |
|--------------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.508 | 0.629 | 0.319 | 0.354 | 0.063 | 0.108 | 0.172 |
| Slab | 0.368 | 1.470 | 0.541 | 0.488 | 0.088 | 0.001 | 0.089 |
| Total | 0.876 | | 0.860 | | | | 0.260 |

SECTION PROPERTIES - TYPE VI

| | | |
|---|---|--------------|
| Modulus of elasticity of prestressed concrete girder, E_c | = | 30653.90 Mpa |
| Modulus of elasticity of reinforced concrete slab, E_{cs} | = | 21675.58 Mpa |
| Modular ratio, $n = E_{cs} / E_c$ | = | 0.707107 |

WHOLE STRUCTURE



A) Total Area (A_x) for Weight Computation

| | | | | | | | |
|--------|---|---|--------|----------|-------|---------|----------------------------|
| Girder | : | No. of girders $\times A_{\text{girder}} =$ | 4 | \times | 0.709 | = | 2.835 m ² |
| Slab | : | $bt =$ | 10.350 | \times | 0.200 | = | 2.070 m ² |
| Haunch | : | No. of haunch $\times A_{\text{haun}} =$ | 4 | \times | 0.000 | = | 0.000 m ² |
| | | | | | | Total = | 4.905 m² |

B) For I_x

| | | | | | | | | | |
|--------|---|-------------------------------|-------|----------|--------|----------|-----------------------------|---------|----------------------------|
| Girder | : | No. of girders $\times I_x =$ | 4 | \times | 0.008 | = | 0.030 m ⁴ | | |
| Slab | : | $nbt^3 / 3 =$ | 0.707 | \times | 10.350 | \times | 0.200 ³ \div 3 | = | 0.020 m ⁴ |
| | | | | | | | | Total = | 0.050 m⁴ |

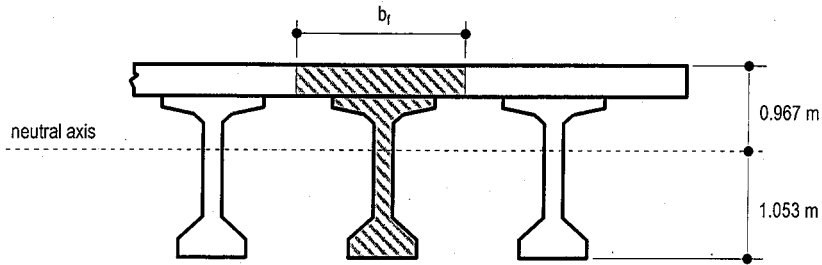
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|-------|---------------------------|-------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.709 | 8.850 | 6.273 | 3.675 | 9.573 | 0.027 | 9.599 |
| B | 0.709 | 6.400 | 4.536 | 1.225 | 1.064 | 0.027 | 1.090 |
| C | 0.709 | 3.950 | 2.800 | 1.225 | 1.064 | 0.027 | 1.090 |
| D | 0.709 | 1.500 | 1.063 | 3.675 | 9.573 | 0.027 | 9.599 |
| E | 1.464 | 5.175 | 7.575 | 0.000 | 0.000 | 13.066 | 13.066 |
| Total | 4.299 | | 22.247 | | | | 34.446 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|-------|---------------------------|-------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.709 | 0.629 | 0.446 | 0.440 | 0.137 | 0.309 | 0.446 |
| B | 0.709 | 0.629 | 0.446 | 0.440 | 0.137 | 0.309 | 0.446 |
| C | 0.709 | 0.629 | 0.446 | 0.440 | 0.137 | 0.309 | 0.446 |
| D | 0.709 | 0.629 | 0.446 | 0.440 | 0.137 | 0.309 | 0.446 |
| E | 1.464 | 1.920 | 2.810 | 0.852 | 1.061 | 0.005 | 1.066 |
| Total | 4.299 | | 4.593 | | | | 2.849 |

INTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned}
 \text{a) } 1/4 \text{ span length} &= 26.700 \div 4 = 6.675 \text{ m} \\
 \text{b) Center-to-center spacing of girde} &= 2.450 = 2.450 \text{ m} \\
 \text{c) Web width + 12 times slab thickr} &= 0.203 + 12 \times 0.200 = 2.603 \text{ m} \\
 \text{Use } b_f &= 2.450 \text{ m}
 \end{aligned}$$

A) Total Area (A_x) for Weight Computation

$$\begin{aligned}
 \text{Girder} &: &= & 0.709 \text{ m}^2 \\
 \text{Slab} &: b_f t = 2.450 \times 0.200 &= & 0.490 \text{ m}^2 \\
 \text{Haunch} &: &= & 0.000 \text{ m}^2 \\
 \text{Total} &= &= & \mathbf{1.199 \text{ m}^2}
 \end{aligned}$$

B) For I_x

$$\begin{aligned}
 \text{Girder} &: &= & 0.008 \text{ m}^4 \\
 \text{Slab} &: nb_f t^3 / 3 = 0.707 \times 2.450 \times 0.200^3 \div 3 &= & 0.005 \text{ m}^4 \\
 \text{Total} &= &= & \mathbf{0.012 \text{ m}^4}
 \end{aligned}$$

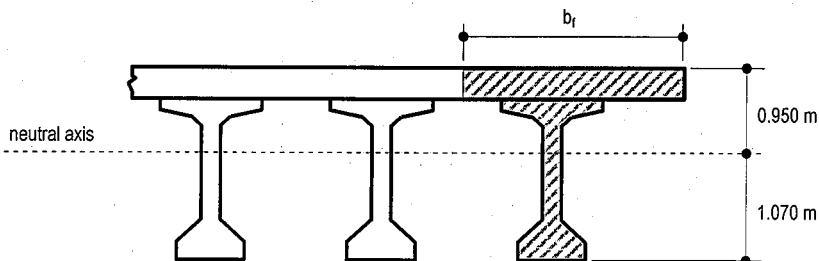
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.709 | 1.225 | 0.868 | 0.000 | 0.000 | 0.027 | 0.027 |
| Slab | 0.346 | 1.225 | 0.424 | 0.000 | 0.000 | 0.173 | 0.173 |
| Total | 1.055 | | 1.293 | | | | 0.200 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.709 | 0.629 | 0.446 | 0.424 | 0.127 | 0.309 | 0.436 |
| Slab | 0.346 | 1.920 | 0.665 | 0.867 | 0.261 | 0.001 | 0.262 |
| Total | 1.055 | | 1.111 | | | | 0.698 |

EXTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned}
 \text{a) } 1/4 \text{ span length} &= 26.700 \div 4 = 6.675 \text{ m} \\
 \text{b) } 1/2 \text{ girder spacing + length of cantile} &= 1.225 + 1.500 = 2.725 \text{ m} \\
 \text{c) Web width + 12 times slab thickness} &= 0.203 + 12 \times 0.200 = 2.603 \text{ m} \\
 \text{Use } b_f &= 2.603 \text{ m}
 \end{aligned}$$

A) Total Area (A_x) for Weight Computation

Girder : = 0.709 m²
 Slab : $b_f t = 2.603 \times 0.200$ = 0.521 m²
 Haunch : = 0.000 m²
 Total = **1.229 m²**

B) For I_x

Girder : = 0.008 m⁴
 Slab : $nb_f t^3 / 3 = 0.707 \times 2.603 \times 0.200^3 \div 3$ = 0.005 m⁴
 Total = **0.012 m⁴**

C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.709 | 1.500 | 1.063 | 0.068 | 0.003 | 0.027 | 0.030 |
| Slab | 0.368 | 1.302 | 0.479 | 0.131 | 0.006 | 0.208 | 0.214 |
| Total | 1.077 | | 1.542 | | | | 0.244 |

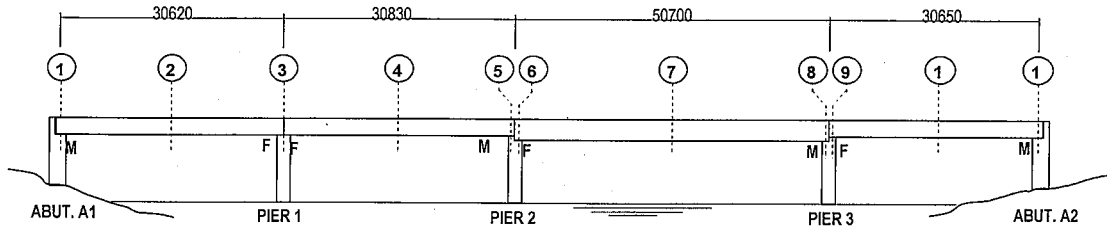
D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{z-z} (m ⁴) | $I_z = I_{z-z} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.709 | 0.629 | 0.446 | 0.441 | 0.138 | 0.309 | 0.447 |
| Slab | 0.368 | 1.920 | 0.707 | 0.850 | 0.266 | 0.001 | 0.267 |
| Total | 1.077 | | 1.153 | | | | 0.714 |

APPENDIX 7.4.3-1 (10/14)

BRIDGE NAME : VARGAS BRIDGE (DOWNSTREAM)

SECTION PROPERTIES



A.1 - SUPERSTRUCTURE (Interior Steel Girder)

| SECTION | LOCATION / REMARKS | COMPOSITE SECTION PROPERTIES | | | | | NON-COMPOSITE SECTION PROPERTIES | | | | | ALLOWABLE STRESSES | | |
|---------|-----------------------|------------------------------|-------------------|---------|---------|-------------------|----------------------------------|-------------------|---------|---------|-------------------|--------------------|--------------------|--------------------|
| | | A_{gross} | A_{shear} | c_b | c_t | $I_{bending}$ | A_{gross} | A_{shear} | c_b | c_t | $I_{bending}$ | f_y | σ_b (allow) | σ_v (allow) |
| | | (m ²) | (m ²) | (m) | (m) | (m ⁴) | (m ²) | (m ²) | (m) | (m) | (m ⁴) | (MPa) | (MPa) | (MPa) |
| 1 | @ Abutment A1 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |
| 2 | @ Midspan of Span 1 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 185.9 | 111.54 |
| 3 | @ Pier 1 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |
| 4 | @ Midspan of Span 2 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 185.9 | 111.54 |
| 5 | @ Pier 2 (left side) | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |
| 6 | @ Pier 2 (right side) | 0.10164 | 0.02177 | 2.12900 | 0.29000 | 0.05976 | 0.02964 | 0.02177 | 1.18200 | 1.23700 | 0.02200 | 338.00 | 185.9 | 111.54 |
| 7 | @ Midspan of Span 3 | 0.13773 | 0.02219 | 1.88700 | 0.57800 | 0.14458 | 0.06576 | 0.02219 | 1.14400 | 1.32100 | 0.07505 | 338.00 | 185.9 | 111.54 |
| 8 | @ Pier 3 (left side) | 0.10164 | 0.02177 | 2.12900 | 0.29000 | 0.05976 | 0.02964 | 0.02177 | 1.18200 | 1.23700 | 0.02200 | 338.00 | 185.9 | 111.54 |
| 9 | @ Pier 3 (right side) | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |
| 10 | @ Midspan of Span 4 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 185.9 | 111.54 |
| 11 | @ Abutment A2 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |

| SECTION | LOCATION / REMARKS | COMPOSITE SECTION PROPERTIES | | | | | NON-COMPOSITE SECTION PROPERTIES | | | | | ALLOWABLE STRESSES | | |
|---------|-----------------------|------------------------------|-------------------|---------|---------|-------------------|----------------------------------|-------------------|---------|---------|-------------------|--------------------|--------------------|--------------------|
| | | A_{gross} | A_{shear} | c_b | c_t | $I_{bending}$ | A_{gross} | A_{shear} | c_b | c_t | $I_{bending}$ | f_y | σ_b (allow) | σ_v (allow) |
| | | (m ²) | (m ²) | (m) | (m) | (m ⁴) | (m ²) | (m ²) | (m) | (m) | (m ⁴) | (MPa) | (MPa) | (MPa) |
| 1 | @ Abutment A1 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |
| 2 | @ Midspan of Span 1 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 253.5 | 152.1 |
| 3 | @ Pier 1 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |
| 4 | @ Midspan of Span 2 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 253.5 | 152.1 |
| 5 | @ Pier 2 (left side) | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |
| 6 | @ Pier 2 (right side) | 0.10164 | 0.02177 | 2.12900 | 0.29000 | 0.05976 | 0.02964 | 0.02177 | 1.18200 | 1.23700 | 0.02200 | 338.00 | 253.5 | 152.1 |
| 7 | @ Midspan of Span 3 | 0.13773 | 0.02219 | 1.88700 | 0.57800 | 0.14458 | 0.06576 | 0.02219 | 1.14400 | 1.32100 | 0.07505 | 338.00 | 253.5 | 152.1 |
| 8 | @ Pier 3 (left side) | 0.10164 | 0.02177 | 2.12900 | 0.29000 | 0.05976 | 0.02964 | 0.02177 | 1.18200 | 1.23700 | 0.02200 | 338.00 | 253.5 | 152.1 |
| 9 | @ Pier 3 (right side) | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |
| 10 | @ Midspan of Span 4 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 253.5 | 152.1 |
| 11 | @ Abutment A2 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |

A.2 - SUPERSTRUCTURE (Exterior Steel Girder)

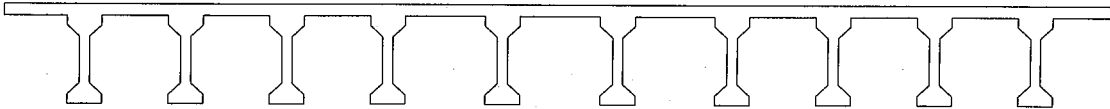
| SECTION | LOCATION / REMARKS | COMPOSITE SECTION PROPERTIES | | | | | NON-COMPOSITE SECTION PROPERTIES | | | | | ALLOWABLE STRESSES | | |
|---------|-----------------------|------------------------------|-------------------|---------|---------|-------------------|----------------------------------|-------------------|---------|---------|-------------------|--------------------|--------------------|--------------------|
| | | A_{gross} | A_{shear} | c_b | c_t | $I_{bending}$ | A_{gross} | A_{shear} | c_b | c_t | $I_{bending}$ | f_y | σ_b (allow) | σ_v (allow) |
| | | (m ²) | (m ²) | (m) | (m) | (m ⁴) | (m ²) | (m ²) | (m) | (m) | (m ⁴) | (MPa) | (MPa) | (MPa) |
| 1 | @ Abutment A1 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |
| 2 | @ Midspan of Span 1 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 185.9 | 111.54 |
| 3 | @ Pier 1 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |
| 4 | @ Midspan of Span 2 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 185.9 | 111.54 |
| 5 | @ Pier 2 (left side) | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |
| 6 | @ Pier 2 (right side) | 0.10164 | 0.02177 | 2.12900 | 0.29000 | 0.05976 | 0.02964 | 0.02177 | 1.18200 | 1.23700 | 0.02200 | 338.00 | 185.9 | 111.54 |
| 7 | @ Midspan of Span 3 | 0.13773 | 0.02219 | 1.88700 | 0.57800 | 0.14458 | 0.06576 | 0.02219 | 1.14400 | 1.32100 | 0.07505 | 338.00 | 185.9 | 111.54 |
| 8 | @ Pier 3 (left side) | 0.10164 | 0.02177 | 2.12900 | 0.29000 | 0.05976 | 0.02964 | 0.02177 | 1.18200 | 1.23700 | 0.02200 | 338.00 | 185.9 | 111.54 |
| 9 | @ Pier 3 (right side) | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |
| 10 | @ Midspan of Span 4 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 185.9 | 111.54 |
| 11 | @ Abutment A2 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 185.9 | 111.54 |

| SECTION | LOCATION / REMARKS | COMPOSITE SECTION PROPERTIES | | | | | NON-COMPOSITE SECTION PROPERTIES | | | | | ALLOWABLE STRESSES | | |
|---------|-----------------------|------------------------------|-------------|---------|---------|---------------|----------------------------------|-------------|---------|---------|---------------|--------------------|--------------------|--------------------|
| | | A_{gross} | A_{shear} | c_b | c_t | $I_{bending}$ | A_{gross} | A_{shear} | c_b | c_t | $I_{bending}$ | f_y | σ_b (allow) | σ_v (allow) |
| | | (m^2) | (m^2) | (m) | (m) | (m^4) | (m^2) | (m^2) | (m) | (m) | (m^4) | (MPa) | (MPa) | (MPa) |
| 1 | @ Abutment A1 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |
| 2 | @ Midspan of Span 1 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 253.5 | 152.1 |
| 3 | @ Pier 1 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |
| 4 | @ Midspan of Span 2 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 253.5 | 152.1 |
| 5 | @ Pier 2 (left side) | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |
| 6 | @ Pier 2 (right side) | 0.10164 | 0.02177 | 2.12900 | 0.29000 | 0.05976 | 0.02964 | 0.02177 | 1.18200 | 1.23700 | 0.02200 | 338.00 | 253.5 | 152.1 |
| 7 | @ Midspan of Span 3 | 0.13773 | 0.02219 | 1.88700 | 0.57800 | 0.14458 | 0.06576 | 0.02219 | 1.14400 | 1.32100 | 0.07505 | 338.00 | 253.5 | 152.1 |
| 8 | @ Pier 3 (left side) | 0.10164 | 0.02177 | 2.12900 | 0.29000 | 0.05976 | 0.02964 | 0.02177 | 1.18200 | 1.23700 | 0.02200 | 338.00 | 253.5 | 152.1 |
| 9 | @ Pier 3 (right side) | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |
| 10 | @ Midspan of Span 4 | 0.10228 | 0.01358 | 1.48770 | 0.21030 | 0.03829 | 0.03028 | 0.01358 | 0.75000 | 0.94800 | 0.01463 | 338.00 | 253.5 | 152.1 |
| 11 | @ Abutment A2 | 0.09410 | 0.01339 | 1.54800 | 0.12600 | 0.02500 | 0.02210 | 0.01339 | 0.81200 | 0.86200 | 0.00912 | 338.00 | 253.5 | 152.1 |

APPENDIX 7.4.3-1 (11/14)

BRIDGE NAME : ROSARIO BRIDGE

SECTION PROPERTIES



Area: 12252000.0000
Perimeter: 85396.4502
Bounding box: X: -1001.3459 -- 20758.6541
Y: 4354.4067 -- 6474.4067
Centroid: X: 9878.6541
Y: 5760.0564
Moments of inertia: X: 4.1286E+14
Y: 1657227907488009
Product of inertia: XY: 6.9716E+14
Radii of gyration: X: 5804.9391
Y: 11630.2118
Principal moments and X-Y directions about centroid:
I: 6.3596E+12 along [1.0000 0.0000]
J: 4.6158E+14 along [0.0000 1.0000]

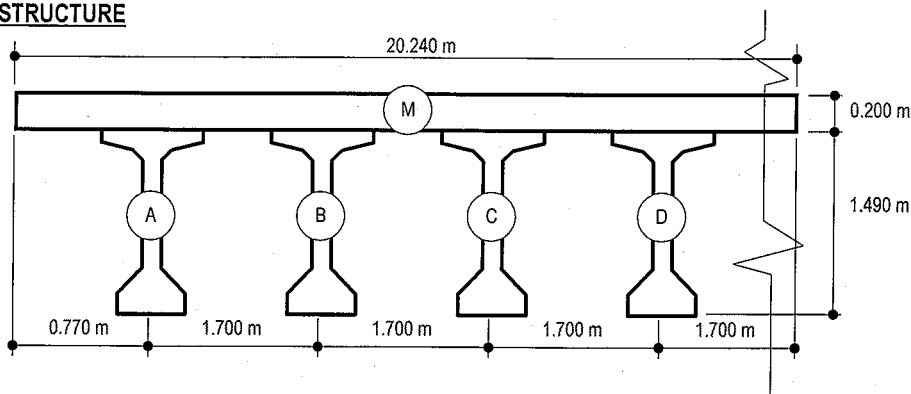
APPENDIX 7.4.3-1 (12/14)

BRIDGE NAME : MARCOS BRIDGE

SECTION PROPERTIES

| | |
|---|----------------|
| Modulus of elasticity of prestressed concrete girder, E_c | = 27983.06 Mpa |
| Modulus of elasticity of reinforced concrete slab, E_{cs} | = 21675.58 Mpa |
| Modular ratio, $n = E_{cs} / E_c$ | = 0.774597 |

WHOLE STRUCTURE



A) Total Area (A_x) for Weight Computation

| | | | | |
|--------|--|--|----------------|-----------------------------|
| Girder | : No. of girders $\times A_{girder} = 12 \times 0.535$ | | | = 6.414 m ² |
| Slab | : $bt = 20.240 \times 0.200$ | | | = 4.048 m ² |
| Haunch | : No. of haunch $\times A_{haunch} = 12 \times 0.500$ | | | = 6.000 m ² |
| | | | Total = | 16.462 m² |

B) For I_x

| | | | | |
|--------|---|--|----------------|----------------------------|
| Girder | : No. of girders $\times I_x = 12 \times 0.007$ | | | = 0.078 m ⁴ |
| Slab | : $nbt^3 / 3 = 0.775 \times 20.240 \times 0.200^3 \div 3$ | | | = 0.042 m ⁴ |
| | | | Total = | 0.120 m⁴ |

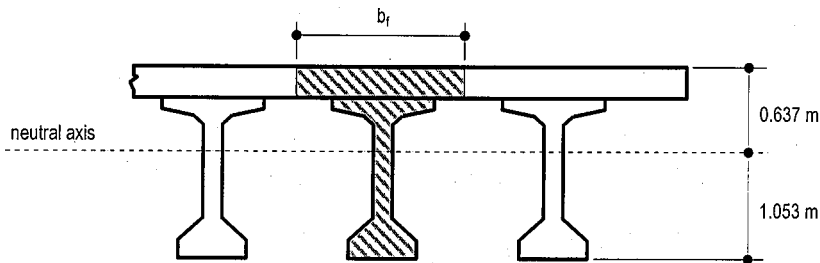
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | $I_{y,y}$ (m ⁴) | $I_y = I_{y,y} + Ad^2$ (m ⁴) |
|--------------|---------------------------|--------|----------------------|-------|-----------------------------------|-----------------------------|--|
| A | 0.535 | 19.470 | 10.407 | 9.350 | 46.728 | 0.020 | 46.748 |
| B | 0.535 | 17.770 | 9.498 | 7.650 | 31.281 | 0.020 | 31.301 |
| C | 0.535 | 16.070 | 8.589 | 5.950 | 18.923 | 0.020 | 18.943 |
| D | 0.535 | 14.370 | 7.681 | 4.250 | 9.654 | 0.020 | 9.675 |
| E | 0.535 | 12.670 | 6.772 | 2.550 | 3.476 | 0.020 | 3.496 |
| F | 0.535 | 10.970 | 5.864 | 0.850 | 0.386 | 0.020 | 0.407 |
| G | 0.535 | 9.270 | 4.955 | 0.850 | 0.386 | 0.020 | 0.407 |
| H | 0.535 | 7.570 | 4.046 | 2.550 | 3.476 | 0.020 | 3.496 |
| I | 0.535 | 5.870 | 3.138 | 4.250 | 9.654 | 0.020 | 9.675 |
| J | 0.535 | 4.170 | 2.229 | 5.950 | 18.923 | 0.020 | 18.943 |
| K | 0.535 | 2.470 | 1.320 | 7.650 | 31.281 | 0.020 | 31.301 |
| L | 0.535 | 0.770 | 0.412 | 9.350 | 46.728 | 0.020 | 46.748 |
| M | 3.136 | 10.120 | 31.732 | 0.000 | 0.000 | 107.042 | 107.042 |
| Total | 9.550 | | 96.642 | | | | 328.182 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{zz} (m ⁴) | $I_z = I_{zz} + Ad^2$ (m ⁴) |
|-------|------------------------------|----------|-------------------------|----------|--------------------------------------|-------------------------------|--|
| A | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| B | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| C | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| D | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| E | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| F | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| G | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| H | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| I | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| J | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| K | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| L | 0.535 | 0.789 | 0.422 | 0.263 | 0.037 | 0.145 | 0.182 |
| E | 3.136 | 1.590 | 4.986 | 0.538 | 0.907 | 0.010 | 0.918 |
| Total | 9.550 | | 10.047 | | | | 3.100 |

ONE PIECE GIRDER



Effective flange width, b_f : (minimum)

- a) 1/4 span length = 30.000 ÷ 4 = 7.500 m
 - b) Center-to-center spacing of girde = 1.700 = 1.700 m
 - c) Web width + 12 times slab thickr = 0.203 + 12 × 0.200 = 2.603 m
- Use b_f = 1.700 m**

A) Total Area (A_x) for Weight Computation

- Girder : = 0.535 m²
 - Slab : $b_f t = 1.700 \times 0.200$ = 0.340 m²
 - Haunch : = 0.500 m²
- Total = 1.375 m²**

B) For I_x

- Girder : = 0.007 m⁴
 - Slab : $nb_f t^3 / 3 = 0.775 \times 1.700 \times 0.200^3 \div 3$ = 0.004 m⁴
- Total = 0.010 m⁴**

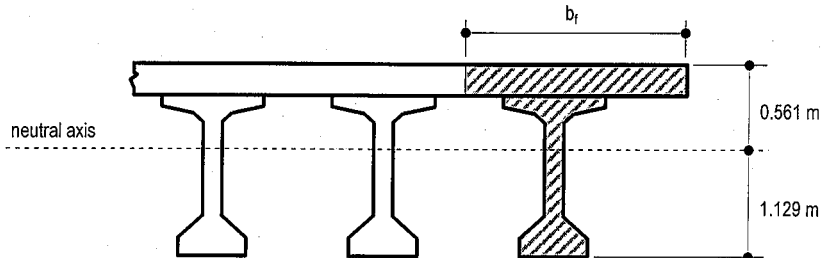
C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | $I_{y,y}$ (m ⁴) | $I_y = I_{y,y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.535 | 0.850 | 0.454 | 0.000 | 0.000 | 0.020 | 0.020 |
| Slab | 0.263 | 0.850 | 0.224 | 0.000 | 0.000 | 0.063 | 0.063 |
| Total | 0.798 | | 0.678 | | | | 0.084 |

D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{zz} (m ⁴) | $I_z = I_{zz} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|-------------------------------|--|
| Girder | 0.535 | 0.789 | 0.422 | 0.264 | 0.037 | 0.145 | 0.182 |
| Slab | 0.263 | 1.590 | 0.419 | 0.537 | 0.076 | 0.001 | 0.077 |
| Total | 0.798 | | 0.841 | | | | 0.259 |

EXTERIOR GIRDER



Effective flange width, b_f : (minimum)

$$\begin{aligned}
 \text{a) } 1/4 \text{ span length} &= 30.000 \div 4 = 7.500 \text{ m} \\
 \text{b) } 1/2 \text{ girder spacing} + \text{length of cantile} &= 0.850 + 1.700 = 2.550 \text{ m} \\
 \text{c) } \text{Web width} + 12 \text{ times slab thickness} &= 0.203 + 12 \times 0.200 = 2.603 \text{ m} \\
 \text{Use } b_f &= 2.550 \text{ m}
 \end{aligned}$$

A) Total Area (A_x) for Weight Computation

$$\begin{aligned}
 \text{Girder} &: &= & 0.535 \text{ m}^2 \\
 \text{Slab} &: b_f t = 2.550 \times 0.200 &= & 0.510 \text{ m}^2 \\
 \text{Haunch} &: &= & 0.500 \text{ m}^2 \\
 \text{Total} &= &= & \mathbf{1.545 \text{ m}^2}
 \end{aligned}$$

B) For I_x

$$\begin{aligned}
 \text{Girder} &: &= & 0.007 \text{ m}^4 \\
 \text{Slab} &: nb_f t^3 / 3 = 0.775 \times 2.550 \times 0.200^3 \div 3 &= & 0.005 \text{ m}^4 \\
 \text{Total} &= &= & \mathbf{0.012 \text{ m}^4}
 \end{aligned}$$

C) For I_y

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{y-y} (m ⁴) | $I_y = I_{y-y} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|--------------------------------|---|
| Girder | 0.535 | 1.700 | 0.909 | 0.181 | 0.017 | 0.020 | 0.038 |
| Slab | 0.395 | 1.275 | 0.504 | 0.244 | 0.024 | 0.214 | 0.238 |
| Total | 0.930 | | 1.412 | | | | 0.276 |

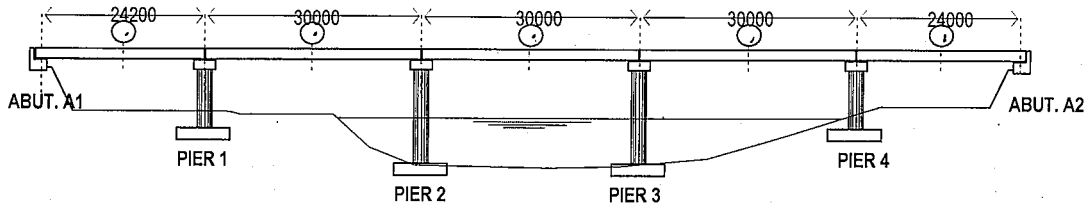
D) For I_z

| Item | Area, A (m ²) | y (m) | Ay (m ³) | d (m) | Ad ² (m ⁴) | I_{zz} (m ⁴) | $I_z = I_{zz} + Ad^2$ (m ⁴) |
|--------|------------------------------|----------|-------------------------|----------|--------------------------------------|-------------------------------|--|
| Girder | 0.535 | 0.789 | 0.422 | 0.340 | 0.062 | 0.145 | 0.207 |
| Slab | 0.395 | 1.590 | 0.628 | 0.461 | 0.084 | 0.001 | 0.085 |
| Total | 0.930 | | 1.050 | | | | 0.292 |

APPENDIX 7.4.3-1 (13/14)

BRIDGE NAME : MARIKINA BRIDGE

SECTION PROPERTIES



A - SUPERSTRUCTURE (AASHTO GIRDER)

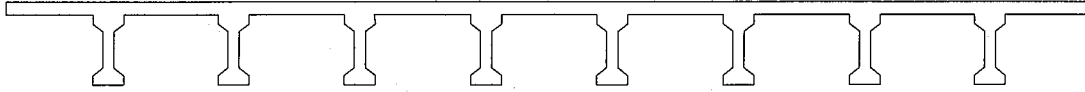
| SECTION | LOCATION / REMARKS | COMPOSITE SECTION PROPERTIES | | | | NO. OF TENDONS (Grade 270) 12-12.7mm dia per duct | TENDON ECC. (m) | ALLOWABLE STRESSES @ SERVICE | |
|---------|---------------------|------------------------------|-------|-------|---------------|--|-----------------|------------------------------|---------------|
| | | A_{gross} | c_b | c_t | $I_{bending}$ | | | COMPRESSION (Mpa) | TENSION (Mpa) |
| | | (m^2) | (m) | (m) | (m^4) | | | | |
| 1 | @ Midspan of Span 1 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.848 | 21.00 | 2.95 |
| 2 | @ Midspan of Span 2 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.898 | 21.00 | 2.95 |
| 3 | @ Midspan of Span 3 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.898 | 21.00 | 2.95 |
| 4 | @ Midspan of Span 4 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.898 | 21.00 | 2.95 |
| 5 | @ Midspan of Span 5 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.848 | 21.00 | 2.95 |

| SECTION | LOCATION / REMARKS | COMPOSITE SECTION PROPERTIES | | | | NO. OF TENDONS (Grade 270) 12-12.7mm dia per duct | TENDON ECC. (m) | ALLOWABLE STRESSES @ SERVICE | |
|---------|---------------------|------------------------------|-------|-------|---------------|--|-----------------|------------------------------|---------------|
| | | A_{gross} | c_b | c_t | $I_{bending}$ | | | COMPRESSION (Mpa) | TENSION (Mpa) |
| | | (m^2) | (m) | (m) | (m^4) | | | | |
| 1 | @ Midspan of Span 1 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.848 | 21.00 | 2.95 |
| 2 | @ Midspan of Span 2 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.898 | 21.00 | 2.95 |
| 3 | @ Midspan of Span 3 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.898 | 21.00 | 2.95 |
| 4 | @ Midspan of Span 4 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.898 | 21.00 | 2.95 |
| 5 | @ Midspan of Span 5 | 0.70150 | 0.998 | 0.422 | 0.22204 | 3 | 0.848 | 21.00 | 2.95 |

APPENDIX 7.4.3-1 (14/14)

BRIDGE NAME : SAN JOSE BRIDGE

SECTION PROPERTIES



Area: 8580724.0000
Perimeter: 64324.8964
Bounding box: X: -601.5497 -- 18998.4503
Y: -7.6254 -- 1613.3746
Centroid: X: 9204.8821
Y: 1140.5379
Moments of inertia: X: 1.3374E+13
Y: 9.8368E+14
Product of inertia: XY: 9.0064E+13
Radii of gyration: X: 1248.4562
Y: 10706.9471
Principal moments and X-Y directions about centroid:
I: 2.2122E+12 along [1.0000 -0.0001]
J: 2.5664E+14 along [0.0001 1.0000]