SOCIALIST REPUBLIC OF VIETNAM
PEOPLE'S COMMITTEE OF HAI PHONG CITY, VIETNAM

SOCIALIST REPUBLIC OF VIETNAM

PREPARATORY SURVEY

ON

HAI PHONG ARTERIAL ROAD CONSTRUCTION PROJECT

# BRIDGE DRAWINGS

DECEMBER 2016

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CHODAI CO.,LTD.
ORIENTAL CONSULTANTS GLOBAL CO., LTD.
ALMEC VPI CO., LTD.

# GENERAL DRAWINGS

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|---|---|---|---|
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DRAWING TITLE: LIST OF DRAWINGS (1)

Rev No.

DRAWING No. G-01

SCALE

# LIST OF DRAWINGS (2)

| | | | |
|---|---|---|---|
| **VU YEN BRIDGE** | | | |
| VY-01 | GENERAL VIEW OF VU YEN BRIDGE (1) | VY-25 | CONSTRUCTION SEQUENCE OF APPROACH BRIDGE (3) |
| VY-02 | GENERAL VIEW OF VU YEN BRIDGE (2) | VY-26 | CONSTRUCTION SEQUENCE OF RAMP WAY |
| VY-03 | GENERAL VIEW OF VU YEN BRIDGE (3) | VY-27 | CONSTRUCTION SEQUENCE OF FOUNDATION (1) |
| VY-04 | GENERAL VIEW OF SOUTH IC RAMP A | VY-28 | CONSTRUCTION SEQUENCE OF FOUNDATION (2) |
| VY-05 | GENERAL VIEW OF SOUTH IC RAMP B | VY-29 | QUANTITIES OF SUPERSTRUCTURE |
| VY-06 | GENERAL VIEW OF SOUTH IC RAMP C | VY-30 | QUANTITIES OF SUBSTRUCTURE |
| VY-07 | GENERAL VIEW OF SOUTH IC RAMP D | **RUOT LON BRIDGE** | |
| VY-08 | GENERAL VIEW OF CABLE STAYED BRIDGE | RL-01 | GENERAL VIEW OF RUOT LON BRIDGE |
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| VY-12 | FOUNDATION (NP) | RL-05 | GENERAL VIEW OF APPROACH BRIDGE |
| VY-13 | FOUNDATION (SP) | RL-06 | CONSTRUCTION SEQUENCE OF PC-BOX GIRDER |
| VY-14 | GIRDER OF APPROACH BRIDGE | RL-07 | CONSTRUCTION SEQUENCE OF APPROACH BRIDGE |
| VY-15 | PIER OF APPROACH BRIDGE | **OVERPASS** | |
| VY-16 | ABUTMENT OF APPROACH BRIDGE | OP-01 | GENERAL VIEW OF No. 1 IC OVERPASS BRIDGE |
| VY-17 | BEARING, EXPANSION JOINT | OP-02 | GENERAL VIEW OF No. 2 IC OVERPASS BRIDGE |
| VY-18 | PIER AND ABUTMENT OF RAMP WAY A, D | OP-03 | GENERAL VIEW OF No. 3 IC OVERPASS BRIDGE |
| VY-19 | PIER AND ABUTMENT OF RAMP WAY B | OP-04 | SUBSTRUCTURE OF No.1 IC |
| VY-20 | PIER AND ABUTMENT OF RAMP WAY C | OP-05 | SUBSTRUCTURE OF No.2 IC |
| VY-21 | CONSTRUCTION SEQUENCE OF CABLE STAYED BRIDGE (1) | OP-06 | SUBSTRUCTURE OF No.3 IC |
| VY-22 | CONSTRUCTION SEQUENCE OF CABLE STAYED BRIDGE (2) | OP-07 | CONSTRUCTION SEQUENCE OF OVERPASS |
| VY-23 | CONSTRUCTION SEQUENCE OF APPROACH BRIDGE (1) | | |
| VY-24 | CONSTRUCTION SEQUENCE OF APPROACH BRIDGE (2) | | |

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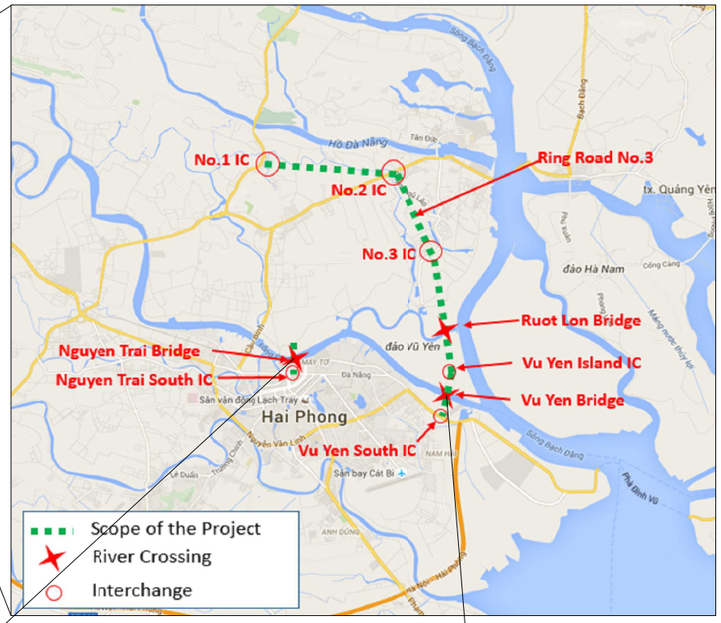
DRAWING TITLE: LIST OF DRAWINGS (2)

DRAWING No. G-02

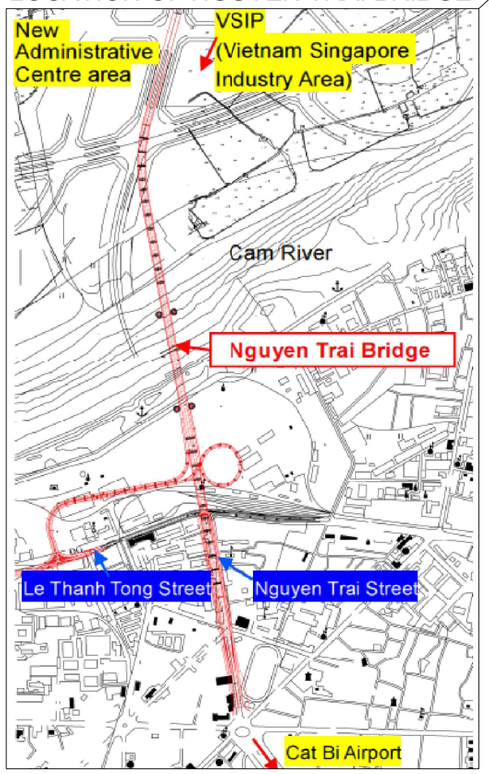
SCALE

Rev No.

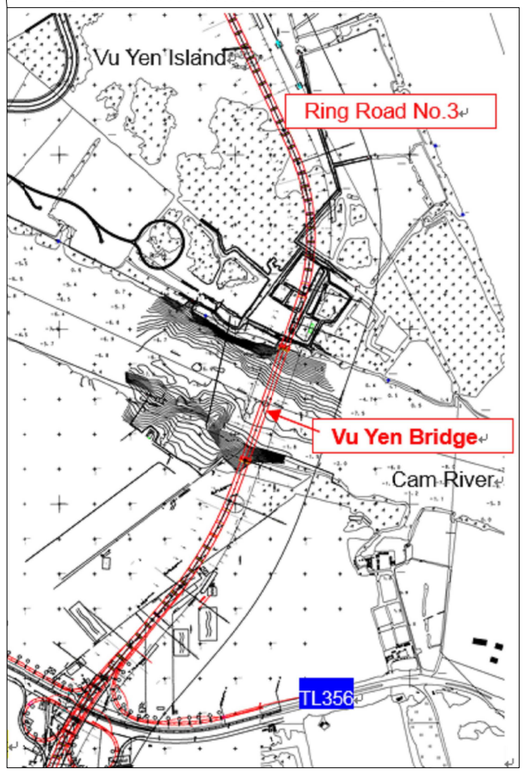
# PROJECT LOCATION MAP


## LOCATION OF NGUYEN TRAI BRIDGE




## LOCATION OF VU YEN BRIDGE




| | | | |
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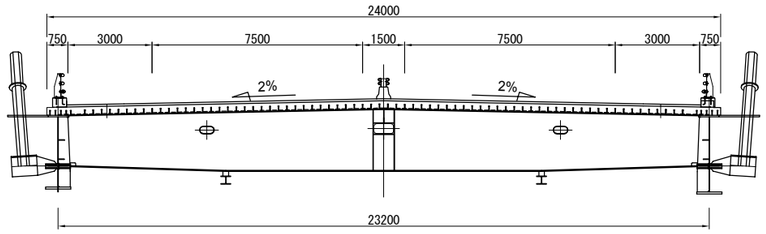
# GENERAL NOTE (1)

## 1. DESIGN CONDITION

### 1.1 GENERAL INFORMATION

| | NGUYEN TRAI BRIDGE | VU YEN BRIDGE |
|---|---|---|
| ROAD STANDARD | TCXDVN 104-2007 (URBAN AREAS SPECIFICATIONS) | TCXDVN 4054-2005 (HIGHWAY SPECIFICATIONS) |
| DESIGN SPEED | V=80KM/H | |
| NUMBER OF LANES | 4 LANES, EACH 3.75M WIDE | |
| LONGITUDINAL GRADIENT | 4% (SPECIFIED FOR URBAN AREAS) | |
| SPAN ARRANGEMENT | L=92+280+92M=464M | L=40+159+340+159+40M=738M |

**TYPICAL CROSS SECTION OF MAIN BRIDGE**




### 1.2 MATERIAL

CONCRETE STRENGTH

| CONCRETE CLASS | STRENGTH F'c (MPa) | STRUCTURAL ELEMENTS IN USE |
|---|---|---|
| C40 | 40 | CIP BOX GIRDERS, V SHAPE PIER OF ARCH, PRECAST SLAB |
| C30 | 30 | ABUTMENTS, PIERS, BORED PILES |
| C25 | 25 | PARAPETS, APPROACH SLABS |
| C20 | 20 | SEALING CONCRETE |
| C10 | 10 | BLINDING CONCRETE |

CONCRETE STRENGTH

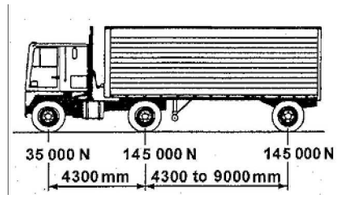
| THICKNESS | SM400 [MPa] | SM490 [MPa] | SM490Y [MPa] | SM570 [MPa] | BHS500 [MPa] |
|---|---|---|---|---|---|
| T<16 | 245 | 325 | 365 | 460 | 500 |
| 16<T<40 | 235 | 315 | 355 | 450 | 500 |
| 40<T<75 | 215 | 295 | 335 | 430 | 500 |

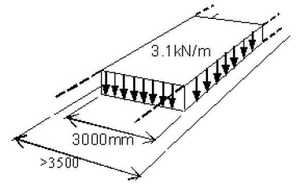
| | SUPER T GIRDER | BOX GIRDER | HOLLOW SLAB GIRDER | PRESTRESSING BAR D32 |
|---|---|---|---|---|
| | ASTM A416 | | | ASTM A722 |
| DIAMETER | 15.2×1STRANDS | 15.2×12 STRANDS | 12.7×7STRANDS | |
| TENSILE STRENGTH | 1,860 MPa | | | 1,180 MPa |
| YIELD STRENGTH | 1,670 MPa | | | 930 MPa |
| ELASTIC MODULUS | 200,000 MPa | | | 200,000 MPa |

### 1.3 DESIGN LOAD

#### 1.3.1 LIVE LOAD

THE BRIDGES HAVE 3 NOTIONAL LANES OF TRAFFIC IN EACH DIRECTION. SINCE THESE BRIDGES HAVE MORE THAN 3 LANES, THE MULTIPLE PRESENCE FACTOR IS SET AT 0.65.




#### 1.3.2 EARTHQUAKE LOAD

VIETNAMESE STANDARDS (22TCN-272-05) ARE APPLIED.
SEISMIC ZONE :2
SOIL PROPERTY COEFFICIENT :2

| BRIDGE NAME | DISTRICT | ACCELERATION RETURN PERIOD 475 YEARS |
|---|---|---|
| NGUYEN TRAI BRIDGE | NGO QUYEN DISTRICT | A=0.1276 |
| VU YEN BRIDGE | HAI AN DISTRICT | A=0.1291 |

#### 1.3.3 WIND LOAD

THE MAXIMUM WIND SPEED OBTAINED FROM THE OBSERVED DATA IS 47.2M/S (2MIN AVERAGE WIND SPEED, H=12M FROM LAND, LAND HEIGHT IS 115M). FOR DESIGN, WIND SPEED IS 37.9 m/sec WHICH IS CONVERTED CONSIDERING HEIGHT AND ENVIRONMENT OF SITE. GUST FACTOR IS USED ACCORDING TO JAPANESE STANDARDS, 1.9 FOR ALL MEMBER OF VU YEN BRIDGE.

$p=0.5\rho Vd^2CdG$

WHERE:
p = WIND PRESSURE
ρ = THE MASS DENSITY OF AIR = 0.125 [kg s2/m4]
Cd = DRAG COEFFICIENT
G = GUST FACTOR
Vd = DESIGN WIND VELOCITY =37.9[m/s]

| | | | |
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| | CONSULTANTS: JOINT VENTURE OF CHODAI CO.,LTD. ORIENTAL CONSULTANTS GLOBAL CO.,LTD. ALMEC VPI CO.,LTD. | DRAWING No. G-04 / SCALE | |

# GENERAL NOTE (2)

## 1.3.4 TEMPERATURE LOAD

THE TEMPERATURE RANGES (ARTICLE 3.12.2 OF 22TCN-272-05) OF EACH MATERIAL ARE SHOWN IN THE FOLLOWING TABLE. THE BASIC TEMPERATURE (AT THE TIME OF ERECTION) IS 23.2 DEGREES.

| CONCRETE | CONCRETE DECK ON STEEL GIRDER | STEEL DECK ON STEEL GIRDER |
|---|---|---|
| +5 DEG. TO 47 DEG. | +1 DEG. TO 55 DEG. | -3 DEG. TO 63 DEG. |
| (-18.2, +23.8 DEG.) | (-22.2, +31.8 DEG.) | (-26.2, +39.8 DEG.) |

TEMPERATURE COEFFICIENTS

- 1.08X10-5 / FOR CONCRETE MEMBERS
- 1.2X10-5 / FOR STEEL MEMBERS.

## 1.4 CLEARANCE

| BRIDGE | NGUYEN TRAI BRIDGE | VU YEN BRIDGE |
|---|---|---|
| DESIGN VESSEL | 7,000 DWT | 20,000 DWT IN REVER FLOW<br>4,000 DWT INSIDE OF WATER LINE |
| VESSEL SPEED | 8 KNOTS (14.816 KM/H) | 8 KNOTS (14.816 KM/H) |
| CLEARANCE (H) | HMAX5% (+2.37M) + 25.0M | HMAX5% (+2.37M) + 47.77M |
| WIDTH (B) | 80M + CURVE EFFECT, AND 30M SAFETY ZONE ON EACH SIDE | 80M + CURVE EFFECT, AND 30M SAFETY ZONE ON EACH SIDE |

## 1.5 AIR SPACE

| BRIDGE | NGUYEN TRAI BRIDGE | VU YEN BRIDGE |
|---|---|---|
| CLEARANCE (H) | 145M | 100M |

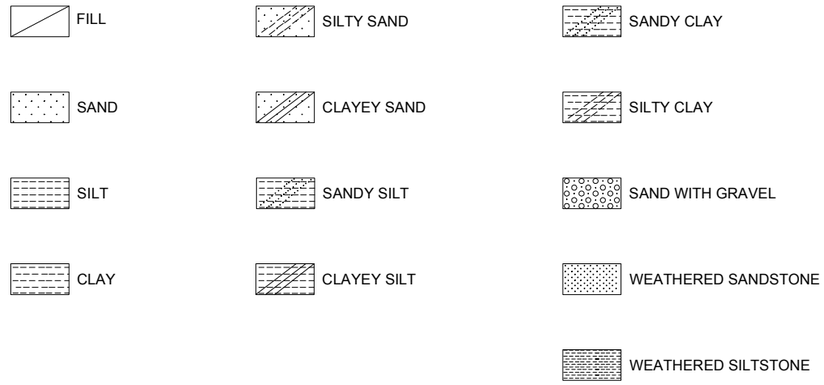
## 1.6 DISTANCE FROM OIL FACILITIES(VU YEN BRIDGE)

| | MIPECORP | PETEC |
|---|---|---|
| PETROL PORT CLASS | CLASS II | CLASS IV |
| SAFETY DISTANCE FROM PORT * | 500M | 300M |
| SIZE OF DOCKING VESSELS | ABOUT 15,000 DWT | ABOUT 8,000 DWT |
| | | (4-10 SHIPS/MONTH) |

*DECREE NO.13/2011/ND-CP

## 1.7 BORING LOG LEGEND

TYPE OF SOIL:




GEOTECNICAL PROFILE:

- (Ac1) COHESIVE SOIL LAYER, BROWNISH GREY, BLUISH GREY AND YELLOWISH GREY, VERY SOFT TO SOFT
- (Ac2) COHESIVE SOIL LAYER, BLACKISH GREY, GREY AND YELLOWISH BROWN, MEDIUM STIFF TO VERY STIFF
- (As1) SANDY SOIL LAYER, BLACKISH GREY, LOOSE TO MEDIUM DENSE
- (As2) SANDY SOIL LAYER, GREY AND BLACKISH GREY MOTTLED WITH YELLOWISH GREY, MEDIUM DENSE TO DENSE
- (Al) ALTERNATION LAYER, YELLOWISH GREY, MEDIUM STIFF TO VERY STIFF
- (Ds) SANDY SOIL LAYER, LIGHT GREY AND BLACKISH GREY, DENSE TO VERY DENSE
- (Rs) SANDSTONE, WEATHERED, REDDISH BROWN, MEDIUM STRONG
- (Rc) SILTSTONE, WEATHERED, BLUISH GREY AND REDDISH GREY, MEDIUM STRONG

| | | | |
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# GENERAL NOTE (3) NGUYEN TRAI BRIDGE

## A- SUPERSTRUCTURE DESIGN

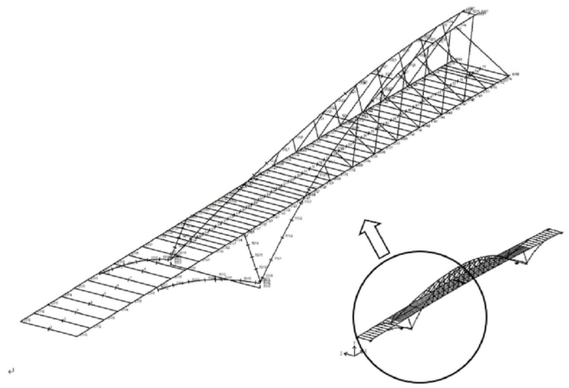
### 1. DESIGN METHOD

NGUYEN TRAI BRIDGE IS ANALYZED USING A 3D MODEL CONSIDERING THE INITIAL LOAD INCLUDING PRE-STRESS, LIVE LOAD, WIND LOAD, AND TEMPERATURE LOAD. THE DESIGN LOAD AND CHECKING METHOD SHALL BE IN ACCORDANCE WITH VIETNAMESE STANDARDS (22 TCN-272-05). THE WIND LOAD AND TEMPERATURE LOAD PARAMETERS OBTAINED FROM THE FIELD STUDY ARE USED.

### 2.ANALYSIS MODEL

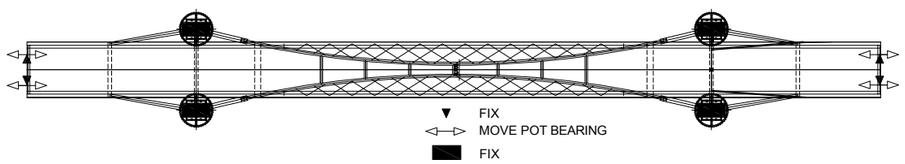
1) MODELING

ANALYSIS IS MADE BY A 3D MODEL WHICH CONSIDERS THE SUPPORT LOCATION AND ECCENTRIC MOMENT AS SHOWN BELOW



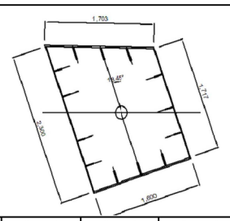
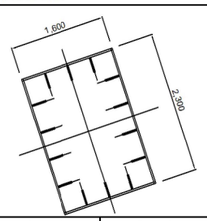
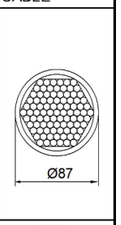
2) SUPPORT CONDITIONS AND EXPANSION JOINTS

THE SUPPORT CONDITIONS CONSIST OF FIXED SUPPORTS AT THE FOUNDATIONS WITH CONCRETE ARCHES, WHILE THE GIRDER ENDS ARE FIXED IN THE VERTICAL AND TRANSITIONAL DIRECTION BY POT BEARINGS AS SHOWN IN THE FOLLOWING FIGURE.




3) STRUCTURE PARAMETERS

THE STRUCTURE PARAMETERS ARE SHOWN IN THE FOLLOWING TABLE.

| SECTION | GIRDER | | | | | ARCH RIB | | CABLE |
|---|---|---|---|---|---|---|---|---|
| |  | | | | |  | |  |
| | Sec-1 | Sec-2 | Sec-3 | Sec-4 | Sec-5 | Sec-1 | Sec-2 | φ7x91 |
| A(m2) | 0.166 | 0.197 | 0.229 | 0.258 | 0.310 | 0.237 | 0.289 | 0.00350 |
| Iz(m4) | 0.114 | 0.138 | 0.151 | 0.169 | 0.215 | 0.173 | 0.213 | |
| Iy(m4) | 0.070 | 0.083 | 0.098 | 0.113 | 0.129 | 0.097 | 0.114 | |
| J(m4) | 0.089 | 0.106 | 0.127 | 0.151 | 0.166 | 0.147 | 0.174 | |

4) WEIGHT (DC,DW)

ASSUMING THAT BARRIERS AND LIGHTNING ARE CONSIDERED, THE ASSUMED WEIGHTS ARE 274.6 [KN/M] FOR THE GIRDERS AND 30.8 [KN/M] FOR THE ARCH RIBS AS SHOWN BELOW.

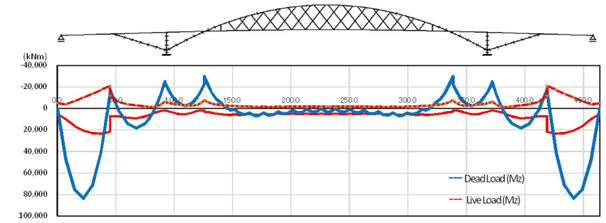
| | 1unit (kN) | | (kN/m/Br) | |
|---|---|---|---|---|
| DECK | 14.987 (box/m) | | 29.975 | |
| DIAPHRAGM | 3.247 (box/unit) | unit/2m | 3.247 | |
| LONGITUDINAL FLOOR BEAM | 5.696 (box/m) | | 11.393 | |
| CROSS BEAM | 73.328 (box/unit) | unit/4m | 36.664 | DC |
| FIXING | 3.906 (/unit) | 2unit/12m | 1.302 | |
| SLAB | 23.5*0.26*23.5m | | 137.475 | |
| PAVEMENT | 22.5*0.075*22.5m | | 37.969 | |
| CENTER BARRIER | 1.6 kN/m | | 1.600 | |
| CURB (CENTER) | 23.5*(0.75+0.25)*0.5 | | 3.819 | |
| SIDE BARRIER | 1.4 kN/m | | 1.400 | |
| CURB (SIDE) | 23.5*(0.75+0.25)*0.5 | | 3.819 | |
| LIGHTNING COLUMN | 0.5 kN/m*2 | | 1.000 | DW |
| INSPECTION WAY | | | 2.500 | |
| INSPECTION WIRE, ETC.. | | | 2.000 | |
| DRAIGNAGE | 0.2 kN/m*2 | | 0.400 | |
| UNSPECIFIED | | | 0.000 | |
| | | | 247.562 kN/m/Br | |
| | | | 137.281 kN/m/Br | |
| | | | 12.2028 kN/m2 | |

| | |
|---|---|
| DC (kN/m/Br) | 220.560 |
| DW (kN/m/Br) | 54.506 |
| Total | 274.562 |

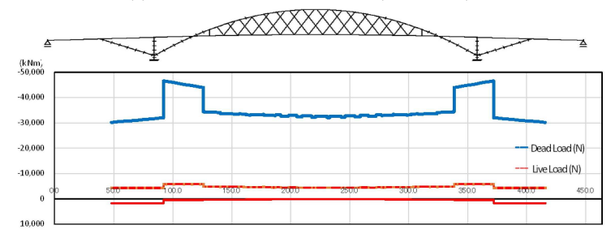
5) SECTIONAL FORCE

THE SECTIONAL FORCE IN CASE OF DEAD LOAD IS SHOWN BELOW. ALTHOUGH THE SECTIONAL FORCE IS DIFFERENT DEPENDING ON THE ERECTION METHOD, AT THE DESIGN STAGE THE COMPLETED STRUCTURE IS ASSUMED FOR ANALYSIS.

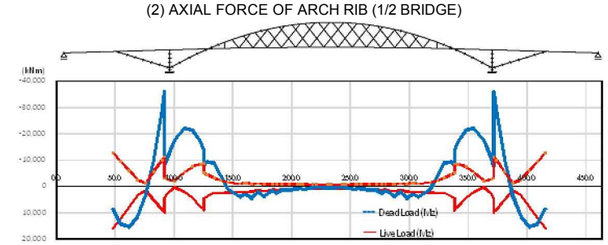
AS A REPRESENTATIVE LOAD CASE, AXIAL FORCE AND BENDING MOMENT BY DEAD LOAD AND LIVE LOAD ARE SHOWN IN THE FOLLOWING FIGURES.




(1) BENDING MOMENT OF GIRDER (1/2 BRIDGE)




(2) AXIAL FORCE OF ARCH RIB (1/2 BRIDGE)




(3) BENDING MOMENT OF ARCH RIB (1/2 BRIDGE)

| | | | |
|---|---|---|---|
| PROJECT: PREPARATORY SURVEY ON HAI PHONG ARTERIAL ROAD CONSTRUCTION PROJECT | JICA | JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) | DRAWING TITLE: GENERAL NOTE (3) NGUYEN TRAI BRIDGE |
| | | CONSULTANTS: JOINT VENTURE OF CHODAI CO.,LTD. ORIENTAL CONSULTANTS GLOBAL CO.,LTD. ALMEC VPI CO.,LTD. | DRAWING No. G-06 / SCALE |

Rev No.

# GENERAL NOTE (4) NGUYEN TRAI BRIDGE

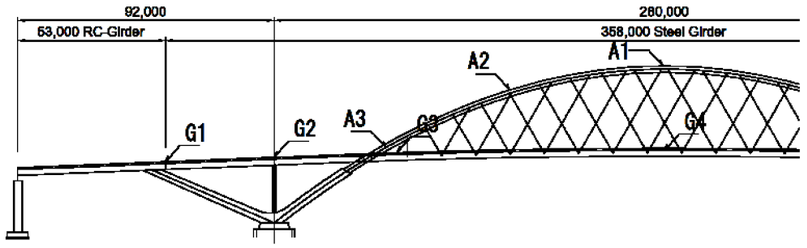
## 3. CHECKING

DURING BRIDGE ERECTION, THE PRECAST PC SLABS ARE LOADED AFTER FINISHING LARGE BLOCK ERECTION FOR THE CENTER SPAN ARCH. FOR THIS REASON, THE STEEL ARCH RIB SUPPORTS THE WEIGHT OF THE PRE-CAST PC SLABS. AFTER THAT, THE COMPOSITE SECTION WILL RESIST THE LIVE LOAD. IN THIS PREPARATORY STUDY, THE STEEL SECTION OF THE ARCH RIBS IS CHECKED AGAINST THE LOAD TOTAL TO BE ON THE SAFE SIDE.

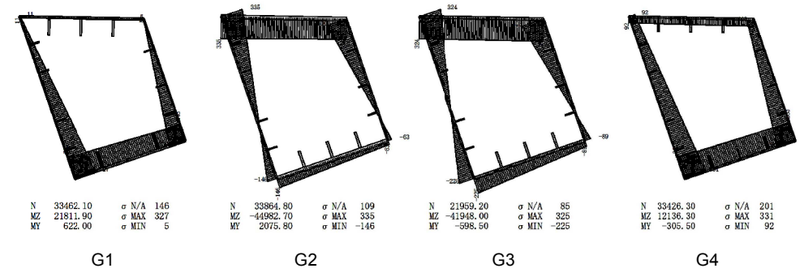
ANALYSIS AT EACH ERECTION STAGE AND STUDY OF DISTRIBUTION SECTIONAL FORCE IN EACH STRUCTURE SHALL BE CONSIDERED AT THE DETAILED DESIGN STAGE.

1) STRESS CHECKS OF ARCH RIBS AND STIFFENING GIRDERS

THE SECTION TYPE DISTRIBUTION OF THE STIFFENING GIRDERS IS SHOWN IN THE FOLLOWING FIGURE AND THE MAXIMAL STRESS IN THE STIFFENING GIRDERS AND ARCH RIBS IS SHOWN IN THE FOLLOWING FIGURE.



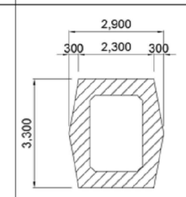
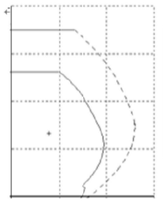
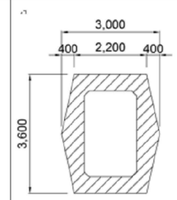
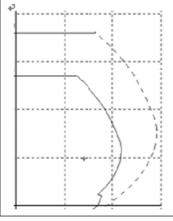

| Section | 3 | 5 | 4 | 3 | 5 | 4 | 2 | 4 | 5 | 4 | 2 | 1 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L(m) | 7.5 | 16.0 | 6.0 | 7.0 | 7.0 | 3.5 | 20.0 | 4.0 | 6.0 | 3.5 | 3.5 | 20.0 | 45.0 | 62.0 |
| tf(mm) | 32 | 60 | 35 | 32 | 60 | 35 | 32 | 36 | 50 | 36 | 32 | 25 | 32 | 25 |
| tw(mm) | 18 | 22 | 22 | 18 | 22 | 22 | 14 | 22 | 22 | 22 | 14 | 12 | 14 | 12 |




G1 G2 G3 G4

2) CHECKING OF ARCH RIB (RC) AND V PIER

RESULT OF ARCH RIB (RC) AND V PIER CHECKING IS SHOWN IN THE FOLLOWING FIGURE.

| | Section | Result |
|---|---|---|
| Arch Rib (RC) |  |  |
| V Pier |  |  |

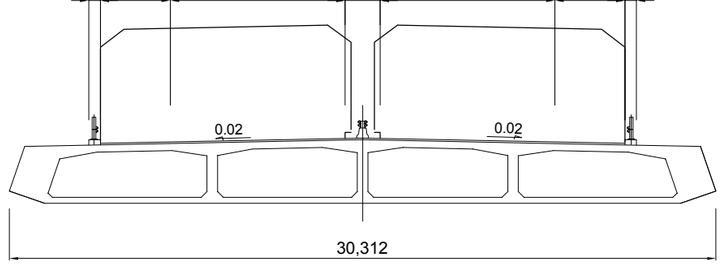


| | | | | | |
|---|---|---|---|---|---|
| Nu | kN | 65000.0 | ex | m | 0.5846 |
| Mux | kN·m | 38000.0 | ey | m | — |
| Muy | kN·m | 0.0 | Prx | m | 114734.8 |
| ϕ mo | — | 0.9000 | Pry | m | 131133.6 |
| ϕ no | — | 0.7500 | Po | m | 218556.1 |
| Pno | kN | 174844.85 | ϕ | m | 0.7500 |
| Pro | kN | 131133.64 | ϕ·Po | m | 163917.0 |
| P10 | kN | 14700.00 | Prxy | m | 97647.6 |
| VERI. ITEM | — | AXIAL FORCE | Nu/Prxy | m | 0.666 |
| | | | JUDGE | — | ok |

| | | | | | |
|---|---|---|---|---|---|
| Nu | kN | 47000.0 | ex | m | 1.4468 |
| Mux | kN·m | 68000.0 | ey | m | — |
| Muy | kN·m | 0.0 | Prx | m | 72981.3 |
| ϕ mo | — | 0.9000 | Pry | m | 138985.5 |
| ϕ no | — | 0.7500 | Po | m | 231642.5 |
| Pno | kN | 185314.01 | ϕ | m | 0.7500 |
| Pro | kN | 138985.51 | ϕ·Po | m | 173731.9 |
| P10 | kN | 15600.00 | Prxy | m | 66045.3 |
| VERI. ITEM | — | AXIAL FORCE | Nu/Prxy | m | 0.712 |
| | | | JUDGE | — | ok |

3) DESIGN OF PC GIRDER

SIDE SPAN OF ARCH BRIDGE IS COMPOSED OF PC BOX GIRDER IN ORDER TO IMPROVE THE WEIGHT BALANCE WITH CENTER SPAN. FOR BENDING MOMENT OF SIDE SPAN, THE GIRDER IS DESIGNED AS PC-BOX GIRDER.




| | | | |
|---|---|---|---|
| PROJECT: PREPARATORY SURVEY ON HAI PHONG ARTERIAL ROAD CONSTRUCTION PROJECT | JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) | DRAWING TITLE: GENERAL NOTE (4) NGUYEN TRAI BRIDGE | Rev No. |
| | CONSULTANTS: JOINT VENTURE OF CHODAI CO.,LTD. ORIENTAL CONSULTANTS GLOBAL CO.,LTD. ALMEC VPI CO.,LTD. | DRAWING No. G-07 / SCALE | |

# GENERAL NOTE (5) NGUYEN TRAI BRIDGE

## B - SUBSTRUCTURE DESIGN

### 1. GENERAL

THE DESIGN OF SUBSTRUCTURE FOR NGUYEN TRAI BRIDGE IS BASICALLY BASED ON THE GENERAL CALCULATION OF THE FOUNDATION TYPES. SPSP AND STEEL PIPE PILE Φ900MM FOUNDATION TYPES ARE USED FOR THE MAIN BRIDGE AND APPROACH BRIDGES RESPECTIVELY.

IN GENERAL CALCULATION, IN ADDITION TO THE REACTION FORCES FROM SUPERSTRUCTURE, THE IMPACT OF BUOYANT FORCE, WATER FLOW PRESSURE, VESSEL COLLISION, AND SEISMIC FORCES HAVE BEEN CONSIDERED.

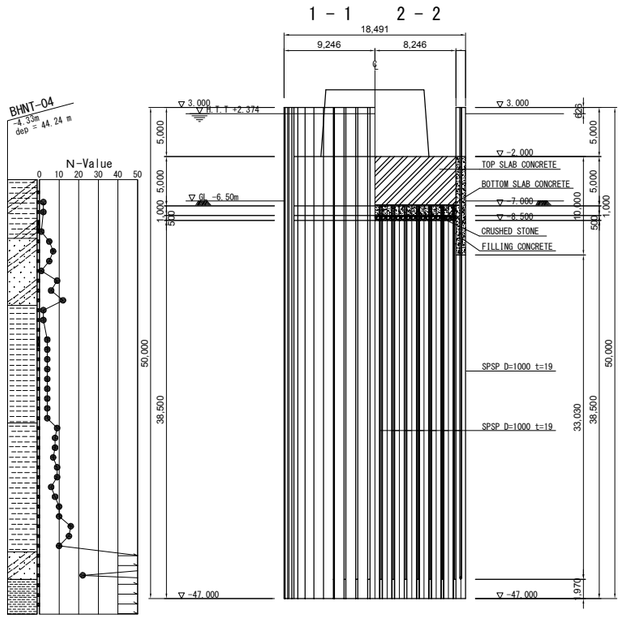
### 2. SOIL

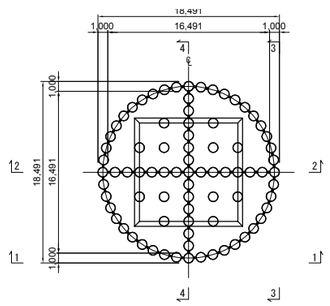
THE GEOTECHNICAL PARAMETERS USED FOR SUBSTRUCTURE DESIGN ARE BASED ON GEOTECHNICAL SURVEY DATA OBTAINED DURING THIS PROJECT.

| LOCATION OF BORING | SOIL TYPE | N-BLOW | UNIT WEIGHT γ ($kN/m^3$) | ANGLE OF SHEAR RESISTANCE φ (deg) | ADHESION c ($kN/m^2$) | ELASTIC MODULUS $E_0$ ($kN/m^2$) |
|---|---|---|---|---|---|---|
| NGUYEN TRAI | AC1 | 2.0 | 17.0 | - | 18.0 | - |
| | AS1 | 7.0 | 17.0 | 30.0 | - | 19.5 |
| | AC2 | 8.0 | 17.0 | - | 61.0 | 22.0 |
| | AS2 | 18.0 | 17.0 | 30.0 | - | 50.0 |
| | DS1 | 41.0 | 18.0 | 35.0 | - | 114.0 |
| | BR | 100.0 | 21.0 | 21.0 | 200.0 | 65.0 |

### 3. DESIGN CALCULATION RESULTS

1) SPSP FOUNDATION OF P13




CALCULATION RESULT (LONGITUDINAL DIRECTION)

| ITERM | | | UNIT | ORDINARY | ORDINARY+T+W | ORDINARY+Im | ORDINARY+Eq |
|---|---|---|---|---|---|---|---|
| FORCES | | Vo | kN | 83,978.80 | 83,459.80 | 83978.8 | 88,678.80 |
| | | Ho | kN | -12,894.00 | -16,637.00 | -23,132.00 | -17,537.00 |
| | | Mo | kN.m | -178,751.00 | -238,674.00 | -164,827.00 | -165,888.00 |
| AT TOP OF TOP SLAB | DISPLACEMENT | δ1 | cm | -2.417 | -3.711 | -1.957 | -2.08 |
| | DEFL. ANGLE | θ1 | mrad | 0.942 | 1.379 | 0.883 | 0.913 |
| AT BEARING STRATUM | DISPLACEMENT | δ2 | cm | -1.866 | -2.9 | -1.442 | -1.546 |
| | DEFL. ANGLE | θ2 | mrad | 0.861 | 1.271 | 0.796 | 0.829 |
| MAX. BENDING MOMENT | | Mmax | kN.m | 301,272.00 | 398,421.00 | 388,240.00 | 388,808.00 |
| LOCATION OF MAX. MOMENT | | Lm | m | -15 | -15 | -15 | -15 |
| STRESSES | EXTERIOR (SKY400) | σmax | $N/mm^2$ | 119.15 | 129.61 | 127.6 | 128.12 |
| | | Lm | m | -11 | -11 | -11 | -11 |
| MAX. BENDING MOMENT AT BASE | | MB | kN.m | 50,455.00 | 82,102.00 | 50,304.00 | 56,162.00 |
| VERTICAL REATION | MAX | Rmax | kN/pile | **1,245** | 1,369 | 1,244 | 1,327 |
| | MIN | Rmin | kN/pile | 829 | 692 | 829 | 863 |
| ALLOWABLE VALUES | DISPLACEMENT | δa | cm | 5 | 5 | 5 | 5 |
| | BEARING | Ra | kN/pile | **1,971** | 2,957 | 2,957 | 2,957 |
| | PULL-OUT | Pa | kN/pile | -600 | -827 | -827 | -827 |
| | STRESS (SKY400) | σa | $N/mm^2$ | 140 | 190 | 210 | 210 |

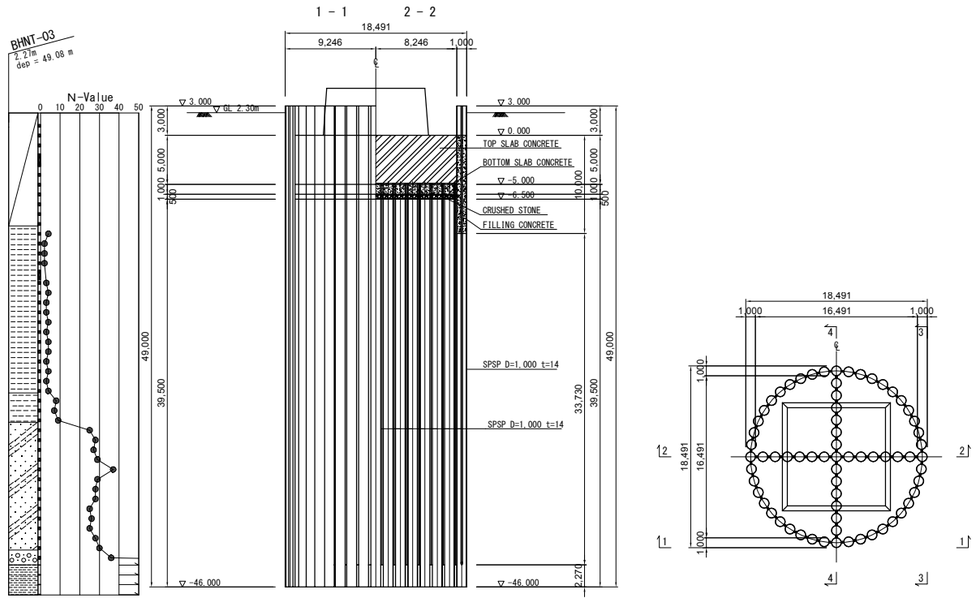
CALCULATION RESULT (TRANSVERSAL DIRECTION)

| ITERM | | | UNIT | ORDINARY | ORDINARY+T+W | ORDINARY+Im | ORDINARY+Eq |
|---|---|---|---|---|---|---|---|
| FORCES | | Vo | kN | 83,978.80 | 83,459.80 | 83978.8 | 88,678.80 |
| | | Ho | kN | 0 | -3,142.00 | -20,476.00 | -10,503.00 |
| | | Mo | kN.m | -41,239.00 | -50,009.00 | -13,391.00 | -19,823.00 |
| AT TOP OF TOP SLAB | DISPLACEMENT | δ1 | cm | -0.145 | -0.14 | -1.213 | -1.035 |
| | DEFL. ANGLE | θ1 | mrad | 0.082 | 0.01 | 0.506 | 0.425 |
| AT BEARING STRATUM | DISPLACEMENT | δ2 | cm | -0.099 | -0.129 | -0.91 | -0.781 |
| | DEFL. ANGLE | θ2 | mrad | 0.067 | 0.025 | 0.478 | 0.403 |
| MAX. BENDING MOMENT | | Mmax | kN.m | 41,239.00 | -50,009.00 | 222,007.00 | 182,615 |
| LOCATION OF MAX. MOMENT | | Lm | m | -11 | -11 | -11 | -11 |
| STRESSES | EXTERIOR (SKY400) | σmax | $N/mm^2$ | 90.7 | 88.47 | 107.75 | 104.55 |
| | | Lm | m | -11 | -11 | -11 | -11 |
| MAX. BENDING MOMENT AT BASE | | MB | kN.m | 1,824.00 | 4,555.00 | 32,337.00 | 28,304.00 |
| VERTICAL | MAX | Rmax | kN/pile | **1,044** | 1,049 | 1,170 | 1,212 |
| REATION | MIN | Rmin | kN/pile | 1,029 | 1,012 | 903 | 978 |
| ALLOWABLE VALUES | DISPLACEMENT | δa | cm | 5 | 5 | 5 | 5 |
| | BEARING | Ra | kN/pile | **1,971** | 2,957 | 2,957 | 2,957 |
| | PULL-OUT | Pa | kN/pile | -600 | -827 | -827 | -827 |
| | STRESS (SKY400) | σa | $N/mm^2$ | 140 | 190 | 210 | 210 |

| | | | |
|---|---|---|---|
| PROJECT: PREPARATORY SURVEY ON HAI PHONG ARTERIAL ROAD CONSTRUCTION PROJECT | JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) | DRAWING TITLE: GENERAL NOTE (5) NGUYEN TRAI BRIDGE | Rev No. |
| | CONSULTANTS: JOINT VENTURE OF CHODAI CO.,LTD. ORIENTAL CONSULTANTS GLOBAL CO.,LTD. ALMEC VPI CO.,LTD. | DRAWING No. G-08 / SCALE | |

# GENERAL NOTE (6) NGUYEN TRAI BRIDGE

2) SPSP FOUNDATION OF P14 (ON-LAND)







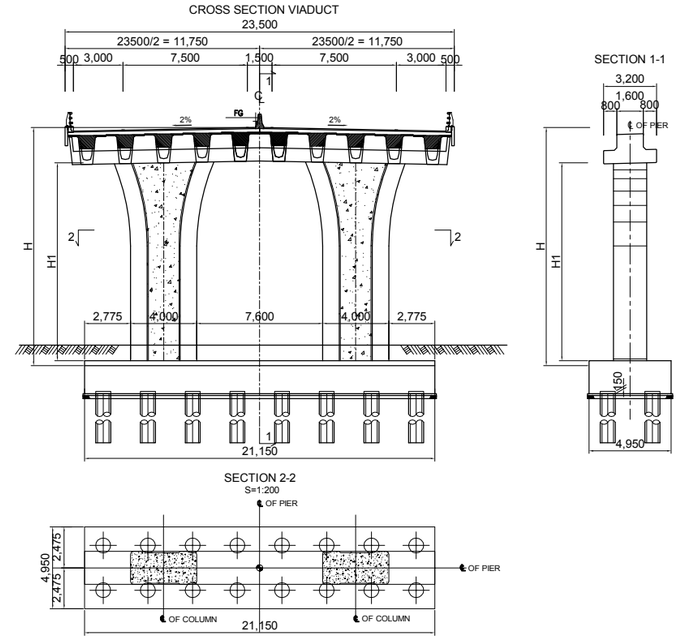
CALCULATION RESULT (LONGITUDINAL DIRECTION)

| ITERM | | | UNIT | ORDINARY | ORDINARY+T+W | ORDINARY+lm | ORDINARY+Eq |
|---|---|---|---|---|---|---|---|
| FORCES | | Vo | kN | 86,698.80 | 86,179.80 | - | 91,398.80 |
| | | Ho | kN | -12,894.00 | -16,637.00 | - | -17,537.00 |
| | | Mo | kN.m | -178,751.00 | -238,674.00 | - | -165,888.00 |
| AT TOP OF TOP SLAB | DISPLACEMENT | δ1 | cm | -2.,65 | -3.485 | - | -3.63 |
| | DEFL. ANGLE | θ1 | mrad | 0.974 | 1.421 | - | 1.441 |
| AT BEARING STRATUM | DISPLACEMENT | δ2 | cm | -1.799 | -2.802 | - | -2.93 |
| | DEFL. ANGLE | θ2 | mrad | 0.886 | 1.304 | - | 1.351 |
| MAX. BENDING MOMENT | | Mmax | kN.m | 266,282.00 | 352,727.00 | - | 356,641.00 |
| LOCATION OF MAX. MOMENT | | Lm | m | -8.7 | -8.7 | - | -18.7 |
| STRESSES | EXTERIOR (SKY400) | σmax | N/mm$^2$ | 75.28 | 89.39 | - | 91.92 |
| | | Lm | m | -8.7 | -8.7 | - | -18.7 |
| MAX. BENDING MOMENT AT BASE | | MB | kN.m | 37,149.00 | 62,454.00 | - | 98,352.00 |
| VERTICAL REATION | MAX | Rmax | kN/pile | 1,422 | 1,527 | - | 1,762 |
| | MIN | Rmin | kN/pile | 1,091 | 971 | - | 887 |
| ALLOWABLE VALUES | DISPLACEMENT | δa | cm | 5 | 5 | - | 5 |
| | BEARING | Ra | kN/pile | 1,971 | 2,770 | - | 2,770 |
| | PULL-OUT | Pa | kN/pile | -580 | -823 | - | -823 |
| | STRESS (SKY400) | σa | N/mm$^2$ | 140 | 190 | - | 210 |

CALCULATION RESULT OF 3P (TRANSVERSAL DIRECTION)

| ITERM | | | UNIT | ORDINARY | ORDINARY+T+W | ORDINARY+lm | ORDINARY+Eq |
|---|---|---|---|---|---|---|---|
| FORCES | | Vo | kN | 83,978.80 | 83,459.80 | 83978.8 | 88,678.80 |
| | | Ho | kN | 0 | -3,142.00 | -20,476.00 | -10,503.00 |
| | | Mo | kN.m | -41,239.00 | -50,009.00 | -13,391.00 | -19,823.00 |
| AT TOP OF TOP SLAB | DISPLACEMENT | δ1 | cm | -0.145 | -0.14 | -1.213 | -1.035 |
| | DEFL. ANGLE | θ1 | mrad | 0.082 | 0.01 | 0.506 | 0.425 |
| AT BEARING STRATUM | DISPLACEMENT | δ2 | cm | -0.099 | -0.129 | -0.91 | -0.781 |
| | DEFL. ANGLE | θ2 | mrad | 0.067 | 0.025 | 0.478 | 0.403 |
| MAX. BENDING MOMENT | | Mmax | kN.m | 41,239.00 | -50,009.00 | 222,007.00 | 182,615 |
| LOCATION OF MAX. MOMENT | | Lm | m | -11 | -11 | -11 | -11 |
| STRESSES | EXTERIOR (SKY400) | σmax | N/mm$^2$ | 90.7 | 88.47 | 107.75 | 104.55 |
| | | Lm | m | -11 | -11 | -11 | -11 |
| MAX. BENDING MOMENT AT BASE | | MB | kN.m | 1,824.00 | 4,555.00 | 32,337.00 | 28,304.00 |
| VERTICAL REATION | MAX | Rmax | kN/pile | 1,044 | 1,049 | 1,170 | 1,212 |
| | MIN | Rmin | kN/pile | 1,029 | 1,012 | 903 | 978 |
| ALLOWABLE VALUES | DISPLACEMENT | δa | cm | 5 | 5 | 5 | 5 |
| | BEARING | Ra | kN/pile | 1,971 | 2,957 | 2,957 | 2,957 |
| | PULL-OUT | Pa | kN/pile | -600 | -827 | -827 | -827 |
| | STRESS (SKY400) | σa | N/mm$^2$ | 140 | 190 | 210 | 210 |

STEEL PIPE FOUNDATION OF REPRESENTATIVE PIERS




CALCULATION RESULT

| ITERM | | | UNIT | MIDDLE HEIGHT | LOW HEIGHT PIERS |
|---|---|---|---|---|---|
| LOAD CASE | | | | STRENGTH II | STRENGTH II |
| REACTION FORCES | | Vo | kN | 36,200 | 30,800 |
| | | Ho | kN | 2,000 | 2,000 |
| | | Mo | kN.m | 57,600 | 57,600 |
| AT TOP OF PILE | DISPLACEMENT | δ1 | cm | 1.485 | 2.233 |
| | DEFL. ANGLE | θ1 | mrad | 1.829 | 2.934 |
| VERTICAL REACTION | MAX | Rmax | kN/pile | 3,512 | 3,225 |
| ALLOWABLE VALUES | DISPLACEMENT | δa | cm | - | - |
| | BEARING | Ra | kN/pile | 3,552 | 3,518 |

| | | | |
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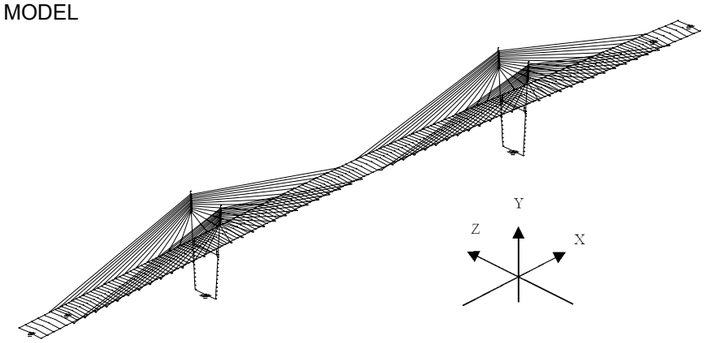
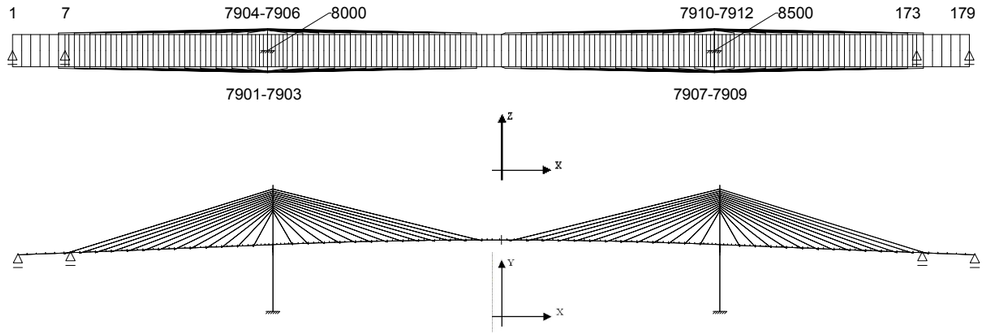
| | CONSULTANTS: JOINT VENTURE OF CHODAI CO.,LTD. ORIENTAL CONSULTANTS GLOBAL CO.,LTD. ALMEC VPI CO.,LTD. | DRAWING No. G-09 SCALE | |

# GENERAL NOTE (7) VU YEN BRIDGE

## 1. SUPERSTRUCTURE DESIGN

### 1.1 ANALYSIS MODEL




- GIRDERS, SLABS

THE LONGITUDINAL GIRDERS AND ATTACHED SLABS ARE MODELED AS COMPOSITE BEAM ELEMENTS, WHILE THE CROSSBEAMS ARE MODELED AS BEAM ELEMENTS.

- PYLONS

THE PYLONS ARE MODELED AS BEAM ELEMENTS.

- CABLES

THE CABLES ARE MODELED AS ONE LINEAR BEAM ELEMENT. NO COMPRESSION FORCE CAN OCCUR IN THE CABLES.

- WIND SHOES

IN ORDER TO SUPPORT LATERAL MOVEMENT, THE WIND SHOES ARE MODELED AS LINEAR SPRING ELEMENTS.

### 1.2 SUPPORT/BEARING CONDITIONS

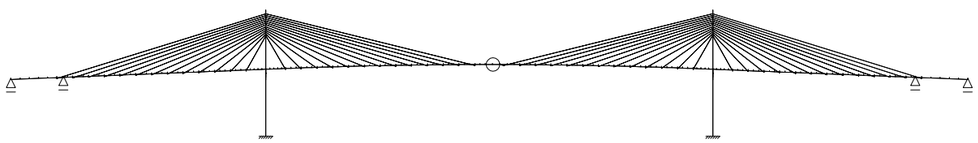
| SUPPORT CONDITIONS | DX | DY | DZ | TX | TY | TZ | NOTE |
|---|---|---|---|---|---|---|---|
| PIER (NODE 1,7) | M | F | F | F | M | M | USING POT BEARINGS |
| SOUTH FOUNDATION (8000) | F | F | F | F | F | F | |
| NORTH FOUNDATION (8500) | F | F | F | F | F | F | |
| PIER (173,179) | M | F | F | F | M | M | USING POT BEARINGS |
| BEARING CONDITIONS | DX | DY | DZ | TX | TY | TZ | |
| SOUTH TOWER (7904-7906, 7901-7903) | K | F | F | F | K | M | USING RUBBER BEARING WIND SHOES*1 |
| NORTH TOWER (7910-7912, 7907-7909) | K | F | F | F | K | M | USING RUBBER BEARING WIND SHOES*1 |

DIRECTION X:LONGITUDINAL, Y:VERTICAL, Z:TRANSVERSE / BOUNDARY M:MOVEABLE, K:SPRING, F:FIXED
*1 KS, VALUE OF SHEAR SPRING = 4434[KN/M]

### 1.3 STRUCTURE PARAMETERS

MAIN GIRDER SECTION WHICH IS MAIN STRUCTURE PARAMETER OF CABLE STAYED BRIDGE ARE CALCULATED IN THIS ANALYSIS AND CHANGED VALUE IN EACH LOCATION. THEREFORE MAIN GIRDER PARAMETER AT CENTER OF SPAN IS SHOWN BELOW.

| | THICKNESS OF UPPER FLANGE | THICKNESS OF LOWER FLANGE | COMPOSITE GIRDER AREA | IZ | IY | JX |
|---|---|---|---|---|---|---|
| UNIT | [MM] | [MM] | [M2] | [M4] | [M4] | [M4] |
| VALUE | 35 | 60 | 0.572 | 0.494 | 19.576 | 0.01 |

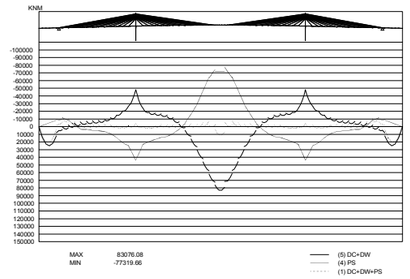


| | | | | | |
|---|---|---|---|---|---|
| PROJECT: PREPARATORY SURVEY ON HAI PHONG ARTERIAL ROAD CONSTRUCTION PROJECT | | JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) | DRAWING TITLE: GENERAL NOTE (7) VU YEN BRIDGE | | Rev No. |
| | | CONSULTANTS: JOINT VENTURE OF CHODAI CO.,LTD. ORIENTAL CONSULTANTS GLOBAL CO.,LTD. ALMEC VPI CO.,LTD. | DRAWING No. G-10 | SCALE | |

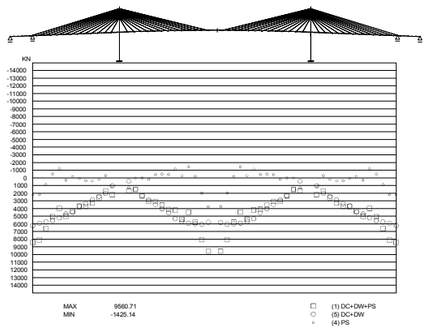
# GENERAL NOTE (8) VU YEN BRIDGE

## 2. CALCULATION OF SUPERSTRUCTURE

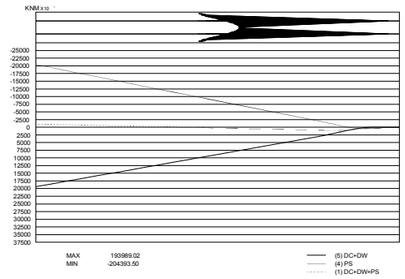
### 2.1 NECESSARY CONDITIONS FOR CABLE-STAYED BRIDGE




BENDING MOMEMT OF GIRDER

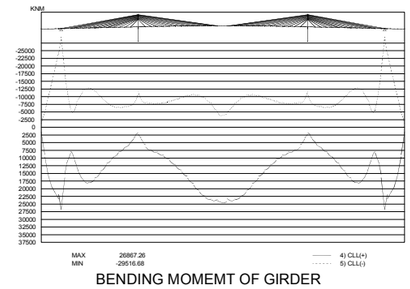



AXIAL FORCE OF CABLE

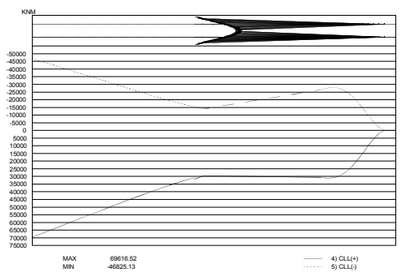



BENDING MOMENT OF PYLON(LONGITUDE)

### 2.2 SECTIONAL FORCE(LL)

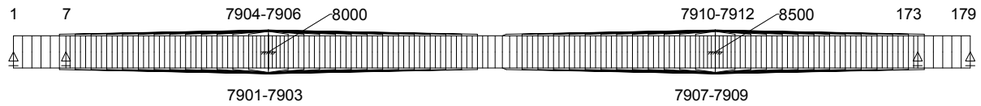



BENDING MOMEMT OF GIRDER




BENDING MOMENT OF PYLON(LONGITUDE)

### 2.3 REACTION FORCE




| | NODE | RX | RY | RZ | MX | MY | MZ |
|---|---|---|---|---|---|---|---|
| | | ( KN ) | ( KN ) | ( KN ) | ( KN*M ) | ( KN*M ) | ( KN*M ) |
| DC | 1 | 0 | 3,855 | 0 | 0 | 0 | 0 |
| | 7 | 0 | 1,936 | 0 | 0 | 0 | 0 |
| | 173 | 0 | 1,957 | 0 | 0 | 0 | 0 |
| | 179 | 0 | 3,850 | 0 | 0 | 0 | 0 |
| | 8000 | 3,475 | 144,641 | 0 | -4 | 0 | 306,523 |
| | 8500 | -3,464 | 144,602 | 0 | -17 | 0 | -305,855 |
| DW | 1 | 0 | 1,141 | 0 | 0 | 0 | 0 |
| | 7 | 0 | 623 | 0 | 0 | 0 | 0 |
| | 173 | 0 | 622 | 1 | 0 | 0 | 0 |
| | 179 | 0 | 1,141 | 0 | 0 | 0 | 0 |
| | 8000 | 920 | 19,069 | 0 | -11 | 0 | 81,354 |
| | 8500 | -920 | 19,070 | 0 | -31 | 0 | -81,370 |
| PS | 1 | 0 | -469 | 0 | 0 | 0 | 0 |
| | 7 | 0 | -1,241 | 0 | 0 | 0 | 0 |
| | 173 | 0 | -1,236 | 0 | 0 | 0 | 0 |
| | 179 | 0 | -471 | 0 | 0 | 0 | 0 |
| | 8000 | -4,895 | 1,712 | 0 | -3 | 0 | -405,294 |
| | 8500 | 4,893 | 1,705 | 0 | -9 | 0 | 405,213 |
| CLL+ | 1 | 0 | 2,974 | 84 | 11,535 | 0 | 0 |
| | 7 | 0 | 6,230 | 135 | 29,800 | 0 | 0 |
| | 173 | 0 | 6,230 | 135 | 29,795 | 0 | 0 |
| | 179 | 0 | 2,974 | 84 | 11,535 | 0 | 0 |
| | 8000 | 1,914 | 14,315 | 61 | 56,628 | 257 | 139,187 |
| | 8500 | 1,521 | 14,316 | 61 | 56,481 | 253 | 93,619 |

| | NODE | RX | RY | RZ | MX | MY | MZ |
|---|---|---|---|---|---|---|---|
| | | ( KN ) | ( KN ) | ( KN ) | ( KN*M ) | ( KN*M ) | ( KN*M ) |
| WS_T | 1 | 0 | 0 | -3,987 | -2,948 | 0 | 0 |
| | 7 | 0 | 0 | 6,920 | -10,655 | 0 | 0 |
| | 173 | 0 | 0 | 6,925 | -10,648 | 0 | 0 |
| | 179 | 0 | 0 | -3,990 | -2,950 | 0 | 0 |
| | 8000 | 0 | 0 | 9,192 | -484,390 | -4,122 | 0 |
| | 8500 | 0 | -1 | 9,194 | -484,626 | 4,129 | 0 |
| WS_L | 1 | 0 | -161 | 0 | 0 | 0 | 0 |
| | 7 | 0 | 330 | 0 | 0 | 0 | 0 |
| | 173 | 0 | -329 | 0 | 0 | 0 | 0 |
| | 179 | 0 | 161 | 0 | 0 | 0 | 0 |
| | 8000 | 5,900 | -225 | 0 | 0 | 0 | 300,348 |
| | 8500 | 5,900 | 225 | 0 | 0 | 0 | 300,344 |
| TU+ | 1 | 0 | 68 | 0 | 0 | 0 | 0 |
| | 7 | 0 | -121 | 0 | -1 | 0 | 0 |
| | 173 | 0 | -126 | 0 | 0 | 0 | 0 |
| | 179 | 0 | 69 | 0 | 0 | 0 | 0 |
| | 8000 | -855 | 54 | 0 | -26 | 0 | -53,655 |
| | 8500 | 855 | 61 | 0 | 7 | 0 | 53,584 |
| TU- | 1 | 0 | -48 | 0 | 0 | 0 | 0 |
| | 7 | 0 | 95 | 0 | 0 | 0 | 0 |
| | 173 | 0 | 98 | 0 | 0 | 0 | 0 |
| | 179 | 0 | -48 | 0 | 0 | 0 | 0 |
| | 8000 | 611 | -48 | 0 | 19 | 0 | 39,152 |
| | 8500 | -611 | -52 | 0 | -3 | 0 | -39,104 |

| | | | |
|---|---|---|---|
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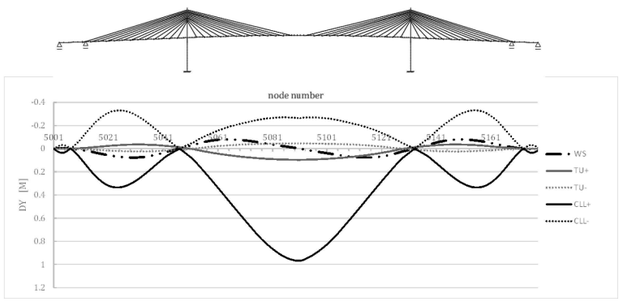
# GENERAL NOTE (9) VU YEN BRIDGE

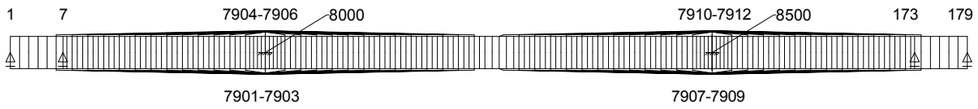
## 2.4 DEFORMATION

### A. VERTICAL DEFORMATION

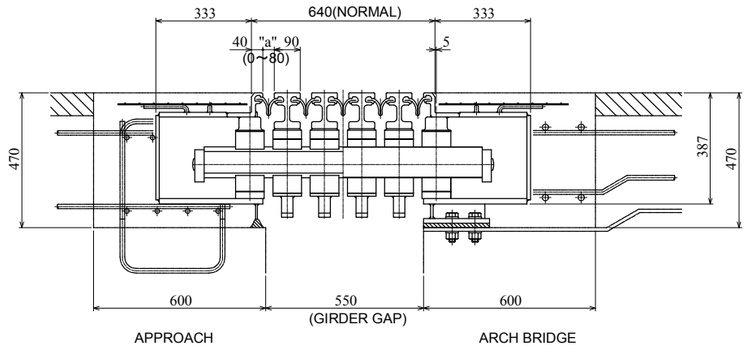



### B. LONGITUDINAL DEFORMATION AT EXPANSION JOINT

| | DX[m] | | | | |
|---|---|---|---|---|---|
| NODE | CLL+ | CLL- | WS | TU+ | TU- |
| 1 | 0.12 | -0.12 | 0.26 | -0.14 | 0.10 |




THE LONGITUDINAL GIRDERS AND ATTACHED SLABS ARE MODELED AS COMPOSITE BEAM ELEMENTS, WHILE THE CROSSBEAMS ARE MODELED AS BEAM ELEMENTS.
FOR THE LARGE DESIGN DEFORMATION OF EXPANSION JOINTS, A MODULAR TYPE IS APPLIED FOR EXPANSION JOINTS

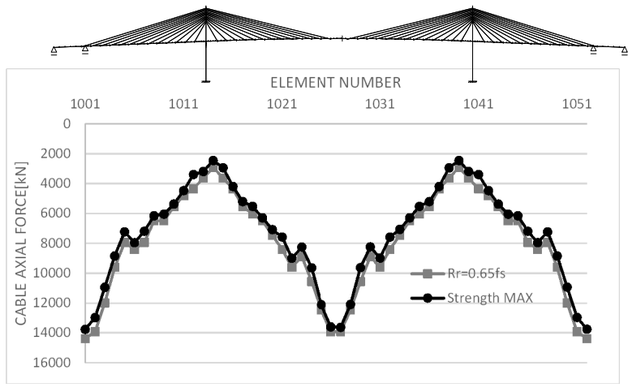



## 2.5 CABLE DESIGN

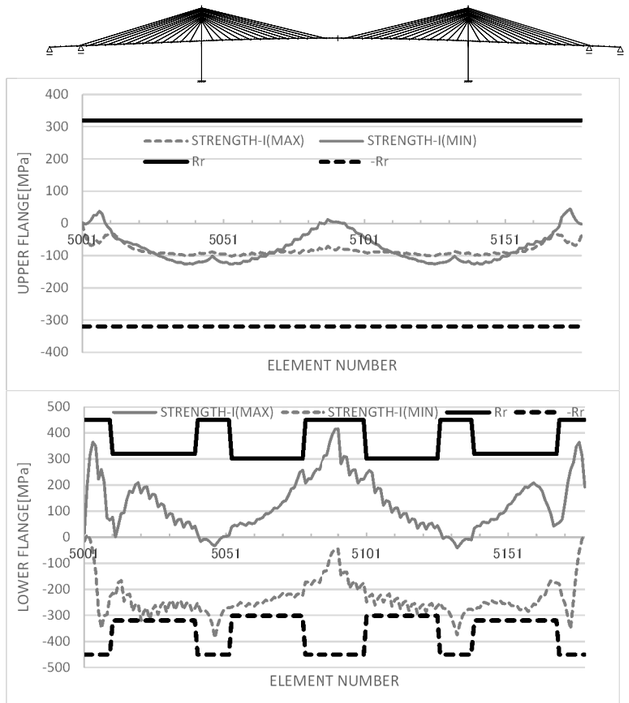
THE PTI RECOMMENDATION FORMULA SHALL BE APPLIED WHEN CHECKING CABLE AXIAL FORCE

$\Sigma n_i r_i q_i \leq \Phi Rn = Rr$

STRENGTH A- AXIAL ONLY $\Phi = 0.65$




## 2.6 GIRDER DESIGN




| | | | | |
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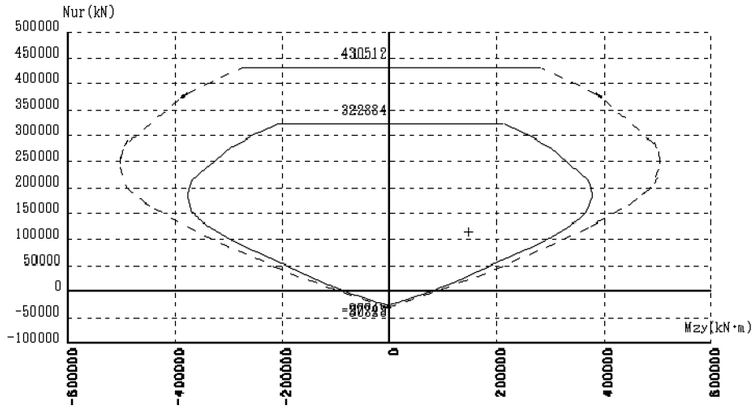
# GENERAL NOTE (10) VU YEN BRIDGE

## 2.7 DESIGN OF PYLON SHAFT AND CROSSBEAM

PYLON SHAFT IS DESIGNED AS COMPRESSION RC COMPONENT WITH BIAXIAL FLEXURE.
THE CHECKING RESULT IN CASE OF STRENGTH-1 OF PYLON SHAFT BASE IS SHOWN BELOW. OTHER SECTIONS AND LOAD CASES ARE CHECKED IN THE SAME WAY.

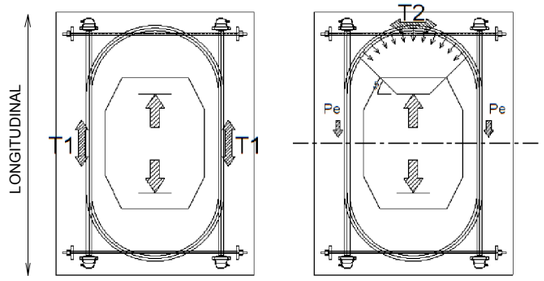



| CALCULATION OF Prxy AND ΣMu/φMr | | |
|---|---|---|
| Nu | kN | 110000 |
| Mux | kN·m | 140000 |
| Muy | kN·m | 30000 |
| φmo | - | 0.9 |
| φno | - | 0.75 |
| Pno | kN | 43512 |
| Pro | kN | 322884 |
| P10 | kN | 45000 |
| VERI. ITEM | - | AXIAL FORCE |
| ex | m | 1.27 |
| ey | m | 0.27 |
| Prx | m | 25941 |
| Pry | m | 322884 |
| Po | m | 538140 |
| φ | m | 0.75 |
| φ·Po | m | 403605 |
| Prxy | m | 223595 |
| Nu/Prxy | m | 0.492 |
| JUDGE | - | OK |

/

## 2.8 STAY CABLE ANCHORAGE DESIGN OF PYLON

U SHAPE TENDONS AND PT BARS ARE ARRANGED AT ANCHORAGE TO RESIST AGAINST THE FORCE (T1 AND T2) DUE TO THE HORIZONTAL COMPONENT OF CABLE TENSION IN STAY CABLES. IN CALCULATION OF T1 AND T2, HORIZONTAL COMPONENT OF STAY CABLE TENSION IS ASSUMED 0.65ΣPU IN ULTIMATE LOAD. YIELDING TENSION FORCE OF U TENDONS AND PT BARS ARE SHOULD BE LARGER THAN T1 AND T2.




| Design against T1 | | | | | | |
|---|---|---|---|---|---|---|
| CABLE | Angle | Wire(7φ) | Area | 0.65fpu | T | T1 (kN) |
| C1 | 16.88 | 361 | 0.014 | 1151 | 15984 | 7648 |
| C2 | 17.50 | 349 | 0.013 | 1151 | 15452 | 7368 |
| C3 | 18.24 | 301 | 0.012 | 1151 | 13327 | 6329 |
| C4 | 19.10 | 241 | 0.009 | 1151 | 10671 | 5042 |
| C5 | 20.15 | 199 | 0.008 | 1151 | 8811 | 4136 |
| C6 | 21.42 | 211 | 0.008 | 1151 | 9342 | 4349 |
| C7 | 23.02 | 199 | 0.008 | 1151 | 8811 | 4055 |
| C8 | 25.06 | 163 | 0.006 | 1151 | 7217 | 3269 |
| C9 | 27.78 | 163 | 0.006 | 1151 | 7217 | 3193 |
| C10 | 31.53 | 139 | 0.005 | 1151 | 6154 | 2623 |
| C11 | 37.00 | 121 | 0.005 | 1151 | 5357 | 2139 |
| C12 | 45.45 | 109 | 0.004 | 1151 | 4826 | 1693 |
| C13 | 59.24 | 91 | 0.004 | 1151 | 4029 | 1030 |

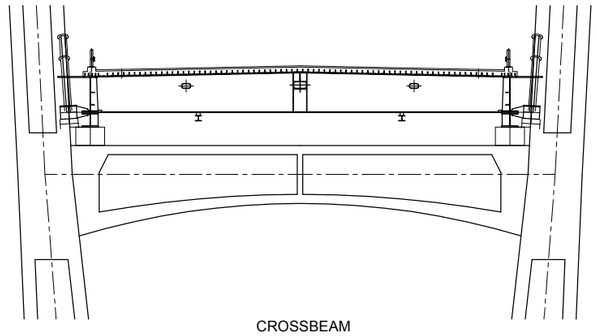
| Longitudinal (U-Tendon) 1860 x 0.9 = 1674 | | | | | |
|---|---|---|---|---|---|
| Type | Area | Py (kN) | U tendon | safety | Judge |
| 19S15.2 | 2635 | 4411 | 2 | 1.15 | OK |
| 19S15.2 | 2635 | 4411 | 2 | 1.20 | OK |
| 19S15.2 | 2635 | 4411 | 2 | 1.39 | OK |
| 12S15.2 | 1664 | 2786 | 2 | 1.11 | OK |
| 12S15.2 | 1664 | 2786 | 2 | 1.35 | OK |
| 12S15.2 | 1664 | 2786 | 2 | 1.28 | OK |
| 9S15.2 | 1248 | 2090 | 2 | 1.03 | OK |
| 9S15.2 | 1248 | 2090 | 2 | 1.28 | OK |
| 9S15.2 | 1248 | 2090 | 2 | 1.31 | OK |
| 9S15.2 | 1248 | 2090 | 2 | 1.59 | OK |
| 9S15.2 | 694 | 1161 | 2 | 1.09 | OK |
| 9S15.2 | 694 | 1161 | 2 | 1.37 | OK |
| 9S15.2 | 694 | 1161 | 2 | 2.25 | OK |

| Design against T2 | | | |
|---|---|---|---|
| CABLE | Angle | Wire(7φ) | T1 (kN) |
| C1 | 16.88 | 361 | 7648 |
| C2 | 17.50 | 349 | 7368 |
| C3 | 18.24 | 301 | 6329 |
| C4 | 19.10 | 241 | 5042 |
| C5 | 20.15 | 199 | 4136 |
| C6 | 21.42 | 211 | 4349 |
| C7 | 23.02 | 199 | 4055 |
| C8 | 25.06 | 163 | 3269 |
| C9 | 27.78 | 163 | 3193 |
| C10 | 31.53 | 139 | 2623 |
| C11 | 37.00 | 121 | 2139 |
| C12 | 45.45 | 109 | 1693 |
| C13 | 59.24 | 91 | 1030 |

| Transverse(PT Bar) 1035 x 0.85 = 879.75 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q (kN) | 2xT1-Q | θ' | T2 (kN) | PT Bar φ | Py (kN) | Number | safety | Judge | n |
| 7386 | 7910 | 49.1 | 4568 | 35 | 846 | 6 | 1.11 | OK | 5.40 |
| 7368 | 7369 | 49.2 | 4265 | 35 | 846 | 6 | 1.19 | OK | 5.04 |
| 7315 | 5343 | 49.4 | 3112 | 35 | 846 | 4 | 1.09 | OK | 3.68 |
| 4552 | 5531 | 49.7 | 3263 | 35 | 846 | 4 | 1.04 | OK | 3.86 |
| 4494 | 3778 | 50.0 | 2253 | 35 | 846 | 4 | 1.50 | OK | 2.66 |
| 4517 | 4180 | 49.9 | 2482 | 35 | 846 | 4 | 1.36 | OK | 2.93 |
| 3370 | 4740 | 50.0 | 2826 | 35 | 846 | 4 | 1.20 | OK | 3.34 |
| 3334 | 3203 | 50.3 | 1926 | 35 | 846 | 4 | 1.76 | OK | 2.28 |
| 3334 | 3051 | 50.3 | 1834 | 35 | 846 | 4 | 1.85 | OK | 2.17 |
| 3307 | 1938 | 50.4 | 1173 | 35 | 846 | 2 | 1.44 | OK | 1.39 |
| 1832 | 2446 | 50.5 | 1483 | 35 | 846 | 2 | 1.14 | OK | 1.75 |
| 1822 | 1563 | 50.6 | 952 | 35 | 846 | 2 | 1.78 | OK | 1.12 |
| 1807 | 254 | 50.8 | 156 | 35 | 846 | 1 | 5.44 | OK | 0.16 |

## 2.9 CROSSBEAM DESIGN

CROSSBEAM OF PYLON IS DESIGNED CURVE AT THE BOTTOM IN AESTHETIC AND STRUCTURAL MATTER. AND THERE IS NO MORE CROSSBEAM ABOVE THE DECK. CROSSBEAM SUPPORTS THE MAIN GIRDER AND RESTRICTS THE TRANSVERSE DEFORMATION OF PYLON SHAFT. IT IS DESIGNED AS PC COMPONENT AND TENDONS SHOULD BE ARRANGED AGAINST TRANSVERSE LOAD.



CROSSBEAM

| | | | |
|---|---|---|---|
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# GENERAL NOTE (11) VU YEN BRIDGE

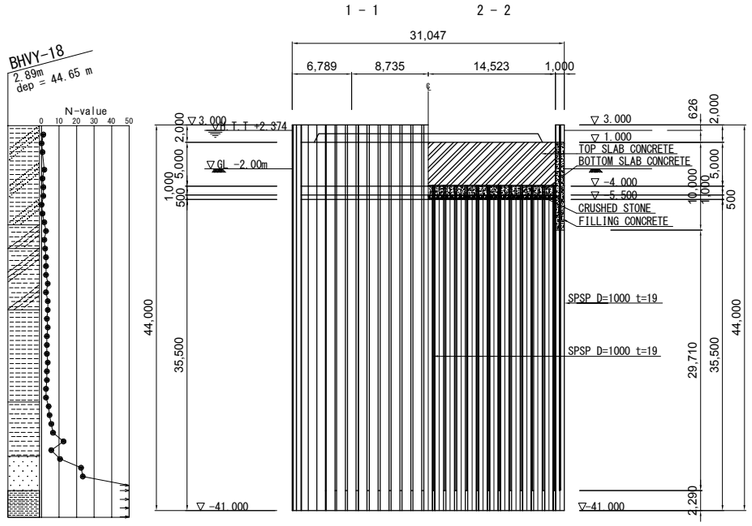
## 3. SUBSTRUCTURE DESIGN

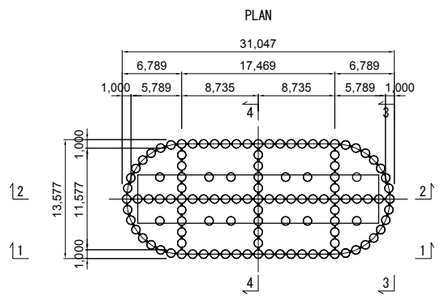
### 3.1 SOIL PARAMETERS

| LOCATION OF BORING | SOIL TYPE | N-BLOW | UNIT WEIGHT γ(kN/m3) | ANGLE OF SHEAR RESIDTANCE Φ(DEG) | ADHESION c(kN/m2) | ELASTIC MODULUS E0(kN/m2) |
|---|---|---|---|---|---|---|
| VU YEN | Ac1 | 3.0 | 17.0 | - | 15.0 | - |
| | As1 | - | - | - | - | - |
| | Ac2 | 8.0 | 17.0 | - | 71.0 | 22,400 |
| | As2 | - | - | - | - | - |
| | Ds1 | 35.0 | 17.0 | 35.0 | - | 98,000 |
| | Br | 100.0 | 21.0 | 21.0 | 200.0 | 65,000 |

## 4. CALCULATION OF SUBSTRUCTURE

### 4.1 SPSP FOUNDATION OF NP & SP(IN-RIVER)




### LONGITUDINAL DIRECTION

| Item | | | Unit | Ordinary | Ordinary+T+W | Ordinary+Im | Ordinary+Eq |
|---|---|---|---|---|---|---|---|
| Reaction Forces | | Vo | kN | 201,269 | 201,548 | 201,269 | 216,108 |
| | | Ho | kN | -2,056 | -8,811 | -13,001 | -34,319 |
| | | Mo | kN.m | -116,163 | -476,921 | -117,695 | -153,010 |
| at top of | Displacement | δ1 | cm | -0.747 | -4.059 | -1.349 | 2.768 |
| top slab | Defl. Angle | θ1 | mrad | 0.40 | 1.94 | 0.72 | -1.35 |
| at bearing | Displacement | δ2 | cm | -0.519 | -2.949 | -0.935 | 1.979 |
| stratum | Defl. Angle | θ2 | mrad | 0.34 | 1.69 | 0.64 | -1.23 |
| Max. Bending moment | | Mmax | kN.m | 141,276 | 589,378 | 290,065 | -518,461 |
| Location of Max. Moment | | Lm | m | -7 | -7 | -7 | -16 |
| Stresses | Exterior(SKY400) | σmax | N/mm2 | 97 | 140 | 106 | 128 |
| | | Lm | m | -7 | -7 | -7 | -16 |
| Max. Bending moment at base | | MB | kN.m | 7,418 | 58,282 | 12,026 | -39,669 |
| Vertical | Max | Rmax | kN/pile | 1,557 | 1,698 | 1,569 | 1,758 |
| reaction | Min | Rmin | kN/pile | 1,516 | 1,379 | 1,569 | 1,541 |
| Allowable | Displacement | δa | cm | 5 | 5 | 5 | 5 |
| Values | Bearing | Ra | kN/pile | 1,685 | 2,527 | 2,527 | 2,527 |
| | Pull-out | Pa | kN/pile | -447 | -559 | -559 | -559 |
| | Stress (SKY400) | σa | N/mm2 | 140 | 190 | 210 | 210 |

### TRANSVERSAL DIRECTION

| Item | | | Unit | Ordinary | Ordinary+T+W | Ordinary+Im | Ordinary+Eq |
|---|---|---|---|---|---|---|---|
| Reaction Forces | | Vo | kN | 201,269 | 201,098 | 201,269 | 216,108 |
| | | Ho | kN | 0 | 9,192 | -21,890 | 32,940 |
| | | Mo | kN.m | -61,268 | -536,466 | -64,333 | 89,568 |
| at top of | Displacement | δ1 | cm | -0.19 | -0.68 | -1.49 | 1.67 |
| top slab | Defl. Angle | θ1 | mrad | 0.08 | 0.38 | 0.50 | -0.57 |
| at bearing | Displacement | δ2 | cm | -0.14 | -0.47 | -1.19 | 1.33 |
| stratum | Defl. Angle | θ2 | mrad | 0.07 | 0.32 | 0.48 | -0.54 |
| Max. Bending moment | | Mmax | kN.m | 61,268 | 536,466 | 430,650 | -487,757 |
| Location of Max. Moment | | Lm | m | -7 | -7 | -17 | -17 |
| Stresses | Exterior(SKY400) | σmax | N/mm2 | 92 | 131 | 111 | 120 |
| | | Lm | m | -7 | -7 | -17 | -17 |
| Max. Bending moment at base | | MB | kN.m | 19,418 | 66,794 | 250,882 | -280,223 |
| Vertical | Max | Rmax | kN/pile | 1,566 | 1,638 | 1,923 | 2,081 |
| reaction | Min | Rmin | kN/pile | 1,506 | 1,432 | 1,150 | 1,218 |
| Allowable | Displacement | δa | cm | 5 | 5 | 5 | 5 |
| Values | Bearing | Ra | kN/pile | 1,685 | 2,527 | 2,527 | 2,527 |
| | Pull-out | Pa | kN/pile | -447 | -559 | -559 | -559 |
| | Stress (SKY400) | σa | N/mm2 | 140 | 190 | 210 | 210 |

| | | | |
|---|---|---|---|
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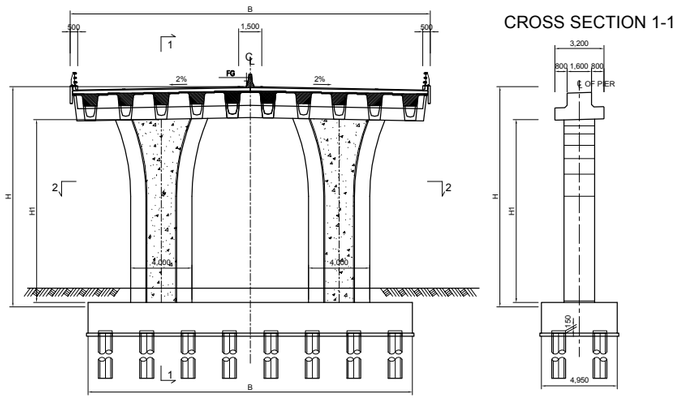
# GENERAL NOTE (12) VU YEN BRIDGE

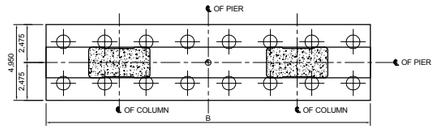
## 4.2 STEEL PIPE PILE FOUNDATION OF REPRESENTATIVE PIERS




CROSS SECTION 1-1




CROSS SECTION 2-2




| Item | | | Unit | High Height Pier | Middle height Piers | Low Height Piers |
|---|---|---|---|---|---|---|
| Load Case | | | | Strength II | Strength II | Strength II |
| Reaction Forces | | Vo | kN | 45100 | 36200 | 30800 |
| | | Ho | kN | 2000 | 2000 | 2000 |
| | | Mo | kN.m | 52100 | 57600 | 57600 |
| At top of | Displacement | δ1 | cm | 1.195 | 1.485 | 2.233 |
| pile | Defl. Angle | θ1 | mrad | 1.445 | 1.829 | 2.934 |
| Vertical reaction | Max | Rmax | kN/pile | 3412 | 3512 | 3225 |
| Allowable | Displacement | δa | cm | - | - | - |
| Values | Bearing | Ra | kN/pile | 3518 | 3552 | 3518 |

| | | | |
|---|---|---|---|
| PROJECT: PREPARATORY SURVEY ON HAI PHONG ARTERIAL ROAD CONSTRUCTION PROJECT | JICA | JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)<br>CONSULTANTS: JOINT VENTURE OF CHODAI CO.,LTD. ORIENTAL CONSULTANTS GLOBAL CO.,LTD. ALMEC VPI CO.,LTD. | DRAWING TITLE: GENERAL NOTE (12) VU YEN BRIDGE<br>DRAWING No. G-15 SCALE |

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