昭和三年九月成

熊本縣金剛八代線

前川及球磨川架橋

# 前川橋及植柳橋設計々算書

# 及材料調書

**JIUN MASUDA**
CONSULTING ENGINEER
SEIYU BLDG, TOKIO

MADE BY J. Masuda DATE 3-8-24 **FILE NO**

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CALCULATIONS FOR

## Design of Maekawa Bashi for Kumamoto-Ken

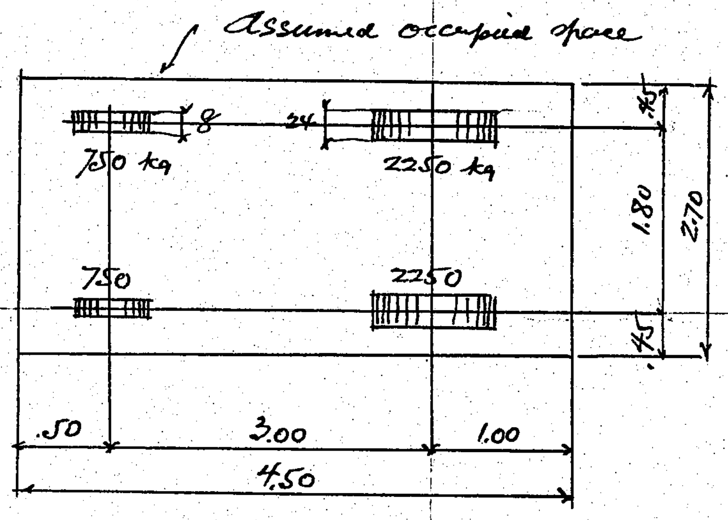
The bridge site will be crossed by 6 - 38.0 meter truss spans
Clear width of roadway 13.2 or say 4.0 meters
Roadway pavement 5cm = 2" granolithic pavement on reinforced concrete slab.
Handrail shall be connected ~~to~~ truss with angle and shape.

Assumed loadings

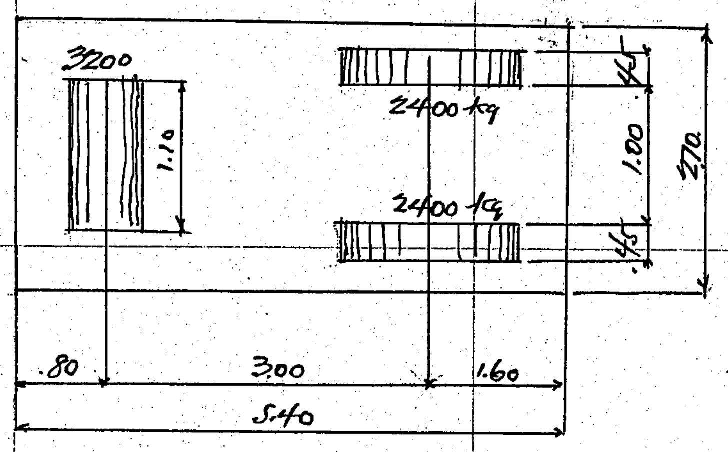
Uniform load on Roadway $w = \frac{100.000}{170+l} \leq 500$ kg/m²

where $w$ = Uniform load in kg per sq. meter
$l$ = span length in meter

6 ton motor truck loading



8 ton roadroller



1 row of motor traffic on roadway with occupied width of 270 cm. Unoccupied space around the motor truck shall be filled with uniform load specified above. One road roller on span assumed
Impact for motor truck loading

where $l$ = loaded length in meter

Coef $\frac{20}{60+l}$ max impact 30%

No impact for roadroller and uniform load.

Allowable Working strength
Structural steel or Reinforcing Bars.

| | |
|---|---|
| Tension net | 1200 kg/cm² |
| Extreme fibre stress net | 1200 " |
| Shear of web gross section | 900 " |
| Compression member | |
| 1500 (1 - 0.0055 $l/r$) not over | 1000 " |
| where $l$ = length of member in cm<br>$r$ = radius of gyration in cm (least). | |
| Compression flange of girder | |
| 1200 (1 - 0.012 $l/b$) not over | 1100 . |
| where $l$ = Unsupported length of flange in cm<br>$b$ = width of flange in cm | |
| Shear on shop rivet (machine driven) | 850 |
| " " field " and turned bolts (machine driven) | 750 |
| Shear on pin | 900 |
| Bearing on shop rivets (machine driven) | 1700 |
| " " field " | 1500 |
| " " pin | 1800 |

Rollers 45d kg per cm $d$ = diameter of roller in cm

CALCULATIONS FOR

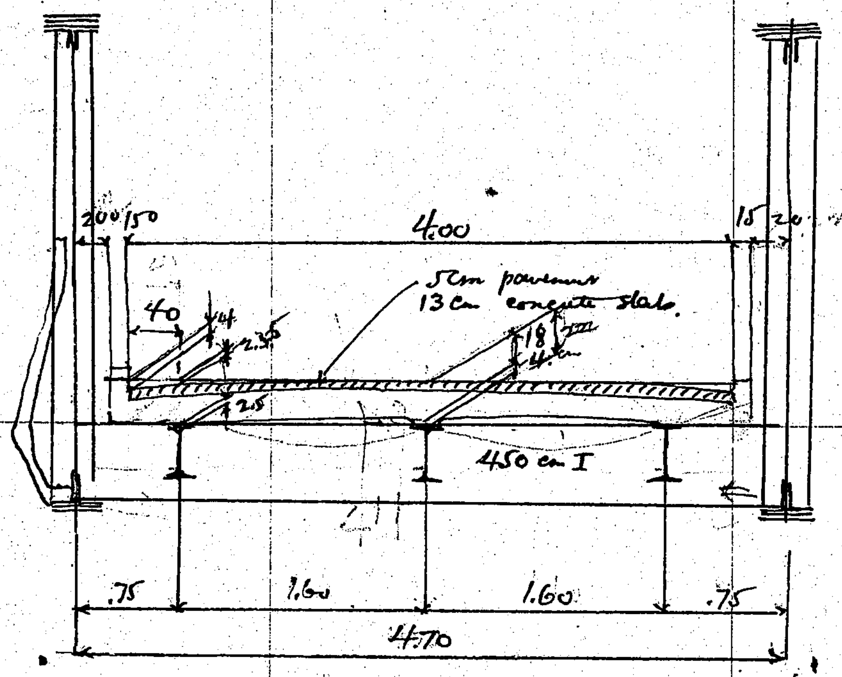
Design of Maekawa-Bashi for Kumamoto-Ken.

Allowable working strength
Concrete 1:2:4 mixture

| | | |
|---|---|---|
| Direct compression | 35 | kg/cm² |
| Fibre stress due to bending | 45 | " |
| Combined stress direct and bending | 35 | " |
| Punching shear of Concrete | 9 | " |
| shear of plain concrete | 4 | " |
| Bearing | 45 | " |
| Bond stress for plain bars | 6 | " |
| " " " deformed bars | 9 | " |

Considering wind or temperature stress in addition to Dead Live and Impact stresses the allowable working strength shall be increased 25%
No seismic force considered in this design.

Cross section of bridge assumed as shown on Sketch below.



Design of floor slab. span length 1.60 meters
Dead Load

| | | | |
|---|---|---|---|
| Pavement | 5 cm granolithic | @ 22 kg | 110 |
| Concrete slab | 13 cm | @ 24 " | 312 |
| | | | 422 |
| Add for miscellaneous details | | | 28 |
| | | | 450 kg/m² |

Dead Load moment = $\frac{1}{10} \cdot 450 \cdot 1.6^2$ = 115 kgm
Dead Load shear = $\frac{1}{2} \cdot 450 \cdot 1.6$ = 360 kg.

Live Load motor truck loading

| | |
|---|---|
| Rear wheel | 2250 |
| Impact 30% | 675 |
| | 2925 kg. |
| Front wheel | 2925 ÷ 3 = 975 " |

Distribution of wheel concentration

| | | |
|---|---|---|
| Contact between wheel and pavement | | 20 |
| distribution | 2@5 = | 10 |
| Longitudinal distribution | a = | 30 cm |
| Transverse distribution | b = 24+10 = | 34 cm |

Effective width $E = \frac{2}{3}l + a$ where $l$ = span length in meter
= 1.37 meters

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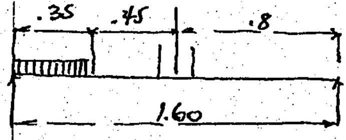
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken

Load per meter strip $2925 \div 1.37 = 2140$ kg.

Uniform live load 500 kg per sq meter.



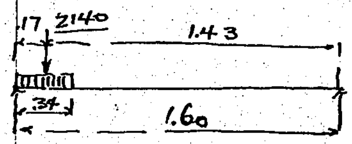
Uniform load $\frac{500 \cdot .35^2}{2 \cdot 1.60} = 19.1$ kg.

moment at center

| | | | |
|---|---|---|---|
| Due to uniform load | $19.1 \cdot 0.8$ | = | 15 |
| Due to motor truck | $\frac{2140}{2} \cdot 0.8$ | = | 855 |
| | | | 870 kg meter |

For Continuity of slab $0.8 \cdot 870 = 695$ kg meter

End shear



$2140 \cdot \frac{1.43}{1.60} = 1910$ kg.

Summary for moments and shears

| | moment | shear |
|---|---|---|
| Dead Load | 115 | 360 |
| Live Load | 695 | 1910 |
| | 810 kgm | 2270 kg. |

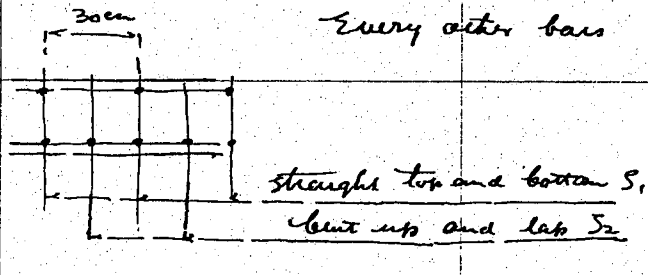
Effective depth required for $f_s = 1200$ kg/cm² and $f_c = 45$ kg/cm²

$R = \frac{M}{bd^2}$ $d = \sqrt{\frac{M}{bR}}$ $R = 7.18$ $d = \sqrt{\frac{810 \cdot 100}{100 \cdot 7.18}} = 10.62$ use 13 cm slab insulation at bottom 2.38 cm

Steel area required $= \frac{810 \cdot 100}{7/8 \cdot 10.62 \cdot 1200} = 7.25$ cm² per meter strip

Spacing for 13mm bar $= \frac{1.33 \cdot 100}{7.25} = 18.4$ cm
use 15 cm spacing.

Bond stress 13 mm bars 30 cm spacing for top and bottom
Every other bars bent up at support and lap.

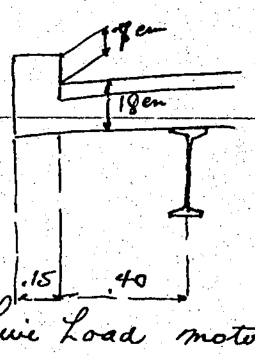


| dia | circumference | | | | |
|---|---|---|---|---|---|
| 13mm | 4.08 | $\cdot$ | 3.33 | = | 13.6 |
| " | " | $\cdot$ | 6.67 | = | 27.2 |
| | | | | | 40.8 cm |

Unit bond $= \frac{2270}{7/8 \cdot 10.62 \cdot 40.8} = 6.0$ kg/cm² plain bar.

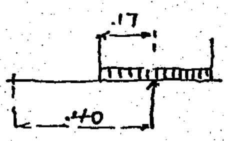
Overhanging slab beyond outside stringer

Dead Load.



| | | | | | Arm | | moment |
|---|---|---|---|---|---|---|---|
| Coping | $.25^{cm} \cdot .15^{cm}$ @ 24 = | 90 | $\cdot$ | .407 | = | 36.6 |
| Slab. | $450 \cdot .40$ = | 180 | $\cdot$ | .200 | = | 36.0 |
| | | 270 kg. | | .270 | | 72.6 |

Live Load motor truck rear wheel at ℄ stringer assumed.



Longitudinal distribution assumed arbitrary .80 meter.
Transverse distribution " 34 cm
Load per meter strip $2925 \div 0.8 = 3660$ kg.
Live Load moment $= \frac{3660}{2} \cdot \frac{.17}{2} = 156$ kg meter
shear $= 1830$ kg.

Summary for moments and shears

| | moment | shear |
|---|---|---|
| Dead Load | 72.6 | 270 |
| Live Load | 156.0 | 1830 |
| | 228.6 kgm | 2100 kg. |

Due to bond stress use same spacing of bar and arrange ~~the~~ [illegible] bar properly
slab depth 13 cm at ℄ stringer will be used.

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CALCULATIONS FOR

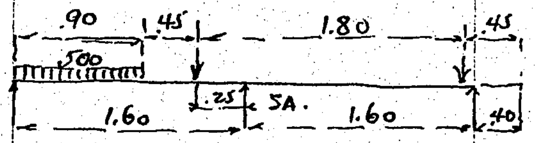
Design of Maekawa-Bashi for Kumamoto-Ken.

Design of I beam stringer. span length 5.43 meters spacing 1.60 meters
Center stringer SA.

Dead load floor slab and pavement $450 \cdot 1.60 = 720$
beam assumed 50
770 kg.

Dead load moment $= \frac{1}{8} \cdot 770 \cdot 5.43^2 = 2840$ kgm } see revised figures.
Dead load shear $= \frac{1}{2} \cdot 770 \cdot 5.43 = 2090$ kg. }

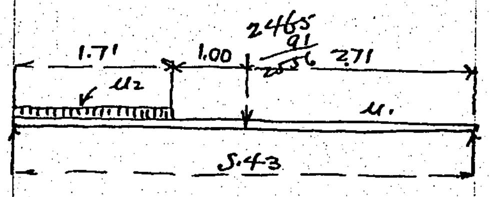
Live load motor truck rear wheel with impact 2925 kg.
Uniform live load 500 kg per sq meter.



motor truck $2925 \cdot \frac{1.35}{1.60} = 2465$ kg.
$\frac{.05}{1.60} = 91$
2556

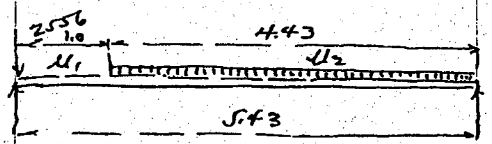
Uniform load $\frac{500 \cdot .90^2}{2 \cdot 1.60} = 127$ kg --- $u_1$

Full uniform load $500 \cdot 1.60 = 800$
less. 127
673 kg --- $u_2$



Due to motor truck $\frac{2556}{2} \cdot 2.71 =$ ~~752~~ 3460
$u_1$ $\frac{1}{8} \cdot 127 \cdot 5.43^2 =$ 467
$u_2$ $\frac{673 \cdot 1.71^2}{2 \cdot 5.43} \cdot 2.71 =$ 490
4417 kg m.

Max End shear



Uniform load.
$u_1$. $\frac{1}{2} \cdot 127 \cdot 5.43 = 344$
$u_2$. $\frac{673 \cdot 4.43^2}{2 \cdot 5.43} = 1220$
1564
motor truck 2556
4120 kg.

Revised dead load moment.
load on center stringer 770 kg per lin meter
Less $2 \cdot \frac{72.6}{1.6} =$ 91
679 kg

Dead load moment $= \frac{1}{8} \cdot 679 \cdot 5.43^2 = 2510$ kgm
" " shear $= \frac{1}{2} \cdot 679 \cdot 5.43 = 1850$ kg.

Summary for moments and shears

| | moment | shear |
|---|---|---|
| Dead Load | 2510 | 1850 |
| Live load | 4417 | 4120 |
| | 6927 kgm | 5970 kg. |

Section modulus req'd $= \frac{692700}{1100} = 630.0$

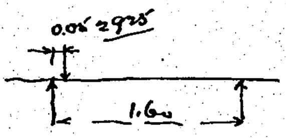
Use $300 \cdot 150 \cdot$ @48.34 kg Sm = 633.2 ~~kg~~

Outside stringer SB.

Dead load
between stringers SA and SB. $450 \cdot 0.8 = 360$
stringer say 50
Overhang- 270
Extra reaction $\frac{72.6}{1.6} =$ 45
725 kg. per lin meter.

Dead load moment $= \frac{1}{8} \cdot 725 \cdot 5.43^2 = 2680$ kgm
" " shear $= \frac{1}{2} \cdot 725 \cdot 5.43 = 1970$ kg.

Live load motor truck loading. rear wheel with impact 2925 kg



$2925 \cdot \frac{1.55}{1.60} = 2830$ kg.

moment due to motor truck $= \frac{2830}{2} \cdot 2.71 = 3840$ kg.

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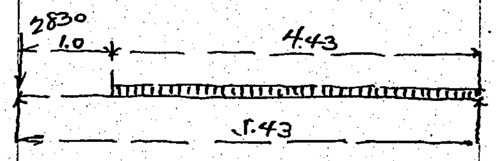
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken.

max End shear



Uniform load max $500 \times \frac{2.00^2}{2 \times 1.60}$ = 625 kg per meter.

End shear = $\frac{625 \times 4.43^2}{2 \times 5.43}$ = ~~950~~ 1130

motor truck 2830

~~3780~~ 3960 kg.

Summary for moments and shears

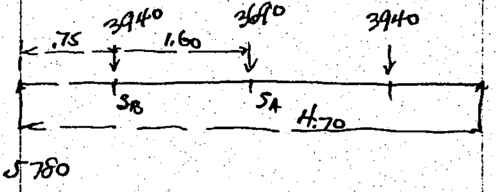
| | moments | shears |
|---|---|---|
| Dead Load | 2680 | 1970 |
| Live Load | 3840 | 3960 ~~3780~~ |
| | 6520 kgm | ~~5750~~ 5930 kg |

section modulus req'd = $\frac{652000}{1100}$ = 593.0

Use 300 × 150 @ 48.34 kg Sm = 633.2

Design of Intermediate floor beam

Dead Load



Concentration on FB. SA $679 \times 5.43$ = 3690 kg

SB $725 \times 5.43$ = 3940 kg.

Reaction $3690 \div 2$ = 1845
3940
5785 kg.

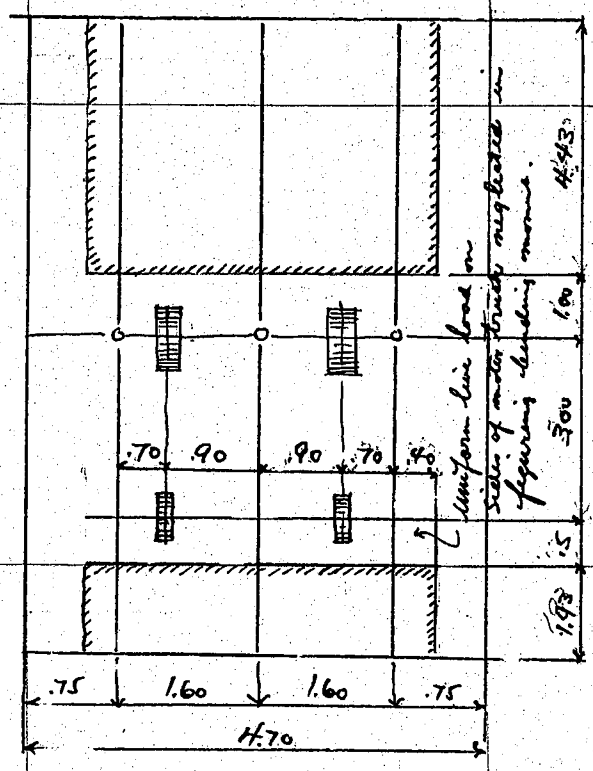
moment = $5785 \times 2.35$ = 13600
$3940 \times 1.60$ = 6300
~~6~~7300

Dead load beam 75 kg per meter $\frac{1}{8} \times 75 \times 4.70^2$ = 206
7~~6~~506 kg meters.

End shear 5780 + 176 = 5956 kg.

Live Load motor truck loading. rear wheel concentration with impact = 2925 kg

Front " " " " = 975 "



Load on stringer.

Rear wheel SA $2925 \times \frac{1.40}{1.60}$ = 2560 kg

SB " $\times \frac{.90}{1.60}$ = 1650 kg.

Front wheel SA $2560 \div 3$ = 853

SB $1650 \div 3$ = 550

Load on floor beam SA. $853 \times \frac{2.43}{5.43}$ = 382.
2560
2942 kg.

SB. $550 \times \frac{2.43}{5.43}$ = 246
1650
1896

Uniform live load 500 kg per ~~sq.~~ meter.

On stringer SA. assumed $500 \times 1.60$ = 800 kg

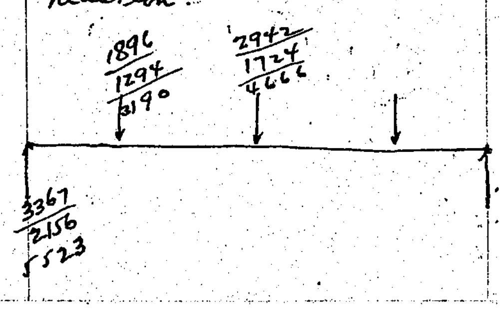
SB " $500 \times 1.20$ = 600

Load on floor beam SA. $800 \times \frac{4.43^2}{2 \times 5.43}$ = 1450

$800 \times \frac{1.93^2}{2 \times 5.43}$ = 274
1724 kg

SB $1724 \times \frac{600}{800}$ = 1294 kg.

Reaction.



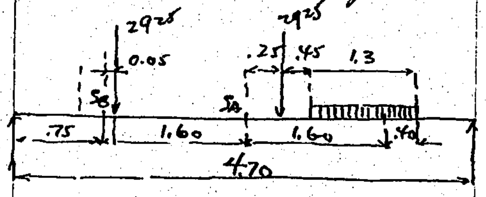
moment at center.

$5523 \times 2.35$ = 13000
$3190 \times 1.60$ = 5100
7900 kgm

Call this moment 8000 kgm

Design of Maekawa-Bashi for Kumamoto-Ken

max End shear (for live load.



motor truck rear wheel — front wheel — Total.

On SA. 2925 × $\frac{1.40}{1.60}$ = 2560 + 382 = 2942

SB. 2925 × $\frac{1.55}{1.60}$ = 2840 + 424 = 3264

SB' 2925 × $\frac{.25}{1.60}$ = 460 + 69 = 529

Front wheel. 975 × $\left(\frac{2.43}{5.43}\right)$ .447

= rear wheel $\frac{1}{3}$ × .447 = .149

Uniform live load assumed on SA 500 × $\frac{.90^2}{2 \times 1.60}$ = 127

SB' 500 × .9 = 450 − 127 = 323

500 × .40 = 200

523.

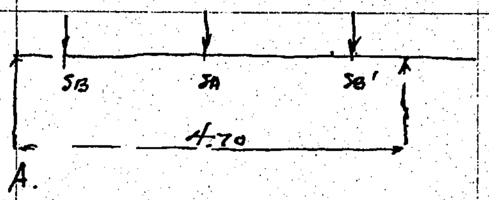
Reaction on floor beam SA. 127 × 1.00 × $\frac{4.93}{5.43}$ = 115

SA 127 × 3.5 × $\frac{3.68}{5.43}$ = 301

416 kg.

SB' 416 × $\frac{523}{127}$ = 1710 kg.

2942 3264 416 3680 529 1710 2239



Reaction A. 2239 × .75 = 1680
2942 × 3.95 = 11620
3680 × 2.35 = 8650
~~3707~~ 21950 ÷ 4.70 = ~~788~~ 4670 kg

Uniform load on front and rear of motor truck = 2156.
motor truck and unif. of sides of motor truck 4670
6826 kg.

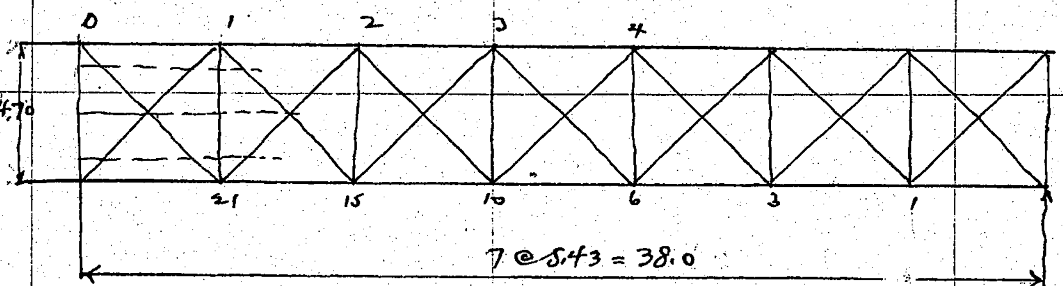
Summary for moments and shears section modulus req'd = $\frac{1550600}{1100}$ = 1410.

| | moment | shear |
|---|---|---|
| Dead Load | 7506 | 5956 |
| Live Load | say 8000 | 6826 |
| | 15506. | 12782 |

Use 450 × 175 @ 91.66 kg Sm = 1743 ~~kg~~.

Use same section for End floor beam

Lower Lateral Bracings.



wind load
loaded chord 400
Unloaded chord 200
600 × 5.43 = 3260 kg.

$4.70^2$ = 22.10
$5.43^2$ = 29.45
51.55 − $7.18^2$

Sec θ = $\frac{7.18}{4.70}$ = 1.53 tan θ $\frac{5.43}{4.70}$ = 1.16

Diagonal stresses.

| Panel | | | SR net | 19mm Rivet | |
|---|---|---|---|---|---|
| 0-1 | $\frac{3260}{7}$ × 1.53 × ~~250~~ 21.0 | = 15000 ÷ 1200 = | 12.5 | 7.0 | 1L 125 × 75 × 10 = 19.00 − 2.2 = 16.80 cm |
| 1-2 | × 15. | = 10700 | 8.9 | 5.0 | 1L 125 × 75 × 10 |
| 2-3 | × 10 | = 7100 | 5.9 | 3.3 | 1L 75 × 75 × 9 = 12.69 − 1.98 = 10.71 cm |
| 3-4 | × 6 | = 4270 | 3.5 | 2.0 | " |

chord stresses.

0-1 3260 × 1.16 × 3.0 = 11360
1-2 × 5.0 = 18900
2-3 × 6.0 = 2270.0
3-4 × 6.0 = "

**JIUN MASUDA**
CONSULTING ENGINEER
SEIYU BLDG, TOKIO

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CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken.

Approximate weight of Lateral Bracings

$8L^s$ 125 × 75 × 10 @ 14.91 × 7.0 = 835
$6L^s$ 75 × 75 × 9 @ 9.96 × 7.0 = 420
1255
Center connection &c 7 @ 20 = 140
1395 say 1400 kg.
1400 ÷ 38.0 = 37.0 kg per lin meter.

Design of truss. span length 7 @ 5.43 = 38.0 meters
Dead Load

Panel Concentration.
Floor slab and pavement 450 × 4.0 = 1800.
Coping 2 @ 90 = 180
1980 kg. × 5.43 = 10760

Structural Steel
stringers 3 @ 50 = 150
floor beam $95 \times \frac{4.7}{5.43}$ = 82
Lateral Bracings 37
269 × 5.43 = ~~1480~~ 1460 × ~~5.4~~ 1460
12220
For one truss 12220 ÷ 2 = 6110 kg.

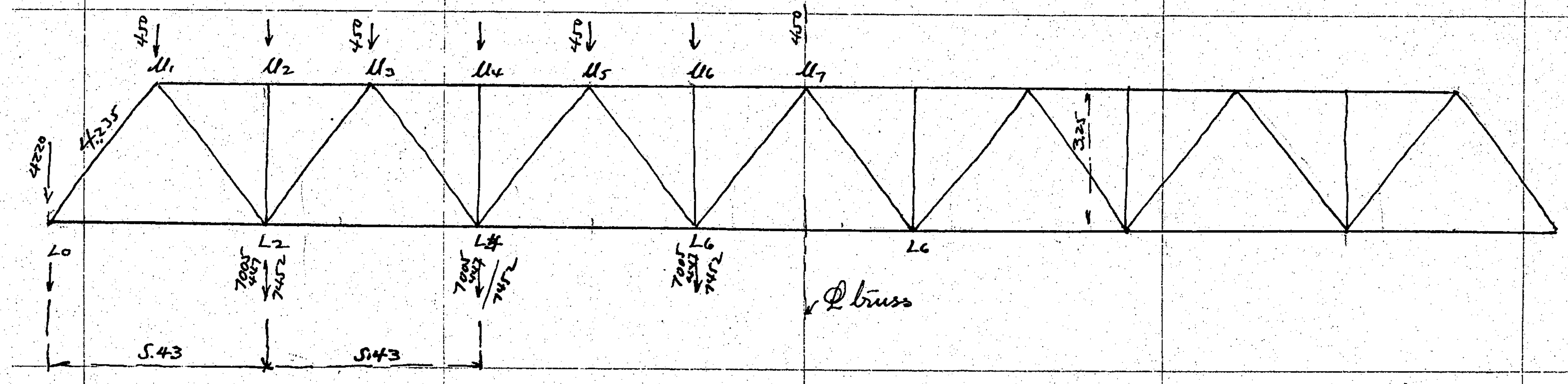
Weight of one truss assumed 330 kg.
Upper half. $165 \times \frac{5.43}{2}$ = 447
Lower half. 165 × 5.43 = 895

Lower Panel Concentration 6110
truss lower half. 895
7005 kg.
Upper chord Panel Concentration 447
7452 say ~~7450~~ kg

And at subpanel point say 450 kg

Dead Load End panel.
Projection say 25 cm $\frac{5.43}{2}$ + .25 = 2.96
floor and – 1980 × 2.96 = 5850 5850
~~structural steel~~ except truss say 269 × 2.96 = 795 assumed 795
trusses say $2 \times 330 \times \frac{5.43}{2}$ = ~~2×895~~ 1790
~~7540~~ 8435 ÷ 2 = 4220.

Dead Load Stresses of truss



$\sec\theta = \frac{4.235}{3.25}$ = 1.30 $\tan\theta = \frac{2.715}{3.25}$ = .835

Reaction 450 × 3.5 = 1575
7452 × 3.0 = 22356
23931

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CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken

$L_0$-$U_1$ 23931 × 1.30 = 31.100 kg.

$L_0$-$L_2$ 23931 × .835 = 20.000 "

$U_1$-$U_3$. 23931 × 2 × .835 = 40.000 say

450 × .835 = 380

39620 kg.

$L_2$-$L_4$ moment at $U_3$.

23931 × 8.145 = 194600

7452 × 2.715 = 20200

450 × 5.43 = 2440

−22640

171960 ÷ 3.25 = 52900 kg.

$U_3$-$U_5$ moment at $L_4$

23931 × 10.86 = 260.000

7452 × 5.43 = 40500

450 × 2.715 × 4 = 4880

−45380

214620 ÷ 3.25 = 66.000 kg.

$L_4$-$L_6$ moment at $U_5$

23931 × 13.575 = 324500

7452 × 2.715 × 4 = 80900

450 × 2.715 × 6 = 7330

−88230

236270 ÷ 3.25 = 72700 kg.

$U_5$-$U_7$. moment at $L_6$.

23931 × 16.29 = 388500

7452 × 2.715 × 6 = 121500

450 × 2.715 × 9 = 11000

132500

256000 ÷ 3.25 = 78700 kg.

$L_6$-$L_6'$ moment at $U_7$

23931 × 19.00 = = 455000

7452 × 2.715 × 9 = 182.000

450 × 2.715 × 12 = 14650

−196650

258350 ÷ 3.25 = 79500 kg.

Diagonal $U_1$-$L_2$ 23931

−450

23481 × 1.30 = 30500 kg. T

−7452

$L_2$-$U_3$ 16029 × 1.30 = 20800 " C

−450

$U_3$-$L_4$ 15579 × 1.30 = $20\overset{2}{\cancel{4}}00$ " T

7452

$L_4$-$U_5$ 8127 × 1.30 = $10\overset{6}{\cancel{7}}00$ " C

−450

$U_5$-$L_6$ 7677 × 1.30 = ~~10100~~ 9950 " T

7452

$L_6$-$U_7$ 225 × 1.30 = 292 " C

stress in vertical = 450 kg C

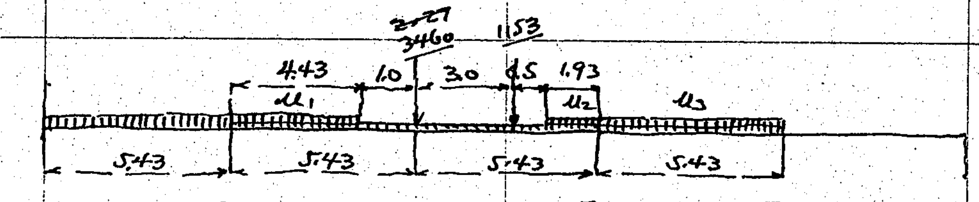
Design of Maekawa-Bashi for Kumamoto-Ken

Live Load on truss

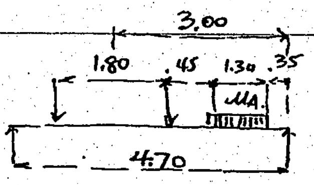
Uniform live load $w = \frac{190.000}{170+38} = 480$ kg/m²

motor truck loading impact $= \frac{20}{60+38} = 20.4\%$

| | | | |
|---|---|---|---|
| Rear wheel | 2250 | Front wheel | 750 |
| Imp. 20.4% | 459 | 20.4% | 153 |
| | 2709 kg. | | 903 kg |



721 721 721 721
2245
2165 ---- 1495
5131 3460
515 ---- 638
284 ---- 1311
6475 2245 ---- 2245
4915 2245 --
5211



Rear wheel $2709 \times \frac{3.00}{4.70} = 1730$
2
3460 kg.

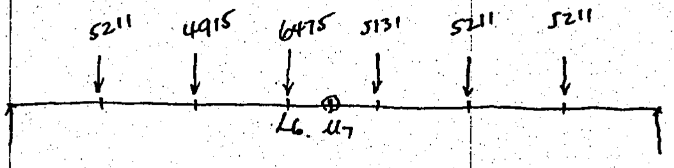
Front wheel 3460 ÷ 3 = 1153 ..

$M_A$. $480 \times 1.30 \times \frac{1.00}{4.70} = 133$ kg

Full load. $480 \times \frac{4.0}{2} = 960$
133
$M_B$ ⟶ 827.0 kg.

$M_A$ 133 × 5.43 = 721
$M_1$ 827 × 4.43 = 3660
$M_2$ 827 × 1.93 = 1595
$M_3$ 827 × 5.43 = 4490

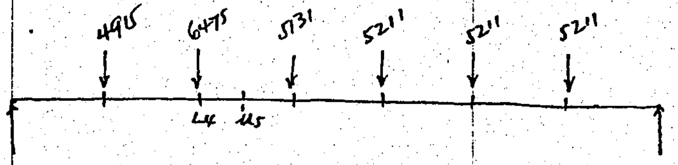
Chord stresses
$L_6$-$L_6'$



Reaction = 5211 × 9/7 = 6700
5131 × 3/7 = 2200
6475 × 4/7 = 3700
4915 × 5/7 = 3520
16120

moment at $U_7$
16120 × 19.0 = 306.000
6475 × 2.715 = 6475
4915 × 2.715 × 3 = 14770
5211 × 2.715 × ~~9~~ 5 = ~~46900~~ 26050
~~68145~~ 47295 × 2.715 = ~~185.000~~ 128300
~~121.000~~ 177700 ÷ 3.25 = ~~37200~~ 54700 kg.

$U_5$-$U_7$.
moment at $L_6$.
16120 × 16.285 = 262.000
4915 × 1 = 4915
5211 × 2 = 10422
15337 × 5.43 = 83300
178700 ÷ 3.25 = 54900 kg



Reaction 5211 × 6/7 = 4470
5131 × 4/7 = 2940
6475 × 5/7 = 4620
4915 × 6/7 = 4210
16240

$L_4$-$L_6$. moment at $U_5$
16240 × 13.575 = 220500
6475 × 1 = 6475
4915 × 3 = 14745
21220 × 2.715 = - 57600
162900 ÷ 3.25 = 50.000 kg

$U_3$-$U_5$ moment at $L_4$
16240 × 10.86 = 176200
4915 × 5.43 = - 26700
149500 ÷ 3.25 = 46.000 kg.

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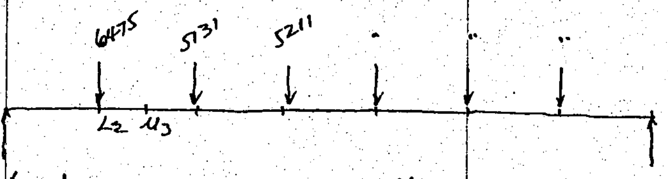
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-ken.



Reaction

5211 × $\frac{10}{7}$ = 7440
5131 × 5/7 = 3670
6475 × 6/7 = 5550
16660

L2-L4 moment at U3
16660 × 8145 = 135800
6475 × 2.715 = −17600
118200 ÷ 3.25 = 36400 kg.

U1-U3 moment at L2
16660 × 5.43 ÷ 3.25 = 27800 kg.

L0-L2 moment at U1 16660 × 2.715 ÷ 325 = 13900 kg.

End Post. L0-U1 16660 × 1.30 = 21700 kg.
U1-L2 = 21700 kg.

Impact for diagonals.
5 panels @ 5.43 = 27.15 I = 22.9 %
4 " @ " = ~~23.72~~ 21.72 = ~~23.9~~ 24.5
3 " " = 16.29 = 26.2

motor truck loading.
without impact 2250 × $\frac{3.00}{4.70}$ = 1435 | 1435 | 1435
Rear wheel Impact 22.9% 328 | 23.9% 24.5 ~~343~~ 351 | 26.2% 376
1763 | ~~1778~~ 1786 | 1811
Front wheel 587 | 59~~2~~5 | 604

For two wheels. Rear wheel 3526 | 35~~86~~72 | 3622
Front wheel. 1174 | 11~~84~~90 | 1208

Uniform live load : panel concentration assumed.

Loading for L2-U3-L4

| | | | | |
|---|---|---|---|---|
| | 721 | 721 | 721 | 721 |
| | 284 --- | 1311 | 4490 | 4490 |
| | | 2245 | | |
| Uniform load - | 1005 | 4277 | 5211 | 5211 |
| motor truck | 3526 | | | |
| " | 525 | 649 | | |
| | 5056 | 4926 | 5211 | 5211 |

Loading for L4-U5-L6.

| | | | | |
|---|---|---|---|---|
| Uniform load | 1005 | 4277 | 5211 | 5211 |
| motor truck | 35~~56~~72 | | | |
| | 530 --- | 654 | | |
| | 50~~91~~102 | 4931 | | |

Loading for L6-U7-L6'

| | | | | |
|---|---|---|---|---|
| Uniform load | 1005 | 4277 | 5211 | 5211 |
| motor truck | 3622 | | | |
| | 540 | 668 | | |
| | 5167 | 4945 | 5211 | 5211 |

For convenience' sake use uniform panel concentration of 5211 kg for diagonal members.

L2-U3-L4 5211 × $\frac{15}{7}$ × 1.30 = 14500 kg

L4-U5-L6. 5211 × $\frac{10}{7}$ × 1.30 = 9650 "

L6-U7-L6' 5211 × 6/7 × 1.30 = 5800 "

**JIUN MASUDA**
CONSULTING ENGINEER
SEIYU BLDG, TOKIO

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CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken.

1Pl. 325 × 9 = 29.25
2Ls 130×130×9 = 45.18
1Pl 220 × 10 = 22.00
96.43

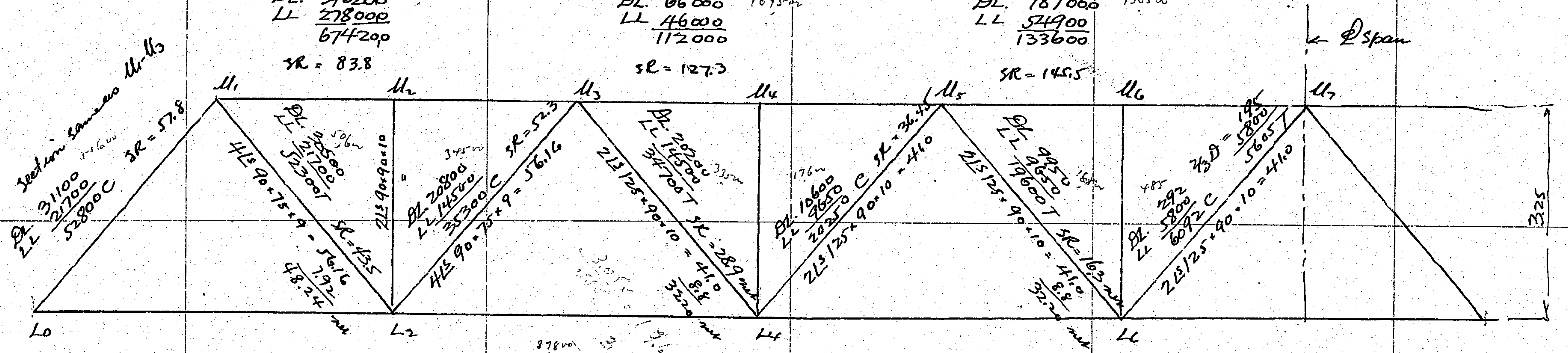
2Pls. 325 × 9 = 58.50
2Ls 130×130×9 = 45.18
1Pl. 220 × 10 = 22.00
125.68

3Pls. 325 × 9 = 87.75
2Ls 130×130×9 = 45.18
1Pl. 220 × 10 = 22.00
154.93

DL. 396200 65800
LL 278000
674200
SR = 83.8

DL. 66000 1095
LL 46000
112000
SR = 127.3

DL. 787000 1305
LL 54900
133600
SR = 145.5



DL. 20.000 332
LL 13900
33900 T
SR = 28.2 net

DL. 52900 878
LL 36400
89300 T
SR = 74.5 net

DL. 72700 1206
LL 50.000
122700 T
SR = 102.0 net

DL. 79500 1327
LL 54700
134200 T
SR = 112.0 net

2Ls 130×130×9 = 45.18 − 7.92 = 37.26
1Pl 200 × 10 = 20.00 − 4.4 = 15.60
65.18 52.86

2Ls 130×130×9
1Pl 200 × 10 } 65.18 52.86
1Pl. 300 × 12 36.00 − 5.28 = 30.72
101.18 83.58

2Ls 130×130×9
1Pl. 200×10
1Pl. 300×12 } 101.18 − 83.58
1Pl. 300 × 12 36.00 − 5.28 = 30.72
137.18 114.30

same as L4-L6

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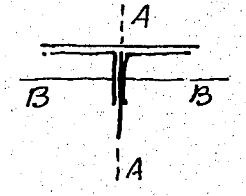
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken.

$L_0$-$U_1$ and $U_1$-$U_3$.



AA.
1 cov Pl. 325 × 9 = 29.25 — 2580
2Ls 130 × 130 × 9 = 45.18 × $3.96^2$ + 709.6 = 1418
1 Pl. 220 × 10 = 22.00
96.43 — 3998

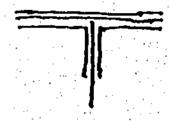
$r = \sqrt{\frac{3998}{96.43}} = 6.44$

Axis BB.
1 Pl. 325 × 9 = 29.25 × .45 = − 13.18 — 29.25 × $4.58^2$ = 614
2Ls 130 × 130 × 9 = 45.18 × 3.51 = 158.50 — 45.18 × $.62^2$ + 709.6 = 727 — $r = \sqrt{\frac{3424}{96.43}} = 5.96$
1 Pl. 220 × 10 = 22.00 × 11.50 = 253.00 — 22.00 × $7.37^2$ + 883 = 2083
96.43 — 4.13 — 398.32 — 96.43 — 3424

Allowable unit stress $1500\,(1 - 0.0055 \times \frac{543}{6.44}) = 805$ kg/cm²
$1500\,(1 - 0.0055 \times \frac{423.5}{6.44}) = 958$ "
$1500\,(1 - 0.0055 \times \frac{423.5}{5.96}) = 914$ "

$L_0$-$U_1$ 52800 ÷ 914 = 57.8
$U_1$-$U_3$ 67420 ÷ 805 = 83.8

$U_3$-$U_5$

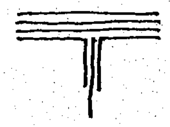


2 cov Pls. 325 × 9 = 58.50 — 5160
2Ls 130 × 130 × 9 = 45.18 — 1418 — $r = \sqrt{\frac{6578}{125.68}} = 7.23$
1 Pl. 220 × 10 = 22.00
125.68 — 6578

$f = 1500\,(1 - 0.0055 \times \frac{543}{7.23}) = 880$ kg/cm²

SR = 112.000 ÷ 880 = 127.3.

$U_5$-$U_7$

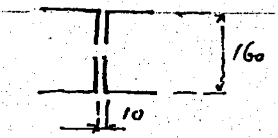


3 cov Pls. 325 × 9 = 87.75 — 7740
2Ls 130 × 130 × 9 = 45.18 — 1418 — $r = \sqrt{\frac{9158}{154.93}} = 7.69$
1 Pl. 220 × 10 = 22.00 — 0
154.93 — 9158

$f = 1500\,(1 - 0.0055 \times \frac{543}{7.69}) = 918$

SR = 133600 ÷ 918 = 145.5 □ cm

$U_3$-$L_2$ 4Ls 90 × 75 × 9 = 56.16 — r = 4.23



$f = 1500\,(1 - 0.0055 \times \frac{423.5}{4.23}) = 675$

SR = 35300 ÷ 675 = 52.3 □ cm

$L_4$-$U_5$ 2Ls 125 × 90 × 10 = 41.0 — r = 3.70

$f = 1500\,(1 - 0.0055 \times \frac{423.5}{3.70}) = 556$

SR = 20250 ÷ 556 = 36.45 □ cm

$L_6$-$U_7$ 2Ls 125 × 90 × 10 = 41.0

SR = 6092 ÷ 556 = 11.0 □ cm

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CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken

Approximate weight of truss.

| | | | | | | |
|---|---|---|---|---|---|---|
| $L_0-U_1$ | 96.43 | @ .785 | × 4.235 | = | 320.0 | |
| $U_1-U_3$ | 96.43 | | × 5.43 | = | 411.0 | |
| $U_3-U_5$ | 125.68 | | × 5.43 | = | 536.0 | 1927 |
| $U_5-U_7$ | 154.93 | | × 5.43 | = | 660.0 | |
| $L_0-L_2$ | 65.18 | | × 5.43 | = | 278.0 | |
| $L_2-L_4$ | 101.18 | | × 5.43 | = | 432.0 | |
| $L_4-L_6-6'$ | 1.5 × 137.18 | | × 5.43 | = | 878.0 | |
| $U_1-L_2-U_3$ | 2 × 56.16 | | × 4.235 | = | 374.0 | |
| diag | 4 × 41.00 | | × 4.235 | = | 545.0 | |
| vert. | 3 × 34.00 | | × 3.25 | = | 260.0 | |

4694.0 × 2 = 9388

28% Details 2640

12028 call this ~~11730~~ 12000

11730 ÷ 38 = 310 kg per lin meter of span.

Load on shoe

Dead Load Intermediate panels End reactions 23930

End panel 4220

28150 call this 28500 kg.

Live Load rear wheel at end panel point See page 9

Unif. load 721 ÷ 2 = 360

1495

1855

motor truck rear wheel 3460

5315 kg.

Unif. load 5131 × 6/7 = 4400

5211 × 15/7 = 11200

20915 call this 21000

Dead Load 28500

49500 kg.

Including shoes say - 50.000 kg.

Roller 9.0 cm dia 45 × 9 = 405 kg per cm of roller

50000 ÷ 405 = 123.5 cm 4 rollers @ 30.8 cm net

Approximate weight of structural steel in one span

| | | | | |
|---|---|---|---|---|
| stringers | 150 × 38.0 | = | 5700 | 5718 |
| floor beam | 8 × 460 | = | 3680 | 3491 |
| Lateral Bracings | | | 1400 | 1360 |
| trusses | 2 @ ~~11730~~ 12000 | = | ~~23460~~ 24000 | |
| shoes say | | | 1100 | |
| | | | ~~35340~~ 35,880 tons. | |

For 6 spans @ 35.88 = 215.28 tons

excluding metal in expansion Joints and handrails.

**JIUN MASUDA**
CONSULTING ENGINEER
SEIYU BLDG, TOKIO

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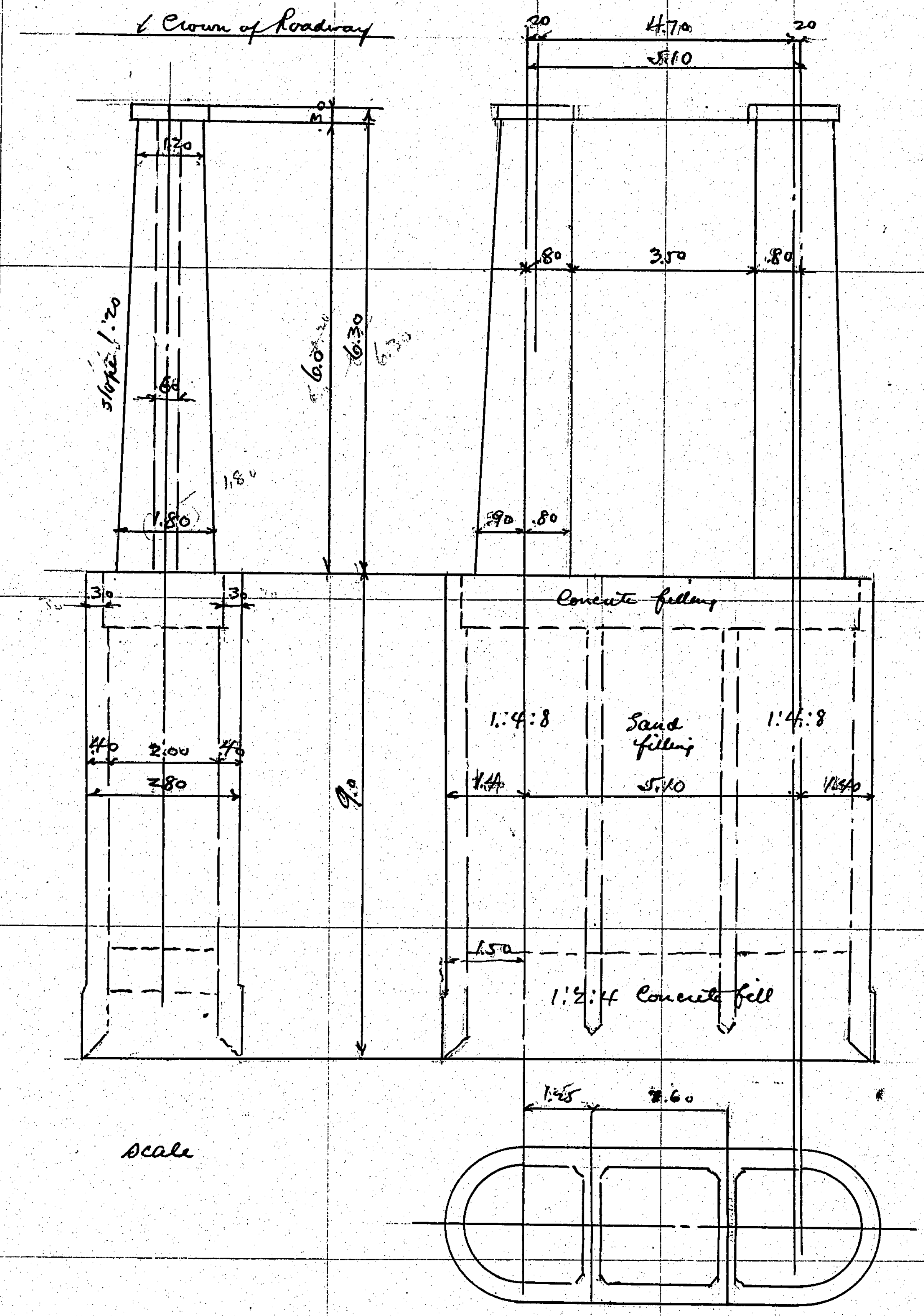
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken

Design of piers.



Volume

Coping 1.4⌀ 1.54
1.4 × 1.60 = 2.24
3.78 × .30 = 1.13 cubic meters.

Shaft Top area
1.20⌀ = 1.13
2- 0.8 × 1.20 = 1.92
3.05

Bottom area
1.800 ~~2.70~~ 2.54
2-0.8 × 1.800 = ~~2.97~~ 2.88
~~5.67~~
5.42

3.05 3.05
5.42 ~~5.67~~ 5.42
8.47 ~~8.72~~ 8.47 ÷ 2 = ~~4.36~~ 4.24

web. 3.50 × ~~8.20~~ 6.00 × .6 = ~~17.20~~ ~~12.95~~ 12.6
shafts ~~4.36~~ 4.24 × ~~8.20~~ 6.00 = ~~35.80~~ 25.40
coping ~~1.13~~ 1.13
~~54.13~~ ~~40.48~~ 39.13 cubic meters.

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CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken

Volume of well

Outside area $2.8^{\phi}$ 6.16 Inside area $2.0^{\phi}$ = 3.14
$2.8 \times 5.1$ = 14.30 $2.0 \times 5.10$ = 10.20
20.46 13.34

Outside ring 20.46 - 13.34 = 7.12
Partitions 2 - 2.00 × .30 = 1.20
Fillets 4 - .20 × .20 = .16
8.48

Partitions assumed to top of well vol = 8.48 × 9.0 = 76.30 cubic meters

Top and bottom filling 20.46 - 8.48 = 11.98 sq meters
top filling 1 meter bottom filling 2 meters
volume = 11.98 × 3.0 = 36.00 cubic meters

Intermediate filling 1:4:8 Concrete
area = $2.0^{\phi}$ = 3.14
$2.0 \times 2.20$ = 4.40
7.54
fillets 2 × .20 × .20 - .08
7.46 × ~~5.0~~ 6.0 = ~~37.3~~ 44.8 cubic meters

Intermediate Sand filling
$2.0 \times 2.30$ = 4.60
2 - .20 × .20 = - .08
4.52 × ~~5.0~~ 6.0 = ~~22.6~~ 27.1 cubic meters

Summary
Coping and shaft ~~40.48~~ 39.13 cubic meters
Well shell 76.30
Concrete filling top and bottom 36.00
" " intermediate ~~37.30~~ 44.80
~~190.08~~ 196.23 @ say 2200 = ~~420.000~~ 432.000
Sand filling ~~22.60~~ 27.10 @ 1700 = ~~38.400~~ 46 400
~~458400~~ 478400

Superimposed Dead and Live Loads 4 @ 50.000 = 200.000
~~658400~~ 678400 kg.

Bottom area of well $3.0^{\phi}$ = 7.07
$3.0 \times 5.1$ = 15.30
22.37 sq meters

Unit bearing = ~~658400~~ 678400 ÷ 22.37 = ~~29300~~ 30300 kg / m2
~~2.74~~ 2.77 tons / ft²

Counting frictional resistance the unit bearing on soil will be reduced somewhat.

Stability during flood water level assumed top of coping.
Total volume of pier = ~~212.68~~ 223.33 @ 62.5 = - 13~~3~~000
9
?

weight of pier 4~~5~~8400
7
Dead Load only 4 × say 29000 = 116.000
5~~7~~4400 kg
9
- 13~~3~~000
9
~~441400~~ 455400 ÷ 22.37 = ~~19700~~ 20200 kg per sq meter
1.8~~3~~ tons / o ft
7

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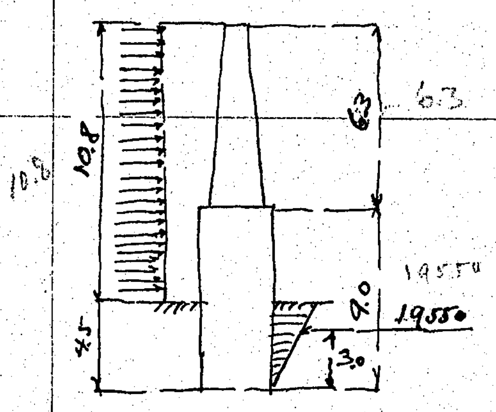
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken.

Horizontal force during flood
velocity assumed 3.14 meters per second
Horizontal force $= \frac{1000}{9.8} \cdot 3.14^2 = 1000$ kg per sq meter.

Side pressure on pier in direction of bridge center line.
15° skew $1000 \cdot .259 = 259$ kg per sq meter.



width of pier assumed 7.0 meter area = $10.8 \cdot 7.0 = 75.5$
Total force $= 75.5 \cdot 259 =$ ~~23600~~ 19550 kg.

moment at bottom of base
$19550 \cdot 9.9 = 193500$
$19550 \cdot 3.0 = -58000$
134900 kg meters.

Moment of inertia of bottom area
Circular ends $0.0491 \cdot 3^4 = 3.98$
straight square portion $\frac{5.1 \cdot 3^3}{12} = 11.50$
15.48

Pressure due to bending $P = \pm \frac{My}{I} = \frac{134900 \cdot 1.5}{15.48} = 13070$ kg/m$^2$
~~1.71~~ 1.21 tons/ft$^2$
~~1.75~~
~~1.09~~ !

Max pressure ~~1.83~~ 1.87 + ~~1.75~~ 1.21 = 3.08 tons/□'
Min " ~~1.83~~ 1.87 − ~~1.75~~ 1.21 = ~~0.58~~ 0.66 ton/□' ok.

Reinforcement in the ring of well.
Between partition walls.

| | | | | |
|---|---|---|---|---|
| 0 | | | | |
| 1 | Side pressure on well. | 2 meters surcharge above top of well assumed. | | |
| 2 | 'Top of well. | Moment between Partition walls. | | 13mm bar spacing |
| 3 | $\frac{1}{3} \cdot 1700 \cdot 3 =$ 1700 kg/□m | 95700 kg cm | | |
| 4 | 2265 " | 127500 | 3.37 cm$^2$ | 39.5 cm |
| 5 | 2840 " | 160.000 | 4.22 | 31.5 |
| 6 | 3400 " | 191500 | 5.05 | 26.3 |
| 7 | 3970 " | 223000 | 5.90 | 22.5 |
| 8 | 4530 " | 255000 | 6.73 | 19.7 |
| 9 | 5100 " | 287000 | 7.59 | 17.5 |
| 10 | 5670 " | 319000 | 8.43 | 15.7 |
| 11 | 6230 " | 351000 | 9.27 | 14.3 cm |

moment assumed between partition walls. $\frac{1}{12} \cdot wl^2$
$\frac{1}{12} \cdot 2.60^2 w = 0.563 w.$
moment circular ends assumed $\frac{1}{12} wl^2 = \frac{1}{12} \cdot 2.40^2 w = 0.480 w.$

use same reinforcing bars throughout as for between partition walls.

Reinforcing bars. thickness of well - 40 cm insulation 4 cm Effective d = 36.

Steel area reqd $= \frac{M \text{ in cm}}{7/8 \cdot 36 \cdot 1200} = \frac{M}{37800}$

use vertical bars 5/8"ϕ bar or ~~15~~ 16mm dia.

Reinforcement in shaft. vertical bars 19mm bars 20 cm spacing around the shaft
horizontal hoop 13mm bars. 60 cm spacing about

Design curb shoe of ⊩ Plate and angle as shown in sketch

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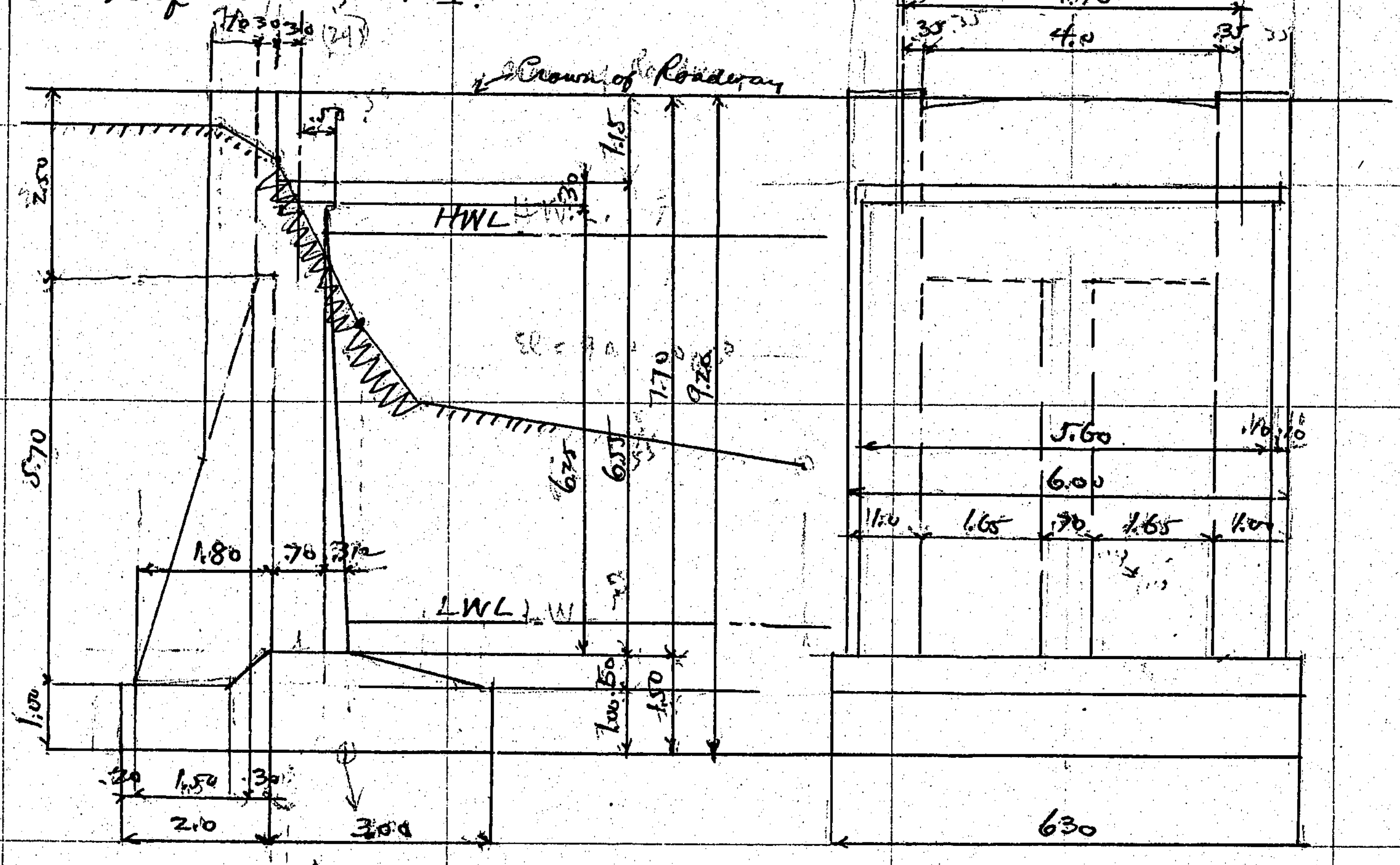
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken

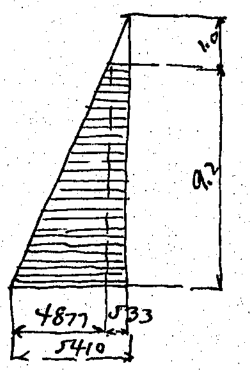
Design of abutment. I.



| | | | wt | arm | moment |
|---|---|---|---|---|---|
| Parapet wall | 2.5 × .30 × 4.0 | = 3.00 @ 2200 = | 6600 | × 1.85 | = 12.200 |
| Side cols | 2 - 1.0 × 1.0 × 8.20 | = 16.40 | 36100 | × 1.50 | = 54100 |
| do buttress | 2 - $\frac{.80 \times .30}{2}$ × 1.00 | = 2.40 | 5270 | × 0.77 | = 4050 |
| Centr buttress | 5.7 × $\frac{1.5}{2}$ × .70 | = 2.99 | 6570 | × 1.20 | = 7890 |
| " " | 5.70 × .30 × .70 | = 1.20 | 2640 | × 1.85 | = 4880 |
| Coping | .80 × 5.80 × .30 | = 1.39 | 3060 | × 2.40 | = 7350 |
| Shaft | .70 × 5.60 × 6.75 | = 26.50 | 58200 | × 2.35 | = 137000 |
| " | $\frac{.312}{2}$ × 5.60 × 6.75 | = 5.90 | 13000 | × 2.804 | = 36400 |
| filler | $\frac{.50 \times .50}{2}$ × 3.3 | = .41 | 900 | × 1.90 | = 1710 |
| | $\frac{.50 \times 1.988}{2}$ × 6.3 | = 3.13 | 6880 | × 3.67 | = 25200 |
| base | 5.0 × 1.0 × 6.3 | = 31.50 | 69200 | × 2.50 | = 172500 |
| | | 94.82 | 208420 | 2.22 | 463280 |

Earth fill assumed thus 8.20 × 1.70 × 6.3 @ 1600 = 140.000 × .85 = 119.000
Superimposed dead and live loads 2 @ 50,000 = 100,000 × 2.30 = 239.000
Total load = 448420 kg. 812.280

Earth Pressure wt $1600^{kg}$ per cubic meter



1 meter surcharge at top
Hor. Pressure at 1 meter $\frac{1}{3}$ × 1600 = 533
" " " 10.2 meters $\frac{1}{3}$ × 1600 × 10.2 = 5410

Horizontal moment about bottom of base.

533 × 9.2 = 4900 × 4.60 = 22600
$\frac{4877}{2}$ × 9.2 = 22450 × 3.07 = 68800
27350
91400 × 6 = 548,400
812.280
1,360.680

Point of Resultant at base = $\frac{1360.680}{448420}$ = 3.04

Ecc = 3.04 - 2.50 = .54

Toe Pressure = $\frac{448420}{6.30 \times 5.0}\left(1 \pm \frac{6 \times .54}{5.0}\right)$ = 23400 kg/m² or 5000 kg/m²
2.18 tons / ft² .465 tons / ft²

**JIUN MASUDA**
CONSULTING ENGINEER
SEIYU BLDG, TOKIO

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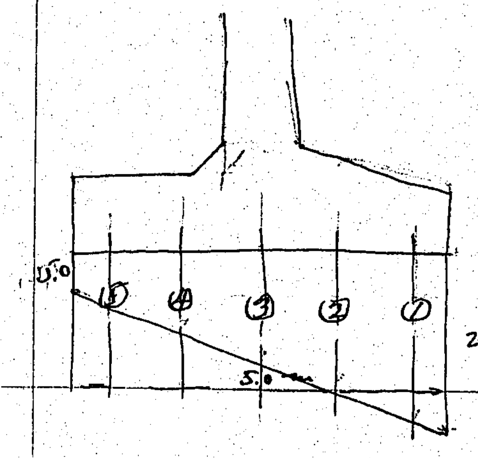
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken



without bearing
load on piling

| | | | | |
|---|---|---|---|---|
| 5 | 4 | 3 | 2 | 1 |
| 1.84 | 5.54 | 9.20 | 12.90 | 16.60 |
| 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| 6.84 | 10.54 | 14.20 | 17.90 | 21.60 / per sq meter. |

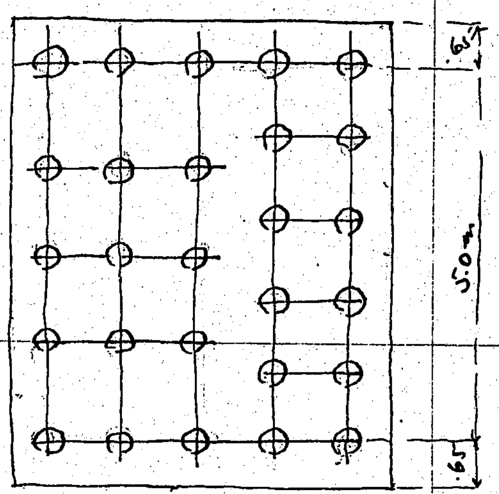
1st and 2nd row load on 1 pile 21.60 tons and 17.90 tons.

3rd row $14.2 \times \frac{6.3}{5}$ = 17.9 tons per pile.

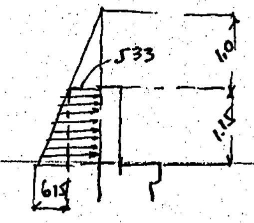
4th row $10.50 \times \frac{6.3}{5}$ = 13.25 " " "

5th row $6.84 \times \frac{6.3}{5}$ = 8.60 " " "

use 末口六寸 長 15.0 尺



Details of Design
Parapet wall.



depth 1.15 $\frac{1}{3} \times 1600 = 533$
$\frac{1}{3} \times 1600 \times 2.15 = 1148$

Horizontal moment
$533 \times 1.15 \times \frac{1.15}{2} = 353$
$\frac{615}{2} \times 1.15 \times \frac{1.15}{3} = 136$
489 kg-meters

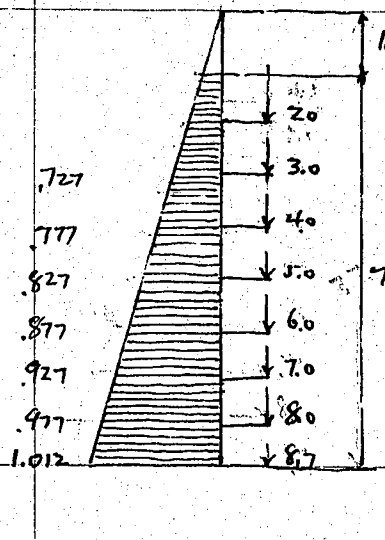
Effective depth required for $f_s = 1200$ $f_c = 45$ kg/cm² $R = 7.18$

$d = \sqrt{\frac{489 \times 100}{100 \times 7.18}} = 8.3$ cm use 30 cm wall.
Effective depth 27. cm.

Steel area req'd $= \frac{48900}{7/8 \times 27 \times 1200} = 1.72$ □ cm

use 13 mm bars 1.33 □ cm .30 cm spacing about. 4.39 □ cm per meter strip

Reinforcement in front wall. span length 2.5 meter ℄ buttress walls.



Side pressure

| Depth | | | | $\frac{1}{10}wl^2$ | d | Steel area |
|---|---|---|---|---|---|---|
| 2.0 | $\frac{1}{3} \times 1600 \times 2$ | = | 1067 | 665 kgm | | |
| 3.0 | 3 | = | 1600 | 1000 " | .69 | ~~0.95~~ 1.380 |
| 4.0 | 4 | = | 2133 | 1330 " | .74 | ~~0.710~~ 1.710 |
| 5.0 | 5 | = | 2666 | 1667 " | .79 | 2.01 |
| 6.0 | 6 | = | 3200 | 2000 " | .84 | 2.28 |
| 7.0 | 7 | = | 3733 | 2330 " | .89 | 2.50 |
| 8.0 | 8 | = | 4266 | 2666 " | .94 | 2.70 |
| 8.7 | 8.7 | = | 4630 | 2900 " | .97 | 2.84 |

Steel area req'd $= \frac{290000}{7/8 \times 97 \times 1200} = 2.84$

use. 13 mm bars 1.33 □ cm 33 cm spacing 4.0 □ cm at bottom

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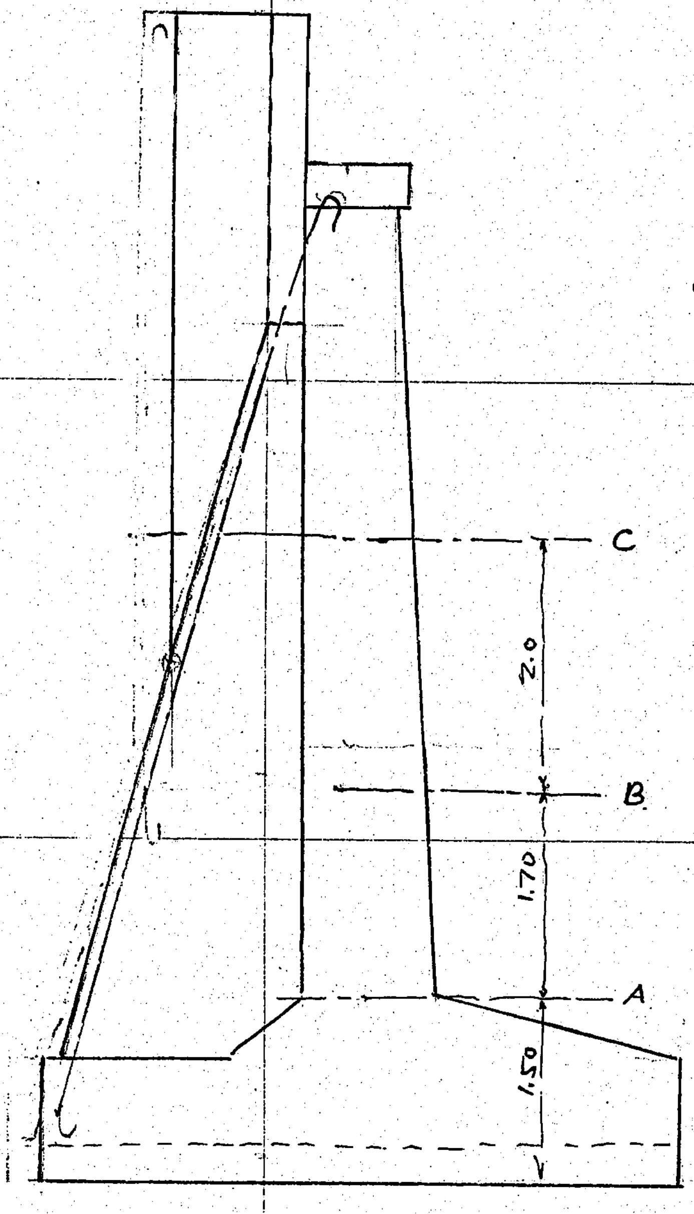
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken

Buttress wall at ℄ bridge.



Scale 1/60

1 meter strip.

$533 \times 7.7 = 4110 \times 3.85 = 15800$

$\text{say } \frac{4100}{2} \times 7.7 = 15800 \times 2.565 = 40500$

$56300 \text{ kgm}$

$1.65 + .70 = 2.35$ meter wide.

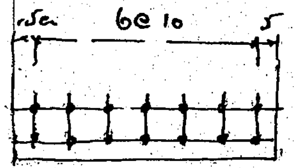
Total moment $56300 \times 2.35 = 132{,}500$ kgm

arm say $\overset{2.60}{\cancel{2.25}}$ meter. as sq beam

$\text{Stress in steel} = \frac{132.500}{\underset{2.60}{\boxed{2.25}} \times 7/8} = \overset{58100}{\cancel{67.200}}$

$\text{Steel area reqd} = \overset{58100}{\cancel{67.200}} \div 1200 = \overset{48.5}{\cancel{56.0}} \text{ cm}$

Use 14- 22mm bars @ 3.80 = 53.20 cm



6 meter from top.

$3733$
$533$
$32.00$

$533 \times 6.0 = 3200 \times 3.5 = 11200$

$\frac{3200}{2} \times 6.0 = 9600 \times 2.0 = 19200$

$30400$

Total moment $30400 \times 2.35 = 71500$ kgm

arm $\overset{2.10}{\cancel{1.70}}$ meters. square beam

$\text{Steel stress} = \frac{71500}{7/8 \times \underset{2.10}{\cancel{1.70}}} = \overset{38900}{\cancel{48000}} \text{ kg.}$

$\text{Steel area} = \overset{38900}{\cancel{48000}} \div 1200 = \overset{32.5}{\cancel{40.0}}$

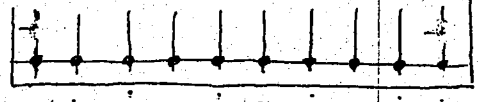
Use $\underset{9}{\cancel{10}}$- 22mm bars @ 3.8 = $\underset{34.2}{\cancel{38.0}}$ cm

Buttress wall at wing.

Section AA. $\frac{1.65}{2} + 1.0 = 1.82^{m}$ wide

Total moment $56300 \times 1.82 = 102500$ kgm

arm say 2.25 $\text{steel area} = \frac{102500}{7/8 \times \underset{2.60}{\boxed{2.25}} \times 1200} = \overset{37.6}{\cancel{43.4}} \text{ cm}^2$



use $\overset{10}{\cancel{12}}$- 22mm bars @ 3.80 = $\overset{38.0}{\cancel{45.60}}$ cm²

Section BB. Total moment $30400 \times 1.82 = 55300$ kgm

arm say 1.70 $\text{Steel area} = \frac{55300}{7/8 \times \underset{2.10}{\boxed{1.70}} \times 1200} = \overset{25.1}{\cancel{31.0}} \text{ cm}^2$

use $\overset{7}{\cancel{8}}$- 22mm bars @ 3.80 = $\overset{26.6}{\cancel{30.4}}$ cm²

Section CC.

$533 \times 4 = 2135 \times 2.0 = 4270$

$\frac{2133}{2} \times 4 = 4266 \times 1.33 = 5690$

$9960$

Total moment $9960 \times 1.82 = 18100$

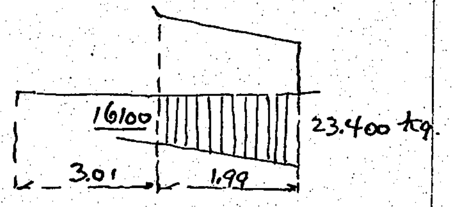
arm say 1.70 $\text{steel area} = \frac{18100}{7/8 \times 1.90 \times 1200} = \overset{9.06}{\cancel{10.15}} \text{ cm}^2$

use 3- 22mm bars @ 3.80 = 11.4 cm

CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken.

Toe Reinforcement.



23400
5000
18.400 × $\frac{3.01}{5.00}$ = 11100
5000
16100

23400
16100
7300

moment due to upward pressure

16100 × $\frac{1.99^2}{2}$ = 31800

$\frac{7300}{2}$ × 1.99 × 1.325 = 9600

41400 kgm

weight of Concrete 2200 kg.
1100 "
3300

moment due to downward pressure

2200 × $\frac{1.99^2}{2}$ = 4350

$\frac{1100}{2}$ × 1.99 × .663 = 725

5075

Summary moment 41400 − 5075 = 36325 kgm

Effective depth say 1.10 meter

Steel area = $\frac{36325}{7/8 \times 1.10 \times 1200}$ = 31.4 $\square$cm per meter strip

Counting 3 meter earth fill on top of base 6600 kg./□m

moment = 6600 × $\frac{1.99^2}{2}$ = 13100 kgm.

36325
13100
23225 kgm.

Steel area = $\frac{23225}{7/8 \times 1.10 \times 1200}$ = 20.1 sq cm per meter strip

22mm bars. $\frac{\overset{3.80}{\cancel{20.1}} \times 100}{\cancel{3.80}\ 20.1}$ = 19 cm spacing

Reinforcement in the Heel.

downward load. 1600 × 8.2 = 13100 kg
1 meter concrete 2200
15300

Upward pressure say unif. − 5000
10300

moment = $\frac{1}{10}$ × 10300 × 2.5$^2$ = 6410 kgm.

Depth of slab say .60

Steel area req'd = $\frac{6410}{7/8 \times .60 \times 1200}$ = 10.2 sq cm per meter strip

16mm bars @ 2.01

spacing = $\frac{2.01 \times 100}{10.2}$ = 19.7 cm

Shear for toe

upward pressure = 16100 × 1.99 = 32000
$\frac{7300}{2}$ × 1.99 = 7300
39300 kg.

Downward. 2200 × 1.99 = 4400
$\frac{1100}{2}$ × 1.99 1100
5500

39300
5500
33800 kg.

unit shear = $\frac{33800}{100 \times 7/8 \times 110}$ = 3.5 kg per cm$^2$ OK

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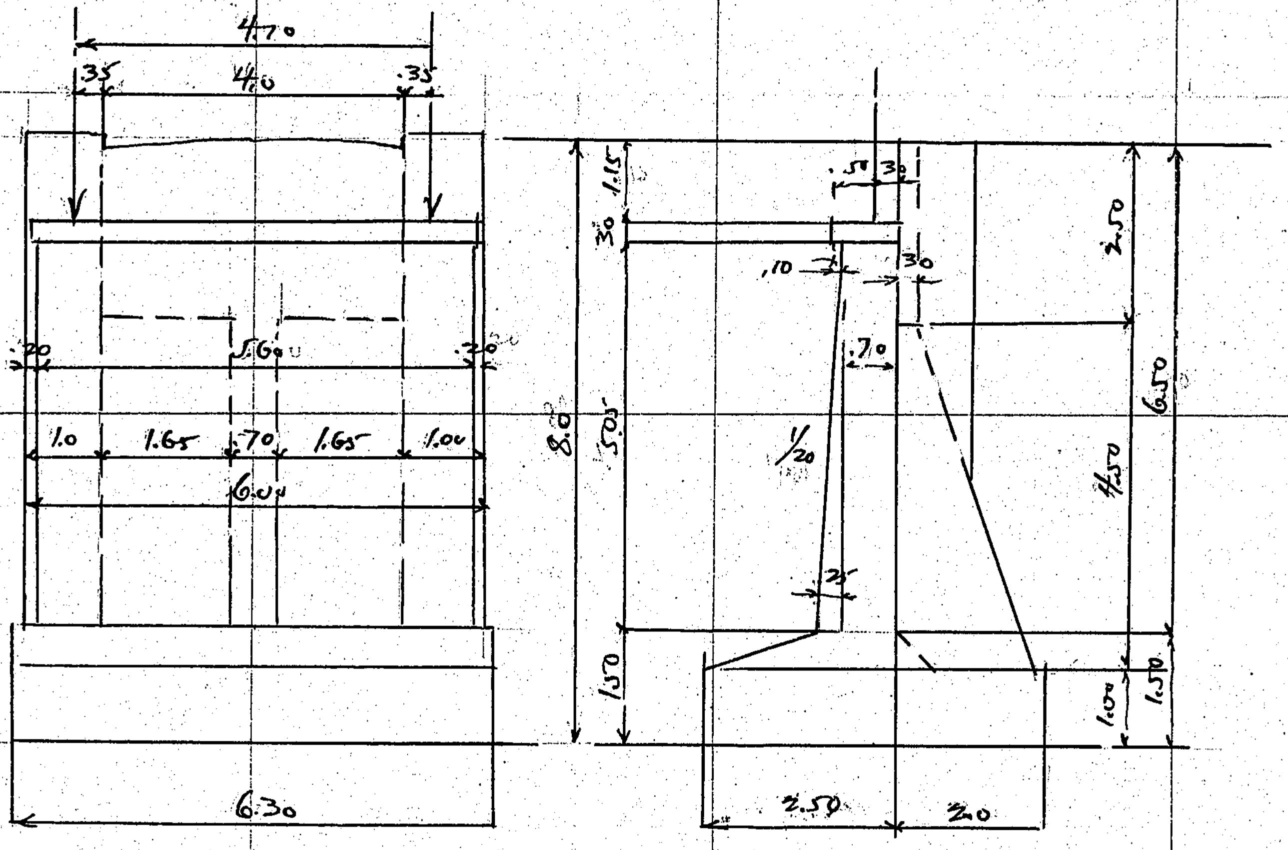
CALCULATIONS FOR

## Design of Maekawa-Bashi for Kumamoto-Ken

### Design of Abutment II.



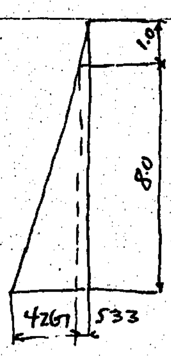
| | | | | | wt | | arm | | moment |
|---|---|---|---|---|---|---|---|---|---|
| Parapet wall | 2.5 × .30 × 4.0 | = | 3.00 | @ 2200 = | 6600 | × | 1.85 | = | 12.200 |
| Side cols. | 2 - 1.0 × 1.0 × 7.0 | = | 14.00 | | 30800 | × | 1.50 | = | 46200 |
| do buttress | $2 - .80 \times \frac{2.4}{2} \times 1.00$ | = | 1.92 | | 4220 | × | 0.77 | = | 3250 |
| Center buttress | $4.5 \times \frac{1.5}{2} \times .70$ | = | 2.36 | | 5200 | × | 1.20 | = | 6230 |
| " " | 4.5 × .30 × .70 | = | 0.94 | | 2070 | × | 1.85 | = | 3830 |
| Coping | .80 × 5.80 × .30 | = | 1.39 | | 3060 | × | 2.40 | = | 7350 |
| shaft | $.70 \times \overset{5.60}{4.50} \times 5.55$ | = | 21.80 | | 48000 | × | 2.35 | = | 113300 |
| " | $\frac{.25}{2} \times \overset{5.60}{4.50} \times 5.55$ | = | 3.88 | | 8550 | × | 2.78 | = | 23800 |
| Filler | $\frac{.50 \times .50}{2} \times 3.3$ | = | .41 | | 900 | × | 1.90 | = | 1710 |
| " | $.50 \times \frac{1.55}{2} \times 6.3$ | = | 2.44 | | 5360 | × | 3.47 | = | 18600 |
| base | 4.50 × 1.0 × 6.3 | = | 28.40 | | 62500 | × | 2.25 | = | 140800 |
| | | | 80.54 | | 177260 | | 2.13 | | 377270 |

| | | | | | |
|---|---|---|---|---|---|
| Earth fill assumed thus | 7.0 × 1.70 × 6.3 @ 1600 | = 120.000 | × .85 | = | 102 000 |
| Superimposed dead and live loads | 2 @ 50.000 = | 100.000 | × 2.30 | = | 230.000 |
| | Total | 397260 | | | 709270 |

Earth Pressure 1600 kg per cubic meter 1 meter surcharge at top assumed.

Hor. P at 1 meter $\frac{1}{3} \times 1600 = 533$ kg.

" " at 9.0 $\frac{1}{3} \times 1600 \times 9 = 4800$ kg.



Horizontal moment about bottom of base

$533 \times 8.0 = 4260 \times 4.0 = 17050$

$\frac{4267}{2} \times 8.0 = \underline{17050} \times 2.67 = \underline{45500}$

$21310 \qquad 62550 \times 6 = 376.000$

$\underline{707.270}$

$1083.270$

Point of resultant at base $= \frac{1083270}{397260} = 2.73$

Eccentricity $= 2.73 - 2.25 = .48$

Toe Pressure $= \frac{397260}{6.3 \times 4.5}\left(1 \pm \frac{6 \times .48}{4.5}\right) = 22700$ kg/m² 5320 kg/m²

1400 2.11 tons / ft² .495 ton / ft²

増田淳氏関係資料
（独立行政法人 土木研究所蔵）

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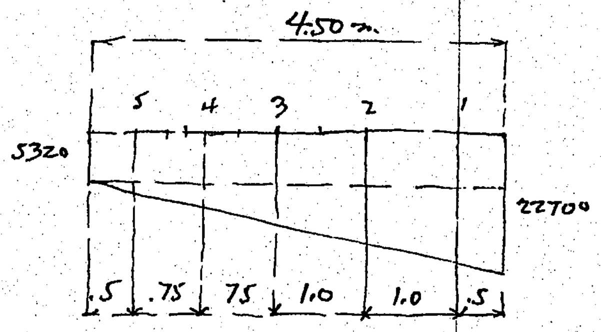
CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken.

Load on piling neglecting soil bearing.



| 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|
| 1.92 | 4.80 | 7.70 | 13.50 | 15.40 |
| 5.32 | 5.32 | 5.32 | 5.32 | 5.32 |
| 7.24 | 10.12 | 13.02 | 18.82 | 20.72 |

1st row load on piling 20.72 tons

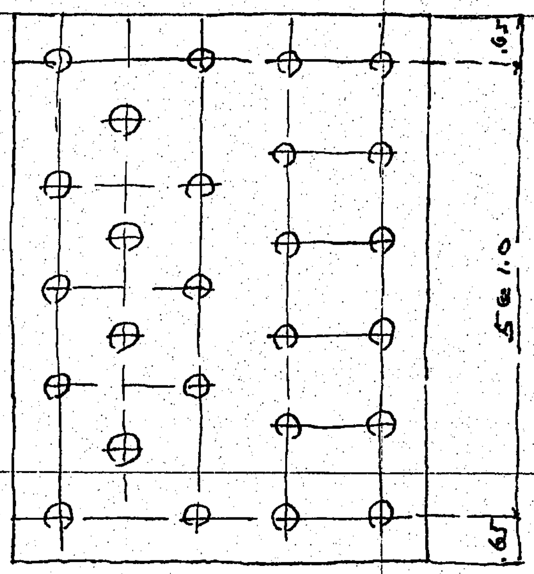
2nd " " " 18.82 tons

~~3rd " " $13.02 \times \frac{6.3 \times .87}{5} =$ 14.3 tons~~

4th row $10.12 \times \frac{6.3 \times .75}{4} = 12.0$ tons

5th row $7.24 \times \frac{6.3 \times .87}{5} = 7.9$ tons

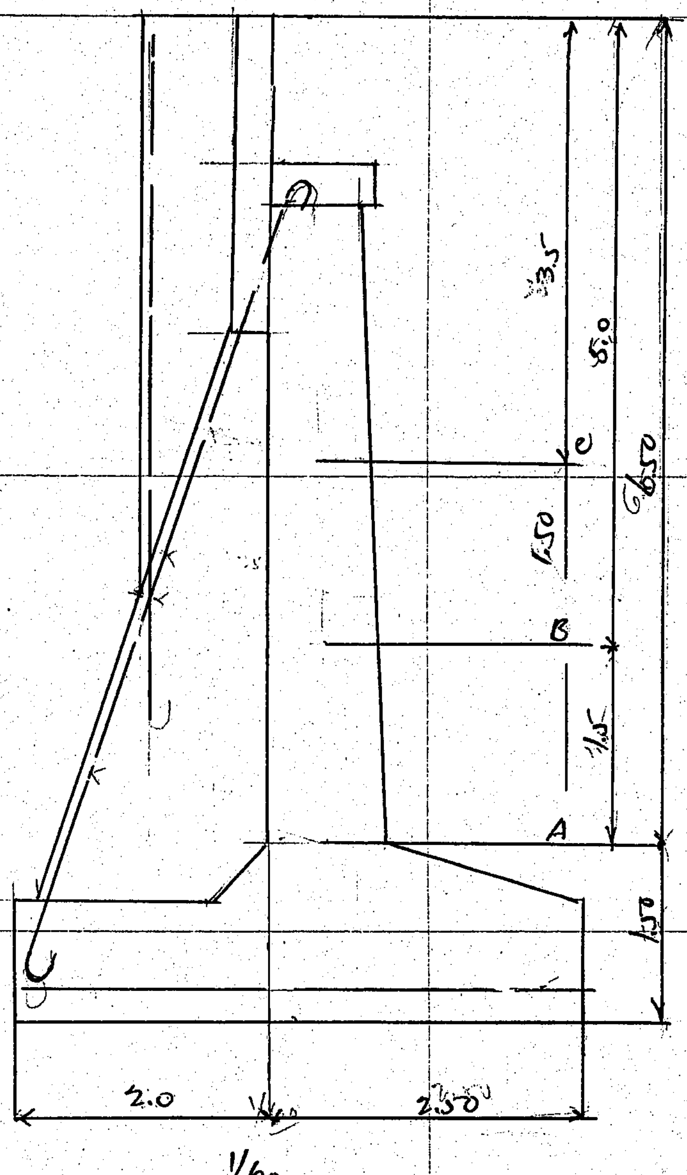
use 末口 え寸 長 15尺



Details parapet wall see page 18 abutment I.

Reinforcement in front wall see page 18

Buttress wall at ℄ Bridge.



1/60

Surcharge 1 meter

section AA.

Horizontal Pressure 1 meter 533.

" " 7.5 meter $\frac{1}{3} \times 1600 \times 7.5 = 4000$

533

3467

One meter strip

$533 \times 6.5 = 3470 \times 3.25 = 11280$

$\frac{3467}{2} \times 6.5 = 11300 \times 2.17 = 24500$

35780

$1.65 + .70 = 2.35$ meter wide

Total moment $35780 \times 2.35 = 84000$ kgm

~~Stat area req'd~~ $= \frac{84000}{\frac{7}{8} \times \overset{}{\underset{2.25}{(1.90)}} \times 1200} = \overset{35.5}{\cancel{42.1}}$ □cm

$10 - 22^{mm}$ bars @ 3.80 $= \overset{38.0}{\cancel{41.8}}$ □cm

Section BB. $\frac{1}{3} \times 1600 \times 6.0 = 3200$

533

2667

Horizontal moment

$533 \times 5.0 = 2667 \times 2.5 = 6667$

$\frac{2667}{2} \times 5.0 = 6667 \times 1.67 = 11100$

17767

Total moment $17767 \times 2.35 = 41700$

~~Stat area~~ req'd $= \frac{41700}{\frac{7}{8} \times 1.40 \times 1200} = 28.4$ □cm

$8 - 22^{mm}$ bars @ 3.80 $= 30.4$ □cm

As square beam

~~Stat area~~ $= \frac{41700}{\frac{7}{8} \times 1.80 \times 1200} = 22.00$ □cm.

$6 - 22^{mm}$ bars @ 3.80 $= 22.8$ □cm

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CALCULATIONS FOR

Design of Maekawa-Bashi for Kumamoto-Ken.

Section CC $\frac{1}{3} \times 1600 \times 3.5 = 1867$

Horizontal moment $533 \times 3.5 = 1867 \times 1.75 = 3260$

$\frac{1867}{2} \times 3.5 = 3265 \times 1.17 = \underline{3820}$

7080

Total moment $7080 \times 2.35 = 16650$

As square beam

Steel area $= \frac{16650}{7/8 \times 1.30 \times 1200} = 12.20$ □cm

use 4- 22mm bars @ 3.80 = 15.20 □cm

Side Buttress wall. Pressure width 1.82 $1.82 \div 2.35 = .775$

Section AA.

Steel area = ~~42.1~~ 35.5 × .775 = ~~32.6~~ 27.5 □cm

use 8- 22mm bars @ 3.8 = ~~34.2~~ 30.4 □cm

Section BB. as square beam Steel area = 22.0 × .775 = 17.05 □cm

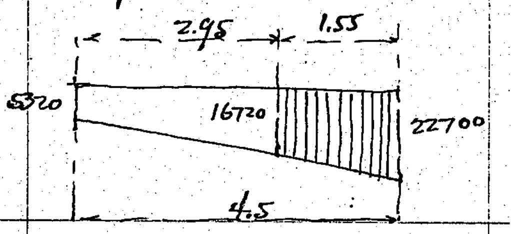
use 5- 22mm bars @ 3.8 = 19.0 □cm

Section CC. Total moment 7080 × 1.82 = 12900

Steel area $= \frac{12900}{7/8 \times 1.70 \times 1200} = 7.22$ □cm

use 2- 22mm bars @ 3.8 = 7.60 □cm

Reinforcement in the toe



$\begin{array}{r}22700\\ \underline{5320}\\ 17380\end{array} \times \frac{2.95}{4.50} = \begin{array}{r}11400\\ \underline{5320}\\ 16720\end{array}$ $\begin{array}{r}22700\\ \underline{16720}\\ 5980\end{array}$

moment $\div$ $16720 \times 1.55 = 25900 \times .775 =$ ~~19550~~ 20100

$\frac{5980}{2} \times 1.55 = \underline{4630} \times 1.033 = \underline{4780}$

30530 ~~24330~~ kgm

24880

Downward moment. $2200 \times 1.55 = 3410 \times .775 = 2640$

$\frac{1100}{2} \times 1.55 = \underline{853} \times 0.52 = \underline{444}$

4263 3084 - $\underline{3084}$

21796

Effective depth say 1.10 m call this 21800 kgm

Steel area $= \frac{21800}{7/8 \times 1.10 \times 1200} = 18.9$ □cm per meter strip

19mm bars @ 2.84 spacing $= \frac{284 \times 100}{18.9} = 15$ cm spacing.

Reinforcement in the Heel

Downward load $7.0 \times 1600 = 11200$

Concrete $\underline{2200}$

13400

Upward pressure say $\underline{5400}$

8000 kg./m² $m = \frac{1}{10} \times 8000 \times 2.5^2 = 5000$ kg.m

Steel area req'd $= \frac{5000}{7/8 \times .60 \times 1200} = 7.95$ sq cm per meter strip

13mm bars @ 1.33

spacing $= \frac{1.33 \times 100}{7.95} = 16.7$ cm

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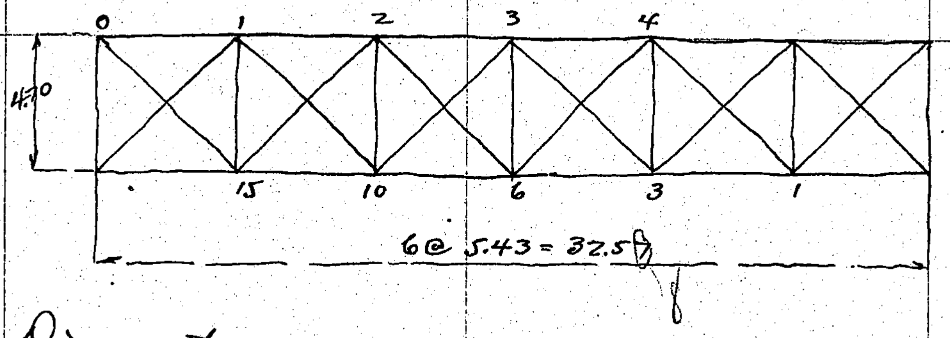
CALCULATIONS FOR

Design of Myeyanagi-Bashi for Kumamoto-Ken.

3 truss spans @ 32.57 meters 6 panel @ 5.43
Clear width of Roadway 13.R or say 4.0 meters
Pavement 5 cm granolithic on reinforced concrete slab.

Design of slab stringers and Floor beams same as for Maekawa-Bashi
see page 1 to 6.

Lower Lateral Bracings



wind load
loaded chord 400
unloaded chord 200
600 · 5.43 = 3260

4.70² = 22.10
5.43² = 29.45
51.55 - 7.18²

sec θ = $\frac{7.18}{4.70}$ = 1.53 tan θ = $\frac{5.43}{4.70}$ = 1.16

Diagonal stress

| Panel | | | | | | | SR | 19 mm Rivet | |
|---|---|---|---|---|---|---|---|---|---|
| 0-1 | $\frac{3260}{6}$ · 1.53 | · 15 | = | 12500 | ÷1200 | = | 10.4 | 5.9 6 | 1L 125 · 75 · 10 = 19.00 - 2.2 = 16.800 cm |
| 1-2 | | · 10 | = | 8300 | | = | 6.9 | 49 6 | do |
| 2-3 | | · 6 | = | 5000 | | = | 4.16 | 2.94 3 | 1L 75 · 75 · 9 = 12.69 - 1.98 = 10.71 |

Chord stresses

| Panel | | | | |
|---|---|---|---|---|
| 0-1 | 3260 · 1.16 | · 2.5 | = | 9450 |
| 1-2 | | · 4.0 | = | 15100 |
| 2-3 | | · 4.5 | = | 17000 |

Approximate weight of Lateral Bracing

| | | | | | |
|---|---|---|---|---|---|
| 8Ls | 125 · 75 · 10 | @ 14.91 | · 7.0 | = | 835 |
| 4Ls | 75 · 75 · 9 | @ 9.96 | · 7.0 | = | 280 |
| Quity Connection | | 6@20 | | | 120 |
| | | | | | 1235 kg. |

1235 ÷ 32.58 = 38.0 kg per lin. meter

Design of truss span length 6@ 5.43 = 32.58 meters
Dead Load
Panel Concentration
Floor slab and pavement 450 · 4.0 = 1800
Coping 2@ 90 = 180
1980 · 5.43 = 10760

Structural steel stringer 3@50 = 150
floor beam 95 · $\frac{4.7}{5.43}$ = 82
Lateral Bracing = 38
270 · 5.43 = 1468
12228

For one truss 12228 ÷ 2 = 6114 kg.

weight of one truss assumed 300 kg.
upper half 150 · $\frac{5.43}{2}$ = 408 kg $U_1 U_2 U_3$ etc
Lower half 150 · 5.43 = 816 kg. $L_0 - L_4 - L_6$ etc

Lower panel concentration 6114
truss lower half 816
6930
upper chord panel concentration 408
7338
upper chord sub panel $U_2 - U_4$ etc 408
7746

Design of Myeyanagi Bashi for Kumamoto-Ken.

Dead Load End panel.

Projection say 25 cm $\frac{5.43}{2}$ + .25 · = 2.96

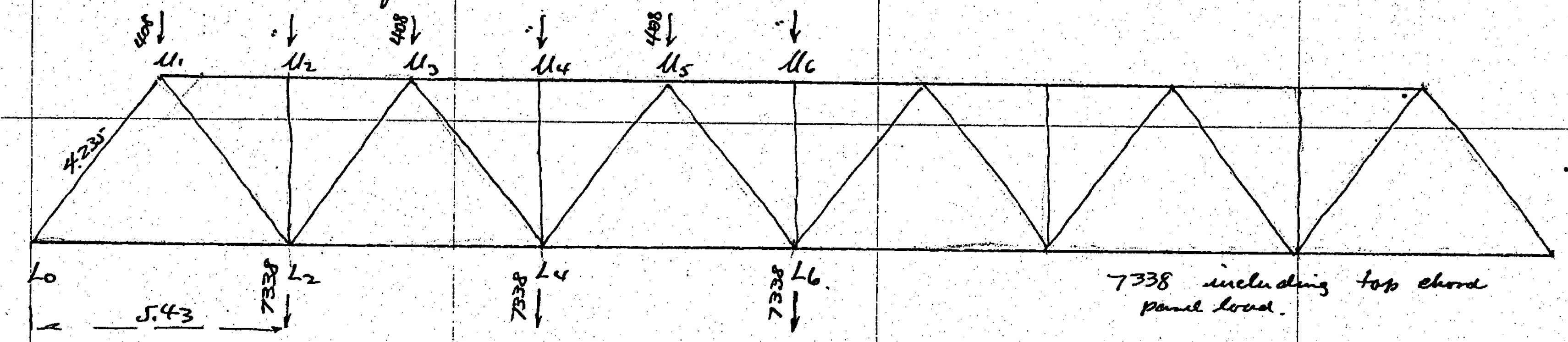
Floor etc 1980 · 2.96 = 5850

steel without truss 270 · 2.96 = 800

trusses 2 × 300 · $\frac{5.43}{2}$ = <u>1630</u>

8280 ÷ 2 = 4140 kg.

Dead Load Stresses of truss.



7338 including top chord panel load.

Reaction 408 · 3 = 1224

7338 · 2.5 = <u>18345</u>

19569

sec θ = $\frac{4.235}{3.25}$ = 1.30 tan θ = $\frac{2.715}{3.25}$ = 0.835

L0-U1 19569 · 1.30 = 25400

L0-L2 19569 · 0.835 = 16330

U1-U3. 19569 · 5.43 = 106100

408 · 2.715 = – <u>1100</u>

105000 ÷ 3.25 = 32400 kg.

L2-L4 moment at U3

19569 · ~~10.86~~ 8.145 = 159.000

7338 · ~~5.43~~ 2.715 = 19900

408 · 5.43 = <u>2220</u>

<u>22120</u>

136880 ÷ 3.25 = 42100

U3-U5 moment at L4

19569 · 10.86 = 212500

7338 · 5.43 = 39900

408 · 2.715 · 4 = <u>4440</u>

<u>44340</u>

168160 ÷ 3.25 = 51800

L4-L6 moment at U5

19569 · 13.575 = 265500

7338 · 2.715 · 4 = 79800

408 · 2.715 · 6 = <u>6650</u>

<u>86450</u>

179050 ÷ 3.25 = 55100

U5-U5' U5' moment at L6.

19569 · 16.29 = 319000

7338 · 2.715 · 6 = 119700

408 · 2.715 · 9 = <u>9990</u>

<u>129690</u>

189310 ÷ 3.25 = 58300

Diagonal U1-L2 19569

<u>408</u>

19161 · 1.30 = 24900 T

L2-U3 11823 · 1.30 = 15400 C

U3-L4 11415 · 1.30 = 14900 T

L4-U5 4077 · 1.30 = 5300 C

U5-L6. 3669 · 1.30 = 4770 T

Vertical - 408 kg C.

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CALCULATIONS FOR

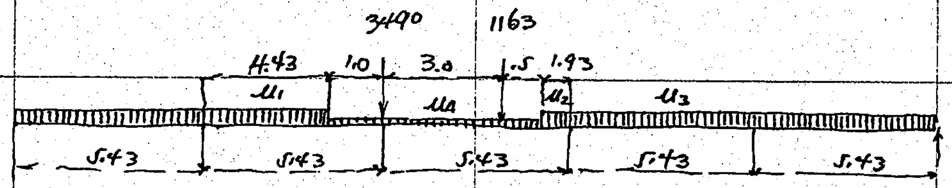
Design of Myeyanagi-Bashi for Kumamoto-Ken.

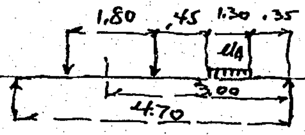
Live Load on truss

Uniform live load $w = \frac{100.000}{170+32.58} = 494$ kg/m²

motor truck loading impact $= \frac{20}{60+32.58} = 21.6\%$

| | | | |
|---|---|---|---|
| Rear wheel | 2250 | Front wheel | 750 |
| impact 21.6% | 485 | impact | 162 |
| | 2735 kg. | | 912 kg |





Rear wheel $2735 \times \frac{3.00}{4.70} \times 2 = 3490$

Front wheel $3490 \div 3 = 1163$

MA $494 \times 1.30 \times \frac{1.0}{4.70} = 137$ kg. per lin meter

Full load $494 \times 4/2 = \frac{1976}{2} = 988$

$\underline{137}$

MB ------- 851 kg.

745   745   745   745

2310

$\underline{2230}$ ---1540

5285   290 --- 1350

motor truck   3490 ---

" "   $\underline{520}$ --- 643

6585   $\underline{2310}$   2310

5048   $\underline{2310}$

5365

Panel load

MA. $137 \times 5.43 = 745$

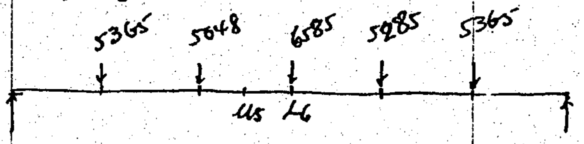
M1 $851 \times 4.43 = 3770$

M2 $851 \times 1.93 = 1640$

M3 $851 \times 5.43 = 4620$

Chord stresses.

M5-M5'



Reaction

$5365 \times \frac{6}{6} = 5365$

$5285 \times 2/6 = 1760$

$6585 \times 3/6 = 3292$

$5048 \times 4/6 = \underline{3360}$

13777

moment at L6

$13777 \times 16.29 = 224000$

$5048 \times 1 = 5048$

$5365 \times 2 \quad \underline{10730}$

$15778 \times 5.43 = \underline{85600}$

$138400 \div 325 = 42600$ kg. C

L4-L6.

moment at M5

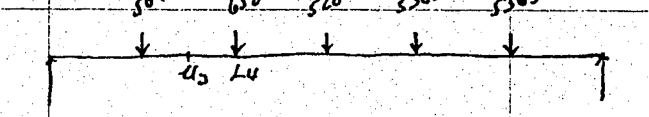
$13777 \times 13.575 \quad 186800$

$5048 \times 1 = 5048$

$5365 \times 3 = \underline{16095}$

$21143 \times 2.715 = \underline{57300}$

$129500 \div 3.25 = 39800$ kg T



Reaction

$5365 \times 3/6 = 2682$

$5285 \times 3/6 = 2643$

$6585 \times 4/6 = 4390$

$5048 \times 5/6 = \underline{4200}$

13915

M3 M5

moment at L4

$13915 \times 10.86 = 151.000$

$5048 \times 5.43 = -\underline{27400}$

$123600 \div 3.25 = 38000$ kg C

L3-L4

moment at M3

$13915 \times 8.145 = 113200$

$5048 \times 2.715 = \underline{13700}$

$99500 \div 3.25 = 30600$ kg T

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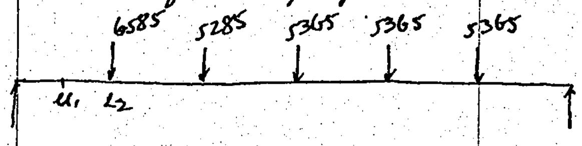
CALCULATIONS FOR

Design of Myeyanagi-Bashi for Kumamoto-Ken.



Reaction

5365 · 6/6 = 5365
5285 · 4/6 = 3520
6585 · 5/6 = 5490
14375

U1-U3 moment at L2
14375 · 5.43 ÷ 3.25 = 24000 kg C

L0-L2 moment at U1
14375 · $\frac{5.43}{2}$ ÷ 3.25 = 12000 kg T

End Post L0-U1 14375 · 1.30 = 18700 kg C
U1-L2 " = 18700 kg T

For diagonal members use uniform panel concentration of 5365 throughout.

L2-U3-L4 5365 · 10/6 · 1.30 ≐ 11640

L4-U5-L6 5365 · 6/6 · 1.30 = 6980

L6-U5' 5365 · 3/6 · 1.30 = 3500

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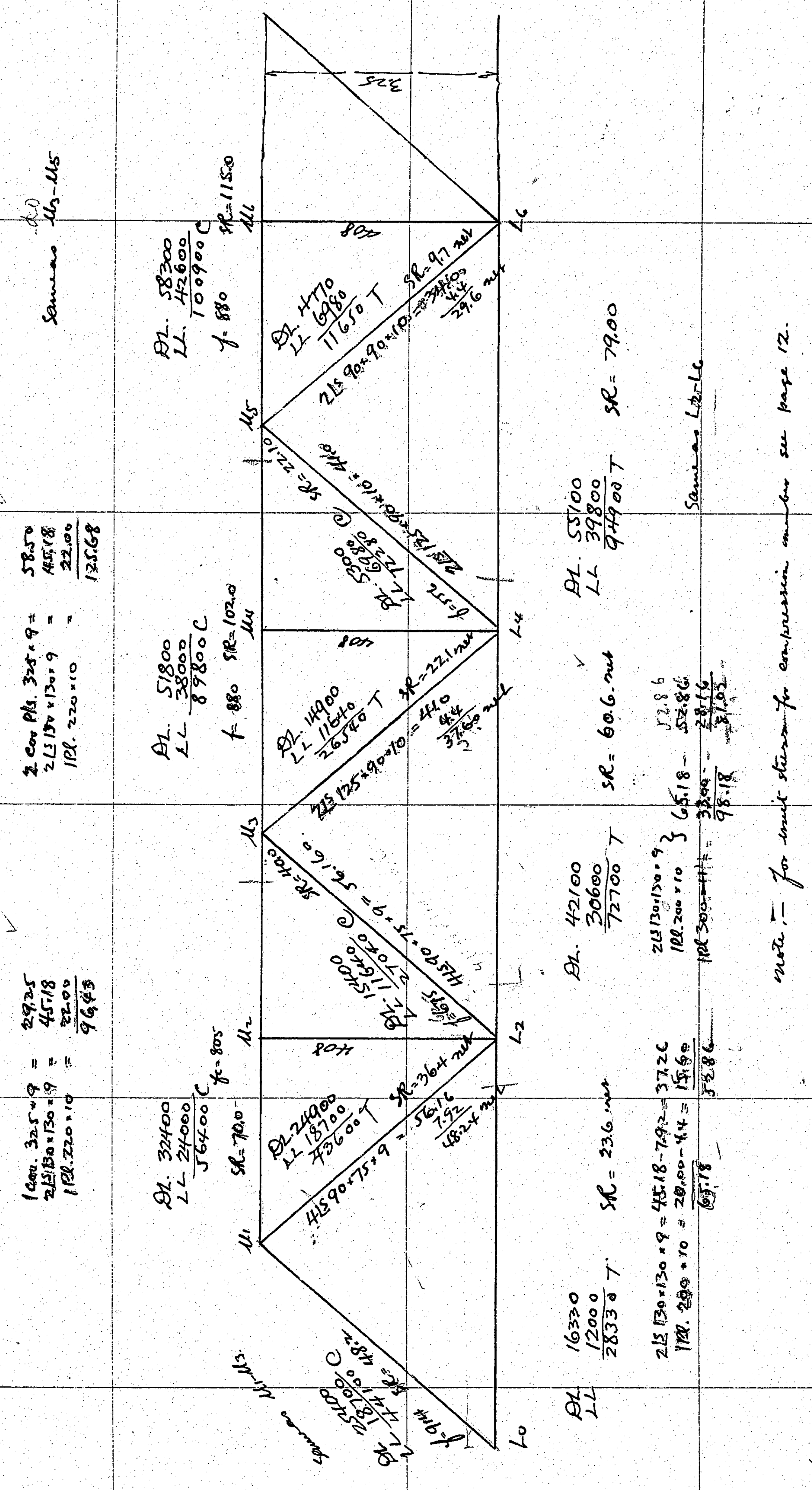
CALCULATIONS FOR

Design of Uyeyanagi-Bashi for Kumamoto-Ken.



note :– for unit stress for compression member see page 12.

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CALCULATIONS FOR

Design of Uye-Yanagi-Bashi for Kumamoto-Ken.

Approximate weight of truss

| | | | | | | |
|---|---|---|---|---|---|---|
| L0-U1 | 96.43 | @ .785 | × 4.235 | = | 320.0 | |
| U1-U3 | 96.43 | @ " | × 5.43 | = | 411.0 | |
| U3-U5 | 125.68 | @ " | × 5.43 | = | 536.0 | |
| U5-U6. | 125.68 | @ " | × 5.43/2 | = | 268.0 | |
| L0-L2 | 65.18 | @ " | × 5.43 | = | 278.0 | |
| L2-L4-L6 | 2 × 98.18 | @ " | × 5.43 | = | 837.0 | |
| U1-L2-U3 | 2 × 56.16 | @ " | × 4.235 | = | 374.0 | |
| diag. | 3 × 41.0 | @ " | × 4.235 | = | 408.0 | |
| vert | 2.5 × 34.0 | @ " | × 3.25 | = | 217.0 | |
| | | | | | 3649.0 × 2 = | 7298 |
| | | 28% - | | | | 2042 |
| | | | | | | 9340 |

9340 ÷ 32.58 = 287 kg per lin meter

Load on shoe
Dead Load Intermediate panels End reaction 19600
End panel 4140
23740 call this 23800 kg.

Live load rear wheel at end panel point see page 26.

745 ÷ 2 = say 370
1540
1910
motor truck 3490
5400
Unif. load 5285 × 5/6 = 4400
5365 × 10/6 = 8950
18750 -- say 18700
42500 kg.

Including shoe say 43000 kg.

Roller 9.0 dia 43000 ÷ 405 = 106.0 cm 4 rollers @ 26.6 cm net
9 × 45 = 405

Approximate weight of structural steel in one span

| | | | |
|---|---|---|---|
| stringers | 150 × 32.5 | = | 4870 |
| floor beams | 7 × 460 | = | 3220 |
| Lateral bracings | | | 1235 |
| trusses | 2 @ 9340 | = | 18680 |
| shoes ← | | | 1100 |
| | | | 29105 |

For 3 spans @ 29.10 tons = 87.3 tons.

excluding metal in expansion joints and handrails.

Design of piers and abutments same as for Maekawa-Bashi see page 14 to 23.

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CALCULATIONS FOR

# Material list of Maekawa-Bashi for Kumamoto-Ken

| | | | | | |
|---|---|---|---|---|---|
| | | | TOP CHORD Lo-$U_1$ | 4-Req'd. | |
| 1 | Cov. Pl. | 325 × 9 | 4.645 | 22.961 | 106.7 |
| 2 | Ls. | 130 × 130 × 9 | 4.720 | 17.730 | 167.4 |
| 1 | Pl. | 220 × 10 | 2.835 | 17.270 | 49.0 |
| 2 | Ls. | 130 × 130 × 9 | 495 | 17.730 | 17.6 |
| 2 | Pls. | 255 × 9 | 795 | 18.016 | 28.6 |
| 2 | fillers | 140 × 9 | 775 | 9.891 | 15.3 |
| 2 | Pls. | 185 × 9 | 440 | 13.070 | 11.5 |
| 2 | Ls. | 90 × 75 × 9 | 1.745 | 11.020 | 38.5 |
| 1 | Pl. | 325 × 13 | 790 | 33.166 | 26.2 |
| 2 | Ls. | 130 × 130 × 12 | 540 | 23.360 | 25.2 |
| 1 | Pl. | 610 × 10 | 1.090 | 47.885 | 52.2 |
| | | | | | 538.2 × 4 = 2152.8 |
| | | | $U_1$ - $U_3$ | 4-Req'd. | |
| 1 | Cov. Pl. | 325 × 9 | 4.173 | 22.961 | 95.8 |
| 2 | Ls. | 130 × 130 × 9 | 4.173 | 17.730 | 148.0 |
| 1 | Pl. | 220 × 10 | 4.173 | 17.270 | 72.1 |
| 1 | Pl. | 325 × 13 | 740 | 33.166 | 24.5 |
| 2 | Ls. | 130 × 130 × 12 | 740 | 23.360 | 34.6 |
| 2 | 〃 | 90 × 75 × 9 | 1.710 | 11.020 | 37.7 |
| | | | | | 412.7 × 4 = 1650.8 |
| | | | $U_3$ - $U_5$ | 4-Req'd. | |
| 1 | Cov. Pl. | 325 × 9 | 4.694 | 22.961 | 107.8 |
| 1 | 〃 | 〃 | 5.439 | 〃 | 124.9 |
| 2 | Ls. | 130 × 130 × 9 | 5.439 | 17.730 | 192.9 |
| 1 | Pl. | 220 × 10 | 4.319 | 17.270 | 74.6 |
| 2 | Pls. | 185 × 9 | 440 | 13.070 | 11.5 |
| 1 | Pl. | 630 × 10 | 1.120 | 49.455 | 55.4 |
| | | | | | 567.1 × 4 = 2268.4 |
| | | | $U_5$ - $U_7$ | 4-Req'd. | |
| 1 | Cov. Pl. | 325 × 9 | 4.339 | 22.961 | 99.6 |
| 1 | 〃 | 〃 | 5.249 | 〃 | 120.5 |
| 1 | 〃 | 〃 | 5.989 | 〃 | 137.5 |
| 2 | Ls. | 130 × 130 × 9 | 5.989 | 17.730 | 212.4 |
| 1 | Pl. | 220 × 10 | 4.289 | 17.270 | 74.1 |
| 1 | Pl. | 325 × 13 | 1.730 | 33.166 | 57.4 |
| 1 | filler | 325 × 9 | 740 910 | 22.961 | 17.0 |
| 1 | Pl. | 325 × 9 | 910 | 〃 | 20.9 20.9 |
| 2 | Ls. | 130 × 130 × 12 | 740 | 23.360 | 34.6 |
| 2 | 〃 | 90 × 75 × 9 | 1.700 | 11.020 | 37.5 |
| 2 | Pls. | 185 × 9 | 440 | 13.070 | 11.5 |
| 1 | 〃 | 510 × 10 | 1.110 | 40.035 | 44.4 |
| 2 | 〃 | 205 × 9 | 440 | 14.483 | 12.7 |
| 2 | fillers | 75 × 9 | 440 | 5.299 | 4.7 |
| 1 | Fill. | 325 × 4 | 465 | 10.205 | ~~883.6 × 4 = 3534.4~~<br>4.7 |
| | | | | | 889.5 × 4 = 3558.0 |

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CALCULATIONS FOR

Material list of Maekawa-Bashi for Kumamoto-Ken

SPLICE at $U_7$. 2-Req'd.

| | | | | | |
|---|---|---|---|---|---|
| 1 | filler | 325 × 9 | 1,520 | 22.961 | 34.9 |
| 1 | 〃 | 〃 | 740 | 〃 | 17.0 |
| 1 | Pl. | 〃 | 2,260 | 〃 | 51.9 |
| 2 | Ls. | 130 × 130 × 12 | 740 | 23.360 | 34.6 |
| 1 | Pl. | 450 × 10 | 1,180 | 35.325 | 41.7 |
| | | | | | 180.1 × 2 = 360.2 |

BOTTOM CHORD $L_0-L_2{}_{L}^{R}$ 4-Req'd.

| | | | | | |
|---|---|---|---|---|---|
| 2 | Ls. | 130 × 130 × 9 | 5.115 | 17.730 | 181.4 |
| 1 | Pl. | 200 × 10 | 4.190 | 15.700 | 65.8 |
| 1 | 〃 | 192 × 9 | 295 | 13.565 | 4.0 |
| 1 | 〃 | 885 × 10 | 920 | 69.473 | 63.9 |
| 2 | Pls. | 185 × 9 | 445 | 13.070 | 11.6 |
| 2 | fillers | 70 × 9 | 445 | 4.946 | 4.4 |
| 2 | Ls. | 130 × 130 × 9 | 500 | 17.730 | 17.7 |
| 1 | Pl. | 142 × 10 | 170 | 11.147 | 1.9 |
| 1 | L. | 90 × 75 × 9 | 142 | 11.020 | 1.6 |
| 1 | filler | 75 × 9 | 90 | 5.299 | 0.5 |
| 1 | Pl. | 410 × 9 | 720 | 28.967 | 20.9 |
| 2 | Ls. | 90 × 90 × 10 | 495 | 13.34 | 13.2 |
| 1 | filler | 192 × 9 | 370 | 13.565 | 5.0 |
| 1 | 〃 | 90 × 12 | 495 | 8.478 | 4.2 |
| | | | | | 396.1 × 4 = 1,584.4 |

$L_2-L_4{}_{L}^{R}$ 4-Req'd.

| | | | | | |
|---|---|---|---|---|---|
| 1 | Cov. Pl. | 300 × 12 | 5.175 | 28.260 | 146.2 |
| 2 | Ls. | 130 × 130 × 9 | 5,425 | 17.730 | 192.4 |
| 1 | Pl. | 200 × 10 | 4.350 | 15.700 | 68.3 |
| 2 | Pls. | 75 × 9 | 445 | 5.299 | 4.7 |
| 1 | L. | 130 × 130 × 12 | 645 | 23.360 | 15.1 |
| 1 | Pl. | 605 × 10 | 1,070 | 47.493 | 50.8 |
| 2 | fillers | 75 × 9 | 445 | 5.299 | 4.7 |
| 2 | Pls. | 185 × 9 | 445 | 13.070 | 11.6 |
| 1 | Pl. | 410 × 9 | 1,295 | 28.967 | 37.5 |
| 1 | 〃 | 245 × 9 | 270 | 17.309 | 4.7 |
| 1 | L. | 90 × 75 × 9 | 142 | 11.020 | 1.6 |
| 1 | Pl. | 142 × 10 | 170 | 11.147 | 1.9 |
| 1 | filler | 75 × 9 | 90 | 5.299 | 0.5 |
| 2 | Pls. | 100 × 13 | 645 | 10.205 | 13.2 |
| 1 | Pl. | 300 × 12 | 800 | 28.260 | 22.6 |
| 1 | Pl. | 〃 | 815 | 〃 | 23.0 |
| | | | | | 598.8 × 4 = 2395.2 |

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CALCULATIONS FOR

## Material list of Maekawa-Bashi for Kumamoto-Ken

$L_4$-$L_7{}^{R}_{L}$ 4-Req'd.

| | | | | | |
|---|---|---|---|---|---|
| 1 | Cov. Pl. | 300 × 12 | 7,858 | 28.260 | 222.1 |
| 1 | " | " | 8.678 | " | 245.2 |
| 2 | Ls. | 130 × 130 × 9 | 8.678 | 17.730 | 307.7 |
| 1 | Pl. | 200 × 10 | 4.450 | 15.700 | 69.9 |
| 1 | " | 200 × 10 | 2,223 | " | 34.9 |
| 1 | " | 142 × 10 | 170 | 11.147 | 1.9 |
| 1 | L. | 90 × 75 × 9 | 742 | 11.02 | 8.2 |
| 1 | filler | 75 × 9 | 90 | 5.299 | 0.5 |
| 2 | Pls. | 75 × 9 | 445 | " | 4.7 |
| 1 | L. | 130 × 130 × 12 | 645 | 23.36 | 15.1 |
| 1 | Pl. | 560 × 10 | 1,020 | 43.906 | 44.8 |
| 2 | fillers | 75 × 9 | 445 | 5.299 | 4.7 |
| 2 | Pls. | 185 × 9 | 445 | 13.070 | 11.6 |
| 1 | " | 335 × 9 | 1,295 | 25.081 | 32.5 |
| 4 | fillers. | 75 × 9 | 445 | 5.299 | 9.4 |
| 4 | Pls. | 185 × 9 | 445 | 13.070 | 23.3 |
| 1 | Pl. | 430 × 10 | 970 | 33.755 | 32.7 |
| 1 | Pl. | 355 × 9 | 870 | 25.081 | 21.8 |
| | | | | | 1109.2 × 4 = 4436.8 |

SPLICE at $L_7$ 2-Req'd.

| | | | | | |
|---|---|---|---|---|---|
| 1 | L. | 150 × 150 × 11 | 155 | 24.950 | 3.9 |
| 1 | " | 90 × 90 × 10 | 220 | 13.340 | 2.9 |
| 2 | Pls. | 195 × 9 | 444 | 13.777 | 12.2 |
| 2 | Ls. | 130 × 130 × 12 | 1,144 | 23.360 | 53.4 |
| 1 | filler | 300 × 9 | 444 | 21.195 | 9.4 |
| 1 | " | 300 × 12 | 994 | 28.260 | 28.1 |
| 1 | Pl. | 300 × 12 | 1,984 | " | 56.1 |
| | | | | | 166.0 × 2 = 332.0 |

DIAGONAL $U_1$-$L_2$ 4-Req'd.

| | | | | | |
|---|---|---|---|---|---|
| 2 | Ls. | 90 × 75 × 9 | 3,635 | 11.02 | 80.1 |
| 2 | " | " | 3,700 | " | 81.5 |
| 4 | " | 90 × 75 × 9 | 295 | " | 13.0 |
| 4 | " | " | 230 | " | 10.1 |
| 2 | Pls. | 150 × 10 | 170 | 11.775 | 4.0 |
| | | | | | 188.7 × 4 = 754.8 |

$L_2$-$U_3$ 4-Req'd.

| | | | | | |
|---|---|---|---|---|---|
| 2 | Ls. | 90 × 75 × 9 | 3635 | 11.02 | 80.1 |
| 2 | " | " | 3,700 | " | 81.5 |
| 2 | Pls. | 150 × 10 | 170 | 11.775 | 4.0 |
| | | | | | 165.6 × 4 = 662.4 |

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CALCULATIONS FOR

Material list of Maekawa-Bashi for Kumamoto-Ken

| | | | | | |
|---|---|---|---|---|---|
| | | | U3-L4 | 4-Req'd. | |
| 2 | Ls. | 125 × 90 × 10 | 3.700 | 16.09 | 119.1 |
| 4 | " | 90 × 75 × 9 | 350 | 11.02 | 15.4 |
| 2 | Pls. | 115 × 10 | 170 | 9.028 | 3.1 |
| | | | | | 137.6 × 4 = 550.4 |
| | | | L4-U5 | 4-Req'd. | |
| 2 | Ls. | 125 × 90 × 10 | 3.700 | 16.09 | 119.1 |
| 2 | " | 90 × 75 × 9 | 190 | 11.02 | 4.2 |
| 2 | Pls. | 115 × 10 | 170 | 9.028 | 3.1 |
| | | | | | 126.4 × 4 = 505.6 |
| | | | U5-L6 | 4-Req'd. | |
| 2 | Ls. | 125 × 90 × 10 | 3.700 | 16.09 | 119.1 |
| 4 | " | 90 × 75 × 9 | 190 | 11.02 | 8.4 |
| 2 | Pls. | 115 × 10 | 170 | 9.028 | 3.1 |
| | | | | | 130.6 × 4 = 522.4 |
| | | | L6-U7 | 4-Req'd. | |
| 2 | Ls. | 125 × 90 × 10 | 3.820 | 16.09 | 122.9 |
| 2 | Pls. | 115 × 10 | 170 | 9.028 | 3.1 |
| | | | | | 126.0 × 4 = 504. |
| | | VERTICALS L2-U2$^{R}_{L}$ L4-U4$^{R}_{L}$ & L6-U6$^{R}_{L}$ | | 12-Req'd. | |
| 1 | L. | 100 × 90 × 10 | 3.295 | 14.13 | 46.6 × 12 = 559.2 |
| | | FLOOR BEAM. | | FB1 2-Req'd. | |
| 1 | I. | 450 × 175 @ | 4.640 | 91.66 | 425.3 |
| 4 | Ls. | 90 × 90 × 10 | 365 | 13.34 | 19.5 |
| | | | | | 444.8 × 2 = 889.6 |
| | | | FB2 & FB3 | 6-Req'd. | |
| 1 | I. | 450 × 175 | 4.640 | 91.66 | 425.3 |
| 2 | Ls. | 100 × 90 × 10 | 295 | 14.13 | 8.3 |
| | | | | | 433.6 × 6 = 2601.6 |
| | | STRINGERS | S1 & S2 | 21-Req'd. | |
| 1 | I. | 300 × 150 | 5.390 | 48.34 | 260.6 |
| 4 | Ls. | 90 × 90 × 10 | 220 | 13.34 | 11.7 |
| | | | | | 272.3 × 21 = 5718.3 |

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CALCULATIONS FOR

## Material list of Maekawa-Bashi for Kumamoto-Ken

### BOTTOM LATERAL BRACINGS

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | Ls. | 125 × 75 × 10 | 6.650 | 14.91 | 198.3 | |
| 2 | Pls. | 525 × 9 | 900 | 37.091 | 66.8 | |
| 2 | Ls. | 150 × 90 × 9 | 208 | 16.32 | 6.8 | |
| 2 | " | 125 × 75 × 10 | 3.215 | 14.91 | 95.9 | |
| 2 | " | " | 3.275 | " | 97.7 | |
| 2 | " | " | 6.650 | " | 198.3 | |
| 2 | Pls. | 525 × 9 | 700 | 37.091 | 51.9 | |
| 2 | Ls. | 150 × 90 × 9 | 208 | 16.32 | 6.8 | |
| 2 | Ls. | 125 × 75 × 10 | 3.215 | 14.91 | 95.9 | |
| 2 | " | " | 3.275 | " | 97.7 | |
| 3 | " | 75 × 75 × 9 | 6.650 | 9.96 | 198.7 | |
| 3 | Pls. | 300 × 9 | 650 | 21.195 | 41.3 | |
| 3 | Ls. | 150 × 90 × 9 | 208 | 16.32 | 10.2 | |
| 6 | " | 75 × 75 × 9 | 3.265 | 9.96 | 195.1 | |
| | | | | | | 1361.4 |

### BRACKET BTI$^{c}$ 12-Reqd.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | L. | 90 × 90 × 10 | 3.010 | 13.34 | 40.2 | |
| 1 | Pl. | 395 × 10 | 610 | 31.008 | 18.9 | |
| 1 | L. | 75 × 75 × 9 | 570 | 9.96 | 5.7 | |
| 2 | Ls. | 90 × 90 × 10 | 295 | 13.34 | 7.9 | |
| 1 | Pl. | 165 × 9 | 170 | 11.657 | 2.0 | |
| 1 | L. | 150 × 90 × 9 | 140 | 16.32 | 2.3 | |
| 1 | " | " | 555 | " | 9.1 | |
| | | | | | 86.1 × 12 = 1033.2 | |

Summary of Truss for 1 Span ~~34.377.9~~
34.32817

### SHOES

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | Cast Steel Shoe RS1 | | | @ 83.8 | 167.6 | 669.6 |
| 2 | " " bed Pls. BPl. | | | " 93.0 | 186.0 | |
| 2 | " Shoe FS1 | | | " 158.0 | 316.0 | |
| 4 | Pins | 100$^{\phi}$ | 184 | 61.65 | 45.4 | |
| 8 | Nuts | | | 1.7 | 13.6 | |
| 4 | Pls. | 70 × 13 | 370 | 7.144 | 10.6 | |
| 8 | Rollers | 90$^{\phi}$ | 360 | 49.43 | 142.4 | |
| 16 | Pins | 25$^{\phi}$ | 45 | 3.85 | 2.8 | |
| 4 | bars | 30 × 13 | 470 | 3.062 | 5.8 | |
| 4 | Ls. | 150 × 100 × 9 | 470 | 17.02 | 32.0 | |
| 4 | Pls. | 117 × 6 | 386 | 5.511 | 8.5 | |
| 16 | Anchor bolts | 32$^{\phi}$ | 700 | 5.2 | 83.2 | |
| 16 | Pls. | 150 × 10 | 150 | 11.775 | 28.3 | |
| | | | | | | 1042.2 |

増田淳氏関係資料
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CALCULATIONS FOR

## Material list of Maekawa-bashi for Kumamoto-Ken

EXPANSION JOINT EJ1 6-Reqd. (for 6 span)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | bar | 30 × 10 | 4,440 | 2.355 | 10.5 | |
| 1 | L. | 100 × 75 × 10 | 4,440 | 12.95 | 57.5 | |
| 1 | Web Pl. | 200 × 8 | 3,970 | 12.560 | 49.9 | |
| 1 | L. | 65 × 65 × 8 | 4,300 | 7.66 | 32.9 | |
| 2 | Pls. | 70 × 8 | 230 | 4.396 | 2.0 | |
| | | | | | 152.8 × 6 = | 916.8 |

EJ2 6-Reqd. (for 6 span)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Checkered Pl. | 230 × 9 | 4,440 | 16.250 | 72.2 | |
| 1 | L. | 65 × 65 × 8 | 4,440 | 7.66 | 34.0 | |
| 1 | Web Pl. | 205 × 8 | 3,970 | 12.874 | 51.1 | |
| 1 | L. | 65 × 65 × 8 | 4,300 | 7.66 | 32.9 | |
| 2 | Pls. | 70 × 8 | 240 | 4.396 | 2.1 | |
| | | | | | 192.3 × 6 = | 1153.8 |

BRACKET BJ1 R L 33-Req'd. (for 6 span)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | L. | 90 × 90 × 10 | 130 | 13.34 | 1.7 | |
| 2 | Ls. | 90 × 90 × 10 | 145 | 13.34 | 3.9 | |
| 1 | Pl. | 170 × 8 | 210 | 10.676 | 2.2 | |
| 1 | bolt. | 19φ | 50 | 0.272 | 0.3 | |
| | | | | | 8.1 × 33 | 267.3 |

Summary of Expansion joint & brackets for 6 span 2,337.9

HANDRAILS (for 6 span)

| | | | | | |
|---|---|---|---|---|---|
| 4 | Ls. | 75 × 65 × 10 | 970 | 10.20 | 39.6 |
| 4 | 〃 | 150 × 90 × 9 | 170 | 16.32 | 11.1 |
| 4 | Pls. | 135 × 9 | 290 | 9.538 | 11.1 |
| 72 | Ls. | 75 × 65 × 10 | 1,375 | 10.2 | 1010.0 |
| 72 | Pls. | 135 × 9 | 225 | 9.538 | 154.5 |
| 12 | Ls. | 75 × 65 × 10 | 1,200 | 10.2 | 146.9 |
| 12 | Ls. | 135 × 9 | 225 | 9.538 | 25.8 |
| 10 | Ls. | 75 × 65 × 10 | 970 | 10.2 | 98.9 |
| 10 | 〃 | 150 × 90 × 9 | 170 | 16.32 | 27.7 |
| 10 | Pls. | 135 × 9 | 290 | 9.538 | 27.7 |
| 10 | Ls. | 75 × 65 × 10 | 970 | 10.2 | 98.9 |
| 10 | 〃 | 150 × 90 × 9 | 170 | 16.32 | 27.7 |
| 10 | Pls. | 135 × 9 | 285 | 9.538 | 27.2 |
| 4 | Ls. | 65 × 65 × 8 | 3,055 | 7.66 | 93.6 |
| 4 | Pls. | 135 × 9 | 210 | 9.538 | 8.0 |
| 4 | Pls. | 135 × 9 | 270 | 〃 | 10.3 |
| 24 | Ls. | 65 × 65 × 8 | 2,630 | 7.66 | 483.5 |
| 60 | 〃 | 〃 | 5,425 | 〃 | 2493.3 |
| 60 | Pls. | 135 × 9 | 270 | 9.538 | 154.5 |
| 60 | Ls. | 65 × 65 × 8 | 5,345 | 7.66 | 2456.6 |
| 12 | 〃 | 〃 | 5,425 | 〃 | 498.7 |
| 12 | 〃 | 〃 | 5,360 | 〃 | 492.7 |
| 10 | 〃 | 〃 | 3,175 | 〃 | 243.2 |
| 10 | Pls. | 135 × 9 | 170 | 9.538 | 16.2 |
| 10 | Pls. | 〃 | 270 | 〃 | 25.8 |
| 4 | Ls. | 65 × 65 × 8 | 290 | 7.66 | 8.9 |

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CALCULATIONS FOR

## Material list of Maekawa-bashi for Kumamoto-Ken

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | Ls. | 65 × 65 × | 8 | .410 | 7.66 | 31.4 | |
| 10 | " | " | | 2760 | " | 211.4 | |
| 10 | Pls. | 135 × | 9 | 270 | 9.538 | 25.8 | |
| 10 | " | " | | 285 | " | 27.2 | |
| 336 | " | 150 × | 9 | 225 | 10.598 | 801.2 | |
| 84~~72~~ | Anchor bolts | 16ϕ × | 200 | | 0.414 | ~~27.8~~ 34.8 | |
| 20 | bolts | 19 × | 45 | | 0.272 | 5.4 | |
| | | | | | | | ~~10380.8~~<br>9,829.6 |

### RIVET HEADS (for 1 span)

| | | | | |
|---|---|---|---|---|
| 10,260 | Shop rivet heads | 19ϕ | @ 0.0646 | 662.8 |
| 7,060 | field " " | " | " " | 456.1 |
| 112 | " " " | 13ϕ | " 0.0204 | 2.3 |
| 29 | Shop " " | " | " 0.0108 | 0.3 |
| | | | | 1,121.5 |

### Total summary for 6 span

| | | | |
|---|---|---|---|
| Trusses | 34.328.7 × 6 = | 205,972.2 | |
| | ~~34.377.9 × 6 =~~ | ~~206,267.4~~ | |
| Shoes | 1,042.2 × 6 = | 6,253.2 | (内 669.6 × 6 = 4017.6 , Cast steel + 含 4) |
| Expansion joints & brackets | | 2,337.9 | |
| hand Rails | | ~~10,380.8~~ | 9.829.6 |
| Rivet heads | 1,121.5 × 6 = | 6,729.0 | |
| | | ~~231,908.3~~<br>231,121.9 | |

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CALCULATIONS FOR

Maekawa-Bashi for Kumamoto Ken

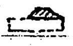
Material List.

List for Abutment R.

Concrete 1:2:4 mixture

| Description | | Req'd. no. | Section | Length | Volume | Remark. |
|---|---|---|---|---|---|---|
| parapet wall | | 1 | $.3^m \times .93^m$ | $4.0^m$ | ✓ $1.116^{cub.m}$ | |
| column | | 2 | 1.0 × 1.0 | 5.19 | ✓ 10.380 | |
| coping | | 1 | .8 × .3 | 5.8 | ✓ 1.392 | |
| front wall | | 1 | .86 × 6.25 | 5.6 | ✓ 30.100 | |
| " | | 1 | .3 × 1.35 | 4.0 | ✓ 1.620 | Under parapet wall |
| buttress wall | A | 2 | .8 × 1.4 | 3.04 | ✓ 6.810 | under column |
| " | B | 1 | .7 × 1.05 | 5.7 | ✓ 4.190 | |
| base | | 1 | 1.25 × 1.99 | 6.0 | ✓ 14.925 | toe |
| " | | 1 | 1.01 × 1.5 | 6.0 | ✓ 9.090 | under front wall |
| " | | 1 | 1.0 × 2.0 | 6.0 | ✓ 12.000 | heel |
| Chamfer | | 2 | .5 × .25 | 1.65 | ✓ 0.413 | between buttress walls |
| " | | 2 | .5 × .25 | .2 | ✓ 0.050 | both ends of base |
| | | | | | ✓ $92.086^{cub.m.}$ | |

Forms. 松板厚み一寸

| Descriptions | | Req'd. no. | Width | Length | Area | Remark. |
|---|---|---|---|---|---|---|
| parapet wall. | | 1. | .93 | 4.0 | ✓ $3.72^{□m}$ | Front side |
| " | | 1 | 2.28 | 4.0 | ✓ 9.12 | rear " |
| " | | 2 | .3 | 1.65 | ✓ 0.99 | bottom plane. |
| Column | | 2 | 3.7 | 1.18 | ✓ 8.73 | all around. □ |
| " | | 2 | .3 | .25 | ✓ 0.15 | above parapet. □ |
| " | | 2 | 2.9 | 4.01 | ✓ 23.26 | below coping |
| " | | 2 | .2 | 1.0 | ✓ 0.40 | bottom plane |
| | | 2 | .3 | 2.66 | 1.60 | under parapet, inside |
| Coping | | 1. | .4 | 5.8 | ✓ 2.32 | front |
| " | | 2 | .4 | .8 | ✓ 0.64 | both ends. |
| Shaft | | 1 | 5.6 | 6.25 | ✓ 35.00 | front |
| " | | 2 | .86 | 6.25 | ✓ 10.75 | both end planes. |
| " | | 2 | 1.65 | 5.7 | ✓ 18.81 | rear between buttresses |
| buttress walls | A | 2 | .8 | 3.15 | ✓ 5.04 | rear face |
| " | " | 4 | 1.4 | 3.04 | ✓ 17.02 | both sides |
| " | B | 1 | .7 | 5.85 | 4.10 | rear face |
| " | " | 2 | 1.05 | 5.7 | ✓ 11.97 | both sides. |
| base | | 2 | 1.0 | 6.0 | ✓ 12.06 | front & rear |
| " | | 2 | .71 | 1.65 | ✓ 2.34 | Chamfer |
| " | | 2 | .71 | .2 | 0.28 | " |
| " | | 2 | 1.0 | 5.0 | ✓ 10.00 | both ends  |
| " | | 2 | .5 | 2.26 | ✓ 2.26 | "  |
| | | | | | ✓ $180.50^{□m}$ | |

Reinforcements. plain bars. ✓ 2.408 kg tons see drawing.

Piles 内地産赤松 27 piles — $18^{cm\phi}$ at tip 4.0 meters long.

蹴込石 花崗石 5 — · ~~20~~ 19 × .22 × .80 = ~~0.176~~ 167 cub. meter.

掘鑿 Bottom area 6.0 × 5.0 = $30.0^{□m}$

mean peneration $7.5^m$ ✓

Excavation 30 × 7.5 = 225 cub. meters

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CALCULATIONS FOR

(2

Maekawa-Bashi for Kumamoto ken.

Material List for Abutment L.

Concrete 1:2:4 mixture.

| Description | Req'd. no. | Section | Length | Volume | Remark. |
|---|---|---|---|---|---|
| Parapet wall | 1 | .3m×.93m | 4.0m | ✓ 1.116 cub.m. | |
| column | 2 | 1.0×1.0 | 4.63 | ✓ 9.260 | |
| Coping | 1 | .8×.3 | 5.8 | ✓ 1.392 | |
| front wall | 1 | .826×5.6 | 5.05 | ✓ 23.359 | |
| " | 1 | .3×1.35 | 4.0 | ✓ 1.620 | Under parapet wall. |
| buttress wall A | 2 | .8×1.4 | 2.4 | ✓ 5.376 | under column |
| " B | 1 | .7×1.05 | 4.5 | ✓ 3.308 | |
| base | 1 | .95×1.5 | 6.0 | ✓ 8.550 | under frontwall. |
| " | 1 | 1.0×2.0 | 6.0 | ✓ 12.000 | at heel |
| " | 1 | 1.05×1.55 | 6.0 | ✓ 11.625 | at toe. |
| Chamfer | 2 | .5×.25 | 1.65 | ✓ 0.413 | between buttress walls. |
| " | 2 | .5×.25 | .2 | ✓ 0.050 | both ends of ~~walls~~ bases. |
| | | | | ✓ 78.069 cub.m. | |

Forms 松板厚四一寸

| Description | Req'd. no. | Width | Length | Volume | Remark |
|---|---|---|---|---|---|
| parapet wall. | 1 | .93m | 4.0m | ✓ 3.72 om | Front side |
| " | 1. | 2.28 | 4.0 | ✓ 9.12 | rear side |
| " | 2 | .3 | 1.65 | ✓ 0.99 | bottom plane. |
| Column | 2 | 3.7 | 1.18 | ✓ 8.73 | all around ☐ |
| " | 2 | .3 | .25 | ✓ 0.15 | above parapet ☐ |
| " | 2 | 2.9 | 3.45 | ✓ 20.01 | below coping |
| " | 2 | .2 | 1.0 | ✓ 0.40 | bottom plane. |
| " | 2 | .3 | 2.1 | ✓ 1.26 | under parapet, inside |
| Coping | 1 | .4 | 5.8 | ✓ 2.32 | front |
| " | 2 | .4 | .8 | ✓ 0.64 | both ends |
| Shaft | 1. | 5.6 | 5.05 | ✓ 28.28 | front |
| " | 2 | .83 | 5.05 | ✓ 8.38 | both end planes |
| " | 2 | 1.65 | 4.5 | ✓ 14.85 | rear, between buttresses. |
| buttress wall A | 2 | .8 | 2.5 | ✓ 4.00 | rear faces |
| " " | 4 | 1.4 | 2.4 | ✓ 13.44 | both sides |
| " B | 1 | .7 | 4.7 | ✓ 3.29 | rear face |
| " " | 2 | 1.05 | 4.5 | ✓ 9.45 | both sides |
| base | 2 | 1.0 | 6.0 | ✓ 12.00 | front and rear |
| " | 2 | .71 | 1.65 | ✓ 2.34 | Chamfer between buttresses |
| " | 2 | .71 | .2 | ✓ 0.28 | " both ends of base. |
| " | 2 | 1.0 | 4.5 | ✓ 9.00 | both ends ▨ |
| " | 2 | .5 | 1.98 | ✓ 1.98 | " ▨ |
| | | | | ✓ 154.63 sq.m. | |

Reinforcements, Plain bars 1.969 kg tons. see drawing sheet No.7.

Piles 内地產赤松 26 − 18cmφ at tip 4.0m long

蹴込石 花崗石 5 − .~~8~~19 × .22 × .8 = 0.~~176~~187 cub. meters.

掘鑿 Bottom area 4.5×6.0 = 27.0 om

mean peneration = 4.3m.

Excavation = 27×4.3 = 116.1 cub.m.

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CONSULTING ENGINEER
SEIYU BLDG, TOKIO

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CALCULATIONS FOR

Maekawa-Bashi for Kumamoto ken.

Material List for Pier

Concrete for Shaft. 1:2:4 mixture.

Piers. Nos. 1 & 5.

| Description | Reqd. no. | Section | | Length | Volume | Remarks. |
|---|---|---|---|---|---|---|
| Coping | 2 | 1.4 × .3 | | .9 | ✓ .756 | Rectangles |
| " | 1 | 1.4ϕ | 1.539 | .3 | ✓ .462 | Circular ends. |
| Shaft. | 2 | 1.5 × .8 | | 6.06 | ✓ 14.544 | Straight portions |
| " | 1. | 1.5ϕ | 1.767 | 6.06 | ✓ 10.708 | Circular ends. |
| Curtain wall | 1. | 0.6 × 3.5 | | 6.06 | ✓ 12.726 | |
| | | | | | ✓ 39.196 cub m. | |
| Piers. Nos. 2 & 4. | 2 | | | | | |
| Coping | 2 | 1.4 × .3 | | .9 | ✓ .756 | Rectangles |
| " | 1 | 1.4ϕ | 1.539 | .3 | ✓ .462 | Circular ends |
| Shaft | 2 | 1.51 × .8 | | 6.16 | ✓ 14.883 | Straight portions |
| " | 1 | 1.51ϕ | 1.791 | 6.16 | ✓ 11.033 | Circular ends. |
| Curtain wall. | 1 | .6 × 3.5 | | 6.16 | ✓ 12.936 | |
| | | | | | ✓ 40.070 cub m. | |
| Pier No. 3. | | | | | | |
| Coping | 2 | 1.4 × .3 | | .9 | ✓ .756 | Rectangles |
| " | 1 | 1.4ϕ | | .3 | ✓ .462 | Circular ends |
| Shaft | 2 | .8 × 1.51 | | 6.19 | ✓ 14.955 | Straight portions |
| " | 1 | 1.51ϕ | | 6.19 | ✓ 11.086 | Circular ends |
| Curtain wall. | 1 | .6 × 3.5 | | 6.19 | ✓ 12.999 | |
| | | | | | ✓ 40.258 cub m. | |

Concrete for well Shell. 1:2:4 mixture

7.5 meter well.

| Description | Reqd. no. | Section | | Length | Volume | Remarks. |
|---|---|---|---|---|---|---|
| Top Side wall. | 2 | .3 × 1.0 | | 5.1 | ✓ 3.060 cub m | Straight portion. |
| middle " | 2 | .4 × 5.0 | | 5.1 | ✓ 20.400 | " " |
| bottom " | 2 | .4 × 1.35 | mean | 5.1 | ✓ 5.508 | " " |
| Top. Circular ends | 1 | .3 × 1.0 | | 2.5ϕ 7.854 | ✓ 2.356 | |
| middle " | 1 | .4 × 5.0 | | 2.4ϕ 7.540 | ✓ 15.080 | |
| bottom " | 1 | .4 × 1.35 | | 2.5ϕ 7.854 | ✓ 4.241 | |
| partition wall | 2 | .3 × 2.0 | | 5.0 | ✓ 6.000 | rectangle |
| " | 2 | .3 × 2.1 | | 1.2 | ✓ 1.512 | trapezoid. |
| Chamfers | 4 | .2 × .2 | | 6.2 | ✓ .992 | 8 chamfers. |
| | | | | | ✓ 59.149 cub m. | |
| Top and bottom fills 1:2:4 mixture. | | | | | | |
| top fill | 1. | 2.2 × 1.0 | | 5.1 | ✓ 11.220 | Straight portion |
| " | 1 | 2.2ϕ | 3.801 | 1.0 | ✓ 3.801 | Circular ends |
| bottom fill | 1. | 2.0 × 0.5 | | 4.5 | ✓ 4.500 | Straight portion |
| " | 1 | 2.0ϕ | 3.142 | 0.5 | ✓ 1.571 | Circular ends. |
| " | 1 | 2.1 × 1.5 | | 4.5 | ✓ 14.175 | Straight portion |
| " | 1 | 2.1ϕ | 3.464 | 1.5 | ✓ 5.196 | Circular ends. |
| " | 2 | .4 × .15 | | 5.1 | ✓ 0.612 | under cutting edge |
| " | 1 | .4 × .15 | | 2.47ϕ 7.76 | ✓ 0.466 | " |
| " | 2 | .3 × 2.2 | | .3 | ✓ 0.396 | under partition walls |
| Chamfers less | 4 | .2 × .2 | | 1.7 | ✓ (−) 0.272 | |
| | | | | | ✓ 41.665 cub m | |

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CONSULTING ENGINEER
SEIYU BLDG, TOKIO

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CALCULATIONS FOR

④

Maekawa-Bashi for Kumamoto Ken.

Intermediate fill for $7.5^m$ well   Sand filling

| Description | | Reqd. no. | Section | Length | Volume | Remarks. |
|---|---|---|---|---|---|---|
| Sand filling | | 1. | 2.0·4.5 | 4.5 | ✓ 40.500 | Straight portion. |
| " | | 1 | $2.0^\phi$ | 4.5 | ✓ 14.139 | Circular ends. |
| Chamfer | less | 4 | ·2×·2 | 4.5 | (−) ✓ 0.720 | |
| | | | | | ✓ 53.919 cub.m. | |

9.0 meter well

Concrete for well shell 1:2:4 mixture.

| Description | Reqd. no | Section | Length | Volume | Remark. |
|---|---|---|---|---|---|
| Top. Side walls | 2 | ·3×1.0 | 5.1 | ✓ 3.060 | Straight portion |
| middle " | 2 | ·4×6.5 | 5.1 | ✓ 26.520 | " |
| bottom " | 2 | ·4×1.35 mean | 5.1 | ✓ 5.508 | " |
| top. circular ends | 1 | ·3×1.0 | $2.5^\phi$ 7.854 | ✓ 2.356 | |
| middle " | 1 | ·4×6.5 | $2.4^\phi$ [illegible] | ✓ 19.604 | |
| bottom " | 1 | ·4×1.35 | $2.5^\phi$ 7.854 | ✓ 4.241 | |
| partition walls | 2 | ·3×2.0 | 6.5 | ✓ 7.800 | rectangle |
| " | 2 | ·3×2.1 | 1.2 | ✓ 1.512 | trapezoid |
| Chamfers | 4. | ·2×·2 | 7.7 | ✓ 1.232 | 8 chamfers. |
| | | | | ✓ 71.833 cub.m. | |

Top and Bottom filling 1:2:4 concrete.

| | | | | | |
|---|---|---|---|---|---|
| top fill | 1 | 2.2×1.0 | 5.1 | ✓ 11.220 | Straight portions |
| " | 1 | $2.2^\phi$ 3.801 | 1.0 | ✓ 3.801 | Circular ends |
| bottom fill | 1 | 2.0×0.5 | 4.5 | ✓ 4.500 | Straight portions |
| " | 1 | $2.0^\phi$ 3.142 | 0.5 | ✓ 1.571 | Circular ends |
| " | 1 | 2.1×1.5 | 4.5 | ✓ 14.175 | Straight portions |
| " | 1 | $2.1^\phi$ 3.464 | 1.5 | ✓ 5.196 | Circular ends |
| " | 2 | ·4×·15 | 5.1 | ✓ 0.612 | under cutting edge |
| " | 1 | ·4×·15 | $2.47^\phi$ 7.76 | ✓ 0.466 | " |
| " | 2 | ·3×2.2 | ·3 | ✓ 0.396 | under partition walls |
| Chamfer less. | 4 | ·2×·2 | 1.7 | (−) ✓ 0.272 | |
| | | | | 41.665 cub.m | |

Intermediate filling for outside partitions 1:4:8 concrete.

| | | | | | | |
|---|---|---|---|---|---|---|
| Intermediate fill. | | 2 | 2.0×1.1 | 6.0 | 26.400 | Straight portions |
| " | | 1 | $2.0^\phi$ 3.142 | 6.0 | ✓ 18.852 | Circular ends. |
| Chamfer | less | 2 | ·2×·2 | 6.0 | (−) ✓ 0.480 | |
| | | | | | 44.772 cub.m | |

Intermediate filling for center partition. Sand fill.

| | | | | | |
|---|---|---|---|---|---|
| Sand fill | | 1 | 2.0×2.3 | 6.0 | ✓ 27.600 |
| chamfer | less | 2 | ·2×·2 | 6.0 | (−) ✓ 0.480 |
| | | | | | ✓ 27.120 cub.m. |

Summary of concrete for piers.

| | Piers Nos 1 & 5 (7.5) | Pier No. 2 (9.0) | Pier No. 3 (9.0) | Pier No. 4 (7.5) |
|---|---|---|---|---|
| Shaft 1:2:4 concrete | 39.196 | 40.070 | 40.258 | 40.070 |
| well shell " | 59.149 } 100.814 | 71.833 } 113.498 | 71.833 } 113.498 | 59.149 } 100.884 |
| top + bottom fill " | 41.665 | 41.665 | 41.665 | 41.665 |
| | 140.010 cub.m | 153.568 cub.m | 153.756 m³ | 140.884 m³ |
| intermediate fill 1:4:8 concrete | | 44.772 | 44.772 | |
| do. Sand | 53.919 cub.m | 27.120 m³ | 27.120 m³ | 53.919 m³ |

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CONSULTING ENGINEER
SEIYU BLDG, TOKIO

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CALCULATIONS FOR

⑤

Maekawa-Bashi for Kumamoto Ken.

Forms for Piers 松板厚さ一寸
Piers Nos 1 & 5 Shafts

| Discription | Reqd. no | Width | Length | Area | Remark. |
|---|---|---|---|---|---|
| Coping | 2 | .4 | 3.2 | ✓ $2.56^{\square m}$ | rectangular portions |
| " | 1 | .4 | $1.4^{\phi}$ 4.40 | ✓ 1.76 | Circular ends. |
| Shaft | 4 | .8 | 6.06 | ✓ 19.39 | Straight portions |
| " | 1 | $1.5^{\phi}$ 4.7 | 6.06 | ✓ 28.54 | Circular ends |
| " | 4 | .45 | 6.06 | ✓ 10.91 | inside |
| Curtain wall | 2 | 3.5 | 6.06 | ✓ 42.42 | both sides. |
| | | | | ✓ $105.58^{\square m}$ | |

Piers Nos 2 & 4. Shaft.

| | | | | | |
|---|---|---|---|---|---|
| Coping | 2 | .4 | 3.2 | ✓ 2.56 | Rectangula portions |
| " | 1 | .4 | $1.4^{\phi}$ 4.4 | ✓ 1.76 | Circular ends |
| Shaft | 4 | .8 | 6.16 | ✓ 19.71 | Straight portions |
| " | 1 | $1.51^{\phi}$ 4.74 | 6.16 | ✓ 29.20 | Circular ends |
| " | 4 | .45 | 6.16 | ✓ 11.09 | inside |
| Curtain wall. | 2 | 3.5 | 6.16 | ✓ 43.12 | both sides. |
| | | | | ✓ $107.44^{\square m}$ | |

Pier. No. 3 Shaft.

| | | | | | |
|---|---|---|---|---|---|
| Coping | 2 | .4 | 3.2 | ✓ 2.56 | Rectangular portions |
| " | 1 | .4 | $1.4^{\phi}$ 4.4 | ✓ 1.76 | Circular ends |
| Shaft | 4 | .8 | 6.19 | ✓ 19.81 | straight portions |
| " | 1 | $1.51^{\phi}$ 4.74 | 6.19 | ✓ 29.34 | Circular ends |
| " | 4 | .455 | 6.19 | ✓ 11.27 | inside |
| Curtain wall | 2 | 3.5 | 6.19 | ✓ 43.33 | both sides. |
| | | | | ✓ $108.07^{\square m}$ | |

Forms for 7.5m well.

| Description | Reqd. no. | Width | Length | Area | Remark. |
|---|---|---|---|---|---|
| Out side | 2 | 5.1 | 7.2 | ✓ 73.44 | Straight portions |
| " | 1 | $2.8^{\phi}$ 8.8 | 6.0 | ✓ 52.80 | circular ends, top |
| " | 1 | $2.9^{\phi}$ 9.11 | 1.2 | ✓ 10.93 | " , bottom |
| inside | 2 | 5.1 | 1.0 | ✓ 10.20 | top straight |
| " | 1 | $2.2^{\phi}$ 6.91 | 1.0 | ✓ 6.91 | " circular ends. |
| " | 2 | 1.9 | 6.5 | ✓ 24.70 | Side wall center partition |
| " | 4 | 0.9 | 6.5 | ✓ 23.40 | " end " |
| partition wall | 4 | 1.6 | 6.2 | ✓ 39.68 | both sides |
| " | 8 | .05 | 1.2 | ✓ 0.48 | tapered portion |
| Chamfer | 8 | .28 | 6.2 | ✓ 13.89 | |
| Circular ends. | 1 | $2.0^{\phi}$ 6.28 | 5.0 | ✓ 31.40 | |
| " | 1 | $2.1^{\phi}$ 6.60 | 1.5 | ✓ 9.90 | |
| | | | | ✓ $297.73^{\square m}$ | |

Forms for 9.0m well.

Area for intermediate 1.5m of well

Out side $2 \times 5.1 = $ ✓ $10.2^{m}$
" $1 \times 2.8^{\phi} = $ ✓ 8.8
inside $2 \times 3.7 = $ ✓ 7.4
" $4 \times 1.6 = $ ✓ 6.4
" $8 \times .28 = $ ✓ 2.24
" $1 \times 2.0^{\phi} = $ ✓ 6.28
✓ $41.32^{m} \times 1.5 = $ ✓ $61.98^{\square m}$

add Area for 7.5m well. 297.73

Forms for 9.0m well = ✓ $359.71^{\square m}$.

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CALCULATIONS FOR

Maekawa-Bashi for Kumamoto Ken. ⑥

Summary of forms for piers.

| | piers Nos. 1 & 5 | Pier No.2 | Pier No.3 | Pier No.4 |
|---|---|---|---|---|
| Shaft. | 105.58 $^{om}$ | 107.44 $^{om}$ | 108.07 $^{om}$ | 107.44 $^{om}$ |
| 7.5 $^{m}$ well | 297.73 | | | 297.73 |
| 9.0 $^{m}$ well. | | 359.71 | 359.71 | |
| Total | √403.31 $^{om}$ | 467.15 $^{om}$ | 467.78 $^{om}$ | √405.17 $^{om}$ |

Reinforcements for Piers.

| | piers Nos. 1 & 5 | Pier No.2 | pier No.3 | Pier No.4 |
|---|---|---|---|---|
| ~~Shaft~~ | 1.186 $^{kg tons}$ | 1.186 $^{kg tons}$ | 1.186 $^{kg tons}$ | 1.186 $^{kg tons}$ |
| 7.5 $^{m}$ well | 2.714 ✓ | | | 2.714 ✓ |
| 9.0 $^{m}$ well | | 3.435 ✓ | 3.435 ✓ | |
| Total. | 3.900 kg tons | 4.621 kg tons | 4.621 kg tons | 3.900 kg tons |

Summary of reinforcement in piers.

piers Nos 1, 4 & 5 3 @ 3.900 = 11.700
" 2 & 3 2 @ 4.621 = 9.242
20.942 kg tons See drawing No.6.

Steel for curb shoes. for one pier 0.992 $^{kg ton.}$ ✓
for 5 piers 5 @ .992 = 4.96 tons. ✓ See drawing Sheet No.6.

Excavation for Piers.

Volume of 9.0 $^{m}$ well.

top area 5.1 × 2.8 = 14.28
2.8 $^{\phi}$ = 6.16
20.44 $^{om}$ × 7.5 = 153.3 $^{cub m}$

bottom area 5.1 × 3.0 = 15.30
3.0 $^{\phi}$ = 7.07
22.37 $^{om}$

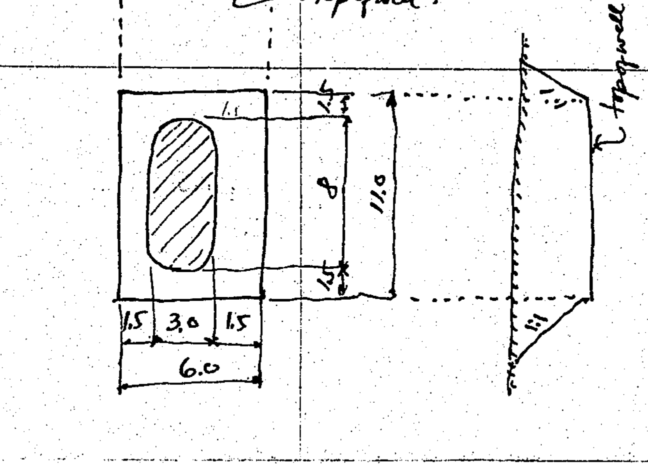
mean area (20.44+22.37)÷2 = 21.41 × 1.5 = 32.1
185.4 cub m for 9.0 $^{m}$ well.

Volume of 7.5 $^{m}$ well

~~top area~~ 20.44 × 6.0 = 122.64
mean " 21.41 × 1.5 = 32.10
154.74 cub m for 7.5 $^{m}$ well

Excavation above top of well Slope of cutting 1:1

| | mean depth | mean width | mean length | volume |
|---|---|---|---|---|
| Pier No. 1 | 1.5 $^{m}$ | 7.5 | 12.5 | √ 140.6 |
| " No.2 | 0 | 0 | 0 | 0 |
| " No.3 | .2 | 6.2 | 11.2 | √ 13.9 |
| " No.4 | 2.0 | 8.0 | 13.0 | 208.0 |
| " No.5 | 1.0 | 7.0 | 12.0 | √ 84.0 |
| | | | | √ 446.5 |



**JIUN MASUDA**
CONSULTING ENGINEER
SEIYU BLDG, TOKIO

MADE BY K. 9 DATE 3-9-17 FILE NO
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CALCULATIONS FOR

Maekawa-Bashi for Kumamoto Ken.

Materials for floor. Concrete 1:2:4 mix.

Total length of slab. 231.32$^{m}$
construction jts. less 12@.01 = -.12
expansion jts. " 5@.12 = -.60
✓ 230.6$^{m}$ net

Cross section
slab A 4.3×.13 = .559
coping 2×.15×.12 = .036
fillet 2×.014×.16 = .004
" .04×.19 = .008
✓ 0.607$^{\square m}$ × 230.6$^{m}$ = ✓139.974$^{cub.m.}$

Extra depth of slab at ends of spans.
length 11×.30 = 3.30$^{m}$
" 1×.50 = .50
✓ 3.80$^{m}$

extra sectional area
0.02×3.6 = 0.072×3.8 = 0.274$^{cub.m.}$
Total volume of slab concrete = 140.248$^{cub.m.}$

For Forms & reinforcements see next page.
Construction jt. 13ヶ所 @長 4.3m.

pavement. Granolithic pavement. 5$^{cm}$ thick.
total length of slab net. = 230.6$^{m}$.
width = 4.0$^{m}$
area of pavement = 230.6×4.0 = ✓922.4$^{\square m}$ − 2.16 (drain) = 920.24$^{\square m}$ net.

area of drain .15×.2 = .03$^{\square m}$
72@.03 = 2.16$^{\square m}$.

Cement mortar finish for coping 1:2 mortar.
total length of coping net = 2@230.6 = 461.2$^{m}$
width .12+.15+.25 = .52$^{m}$.
Area of finish = 461.2×.52 = 239.82$^{\square m}$.

Drains. Cast iron. 72 drains required
Casting 15×20. = 300×1.5 = 450$^{cub.cm.}$
65×1.5×1.5 = 146
less holes. 2×17×1.5×4 = −204
392$^{cub.cm}$ @ 0.0072 = 2.82$^{kg}$ per drain. (.75貫)

Cast iron for 72 drains = 72 @ 2.82 = 203.0$^{kg}$ or (54.0貫)

Materials for Light pedestal.
Concrete 1:2:4 mixture.

| Description | Reqd. no. | section | Length | Volume | Remark |
|---|---|---|---|---|---|
| lower part. | 1. | .8×.8 | 1.2 | .768 | |
| upper " | 1 | .55×.55 | .25 | .076 | |
| moulding | 4 | .06×.22 | .40 | .021 | |
| depression less | 4 | .07×.35 | .70 | −.069 | |
| | | | | 0.796$^{cub.m}$ | per pedestal. |

Reinforcements plain bars. ~~0.21~~ 0.053 kg ton. " "

人造洗出仕上

| | | | | | |
|---|---|---|---|---|---|
| lower part. | 4 | .8 | 1.2 | 3.84 | Form 5.14$^{\square m}$. |
| depression | 4 | .07 | 2.1 | .59 | |
| upper part. | 4 | .25 | .6 | .60 | |
| moulding ends. | 8 | .06× | .22 | .11 | |
| top plane | 1 | .8 | .8 | .64 | |
| casting area | 1 | .45 | .45 | (−) .20 | |
| | | | | 5.98$^{\square m}$.<br>5 | |

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CALCULATIONS FOR

Maekawa-Bashi for Kumamoto Ken.

Approximate weight of casting for Light pedestal.

| | | | | |
|---|---|---|---|---|
| top arms. | 4 | 4×5×1 | 35 | ✓ 2,800 |
| ring | 4 | 6×1.5 | 24 | ✓ 864 |
| projection | 4 | 5ϕ | 3 | ✓ 188 |
| 〃 | 4 | 7ϕ | 1.5 | ✓ 132 |
| 〃 | 4 | 5ϕ×1.5 | 3 | 283 |
| Socket | 4 | 13ϕ×8 | 1.5 | ✓ 1958 |
| base | 1 | 40×40 | 1. | 1600 |
| 〃 | 4 | 40×6 | 1.2 | ✓ 1152 |
| | | | | ✓ 8977 cub. cm. |

@ .0072 = 63.2 kg (16.8貫)
Call this 65 kg or (17.3貫)

| | | | |
|---|---|---|---|
| Gaspipes | 4 pipes | 7.2ϕ × | ~~3.05~~ 1.50 m |
| 〃 | 1 〃 | 5ϕ × | ~~2.6~~ 1.3 |

Glass globe (milk white) 4 — 0.8尺ϕ
~~Brass~~ Bronze socket 4 — 100 watt 用.
name plate bronze. 1

Lamp fixture for Top chord. 12 Required.

Forms for floor slab. 杉板厚さ一寸.

| Description | Req'd. no | width | length | area | remark |
|---|---|---|---|---|---|
| slab. | 4.0 ~~4.3~~ − .45 = ~~3.85~~ m 3.55 | | | | |
| Copings | 2(.25+.15+.12) = ✓1.04 | | | | |
| | ✓ $4.\underset{5}{8}9$ m | | | | |

less F.B. flange .175×8×3 = 4.2 m

total length of slab = ~~230.6~~ 226.4 m net

area of form = ~~230.6~~ 226.4 × $4.\underset{5}{8}9$ = ✓ ~~1,127.63~~ 1,039.18 m²

Reinforcements for slab. Plain bars. 18.63 kg/tons. ✓ see drawing Sheet No 7.

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CALCULATIONS FOR

Material list of Ueyanagi-Bashi for Kumamoto-Ken.

TOP CHORD LoU1 4 Required:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Cov. Pl. | 325 × 9 | × | 4.645 | 22.961 | 106.7 |
| 2 | ∠s | 130 × 130 × 9 | × | 4.720 | 17.730 | 167.4 |
| 1 | Pl. | 220 × 10 | × | 2.835 | 17.270 | 49.0 |
| 2 | ∠s | 130 × 130 × 9 | × | 495 | 17.730 | 17.6 |
| 2 | Pls | 255 × 9 | × | 795 | 18.016 | 28.6 |
| 2 | Fills | 140 × 9 | × | 775 | 9.891 | 15.3 |
| 2 | Pls | 185 × 9 | × | 440 | 13.070 | 11.5 |
| 2 | ∠s | 90 × 75 × 9 | × | 1,745 | 11.020 | 38.5 |
| 1 | Pl. | 325 × 13 | × | 790 | 33.166 | 26.2 |
| 2 | ∠s | 130 × 130 × 12 | × | 540 | 23.360 | 25.2 |
| 1 | Pl. | 610 × 10 | × | 1,090 | 47.885 | 52.2 |
| | | | | | | 538.2 × 4 = 2,152.8 |

U1U3 4 Required.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Cov. Pl. | 325 × 9 | × | 4.173 | 22.961 | 95.8 |
| 2 | ∠s | 130 × 130 × 9 | × | 4.173 | 17.73 | 148.0 |
| 1 | Pl. | 220 × 10 | × | 4.173 | 17.27 | 72.1 |
| 1 | " | 325 × 13 | | 740 | 33.166 | 24.5 |
| 2 | ∠s | 130 × 130 × 12 | | 740 | 23.36 | 34.6 |
| 2 | " | 90 × 75 × 9 | | 1,710 | 11.02 | 37.7 |
| | | | | | | 412.7 × 4 = 1,650.8 |

U3U5 4 Required.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Cov. Pl. | 325 × 9 | × | 4.694 | 22.961 | 107.8 |
| 1 | " | " | × | 5.439 | " | 124.9 |
| 2 | ∠s | 130 × 130 × 9 | | 5.439 | 17.73 | 192.9 |
| 1 | Pl. | 220 × 10 | | 4.319 | 17.27 | 74.6 |
| 2 | " | 185 × 9 | | 440 | 13.07 | 11.5 |
| 1 | " | ~~630~~ 570 × 10 | | 1,120 | ~~49.455~~ 44.745 | ~~55.4~~ 50.1 |
| | | | | | | ~~567.1 × 4 = 2,268.4~~<br>561.8 × 4 = 2247.2 |

U5-U5' 2 Required.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Cov. Pl. | 325 × 9 | | 5.804 | 22.961 | 133.3 |
| 1 | " | " | | 6.544 | " | 150.3 |
| 2 | ∠s | 130 × 130 × 9 | | " | 17.73 | 232.1 |
| 1 | Pl. | 200 × 10 | | 4.324 | 15.70 | 67.9 |
| 2 | Pls | 325 × 13 | | 1,730 | 33.166 | 114.8 |
| 2 | Fills | 325 × 9 | | 740 | 22.961 | 34.0 |
| 4 | ∠s | 130 × 130 × 12 | | 740 | 23.36 | 69.1 |
| 4 | " | 90 × 75 × 9 | | 1,700 | 11.02 | 74.9 |
| 4 | Pls | 185 × 9 | | 440 | 13.07 | 23.0 |
| 2 | " | 510 × 10 | | 1,110 | 40.035 | 88.9 |
| | | | | | | 988.3 × 2 = 1,976.6 |

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CALCULATIONS FOR

Material list of Ueyanagi-Bashi for Kumamoto-Ken.

| | | | | | | |
|---|---|---|---|---|---|---|
| | | BOTTOM CHORD | | LoL2 | 4 Required: | |
| 2 | L^s | 130×130×9 | × | 5.115 | 17.73 | 181.4 |
| 1 | Pl. | 200×10 | × | 4.190 | 15.70 | 65.8 |
| 1 | " | 192×9 | × | 295 | 13.565 | 4.0 |
| 1 | " | 885×10 | × | 920 | 69.473 | 63.9 |
| 2 | Pls | 185×9 | × | 445 | 13.07 | 11.6 |
| 2 | Fills | 70×9 | × | 445 | 4.946 | 4.4 |
| 2 | L^s | 130×130×9 | × | 500 | 17.73 | 17.7 |
| 1 | Pl. | 142×10 | × | 170 | 11.147 | 1.9 |
| 1 | L | 90×75×9 | × | 142 | 11.02 | 1.6 |
| 1 | Fill. | 75×9 | × | 90 | 5.299 | 0.5 |
| 1 | Pl. | 410×9 | × | 720 | 28.967 | 20.9 |
| 2 | L^s | 90×90×90 | × | 495 | 13.34 | 13.2 |
| 1 | Fill. | 192×9 | × | 370 | 13.565 | 5.0 |
| 1 | " | 90×12 | × | 495 | 8.478 | 4.2 |
| | | | | | | 396.1 × 4 = 1,584.4 |
| | | | | L2L4 | 4 Required: | |
| 1 | Cov. Pl. | 300×~~12~~ 11 | × | 5.175 | ~~28.26~~ 25.905 | ~~146.2~~ 134.1 |
| 2 | L^s | 130×130×9 | × | 5.425 | 17.73 | 192.4 |
| 1 | Pl. | 200×10 | | 4.350 | 15.70 | 68.3 |
| 2 | Pls | 75×9 | | 445 | 5.299 | 4.7 |
| 1 | L | 130×130×12 | | 645 | 23.36 | 15.1 |
| 1 | Pl. | 605×10 | | 1.070 | 47.493 | 50.8 |
| 2 | Fills | 75×9 | | 445 | 5.299 | 4.7 |
| 2 | Pls | 185×9 | | 445 | 13.07 | 11.6 |
| 1 | Pl. | 410×9 | | 1.295 | 28.967 | 37.5 |
| 1 | " | 245×9 | | 270 | 17.309 | 4.7 |
| 1 | L | 90×75×9 | | 142 | 11.02 | 1.6 |
| 1 | Pl | 142×10 | | 170 | 11.147 | 1.9 |
| 1 | Fill | 75×9 | | 90 | 5.299 | 0.5 |
| 1 | Pl. | 100×13 | | 645 | 10.205 | 6.6 |
| | | | | | | ~~546.6~~ × 4 = ~~2,186.4~~<br>534.5 = 2,138.0 |
| | | | | L4-L6 | 2 Required. | |
| 1 | Cov. Pl. | 300×11 | | 5.525 | 25.905 | 143.1 |
| 2 | L^s | 130×130×9 | | " | 17.730 | 195.9 |
| 1 | Pl. | 200×10 | | 4.500 | 15.700 | 70.7 |
| 2 | Pls | 75×9 | | 445 | 5.299 | 4.7 |
| 1 | L | 130×130×12 | | 645 | 23.360 | 15.1 |
| 1 | Pl | 100×13 | | 645 | 10.205 | 6.6 |
| 2 | Fills | 75×9 | | 445 | 5.299 | 4.7 |
| 2 | Pls | 185×9 | | 445 | 13.070 | 11.6 |
| 1 | Pl. | 500×10 | | 1.020 | 39.250 | 40.0 |
| 1 | " | 300×11 | | 885 | 25.905 | 22.9 |
| 1 | " | 355×9 | | 1.200 | 25.081 | 30.1 |
| 1 | " | 142×10 | | 170 | 11.147 | 1.9 |
| 1 | L | 90×75×9 | | 742 | 11.020 | 8.2 |
| 1 | Fill | 75×9 | | 90 | 5.299 | 0.5 |
| 2 | Pls | 75×9 | | 445 | " | 4.7 |
| 1 | Pl | 100×13 | | 645 | 10.205 | 6.6 |
| 1 | L | 130×130×12 | | 645 | 23.360 | 15.1 |
| | | | | | | 582.4 × 2 = 1,164.8 |

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CALCULATIONS FOR

## Material list of Ueyanagi-Bashi for Kumamoto-Ken.

| | | | | | |
|---|---|---|---|---|---|
| | | L6 L4' | | 2 Required. | |
| 1 | Cov. Pl. | 300 × 11 | 6.400 | 25.905 | 165.8 |
| 2 | Ls | 130 ×130×9 | 6.400 | 17.730 | 226.9 |
| 1 | Pl | 200 × 10 | 4.500 | 15.70 | 70.7 |
| 2 | P/s | 75 × 9 | 445 | 5.299 | 4.7 |
| 1 | L | 130×130×12 | 645 | 23.36 | 15.1 |
| 1 | Pl. | 100 × 13 | 645 | 10.205 | 6.6 |
| 2 | Fills | 75 × 9 | 445 | 5.299 | 4.7 |
| 2 | P/s | 185 × 9 | 445 | 13.070 | 11.6 |
| 1 | " | 500 × 10 | 1.020 | 39.250 | 40.0 |
| 1 | " | 300 × 11 | 885 | 25.905 | 22.9 |
| 1 | " | 355 × 9 | 1.200 | 25.081 | 30.1 |
| 1 | " | 142 × 10 | 170 | 11.147 | 1.9 |
| 1 | L | 90 ×75×9 | 742 | 11.020 | 8.2 |
| 1 | Fill | 75 × 9 | 90 | 5.299 | 0.5 |
| 2 | Fills | 75 × 9 | 445 | " | 4.7 |
| 2 | P/s | 185 × 9 | 445 | 13.070 | 11.6 |
| 1 | Pl | 430 × 10 | 870 | 33.755 | 29.4 |
| 1 | " | 300 × 11 | 1.045 | 25.905 | 27.1 |
| 1 | " | 355 × 9 | 1.125 | 25.081 | 28.2 |
| | | | | | 710.7 × 2 = 1.421.4 |
| | | DIAGONAL | U1 L2 | 4 Req'd | |
| 2 | Ls | 90 × 75 × 9 | 3.635 | 11.02 | 80.1 |
| 2 | Ls | " | 3.700 | " | 81.5 |
| 4 | " | " | 230 | " | 10.1 |
| 4 | " | " | 165 | " | 7.3 |
| 2 | P/s | 150 × 10 | 170 | 11.775 | 4.0 |
| | | | | | 183.0 × 4 = 732.0 |
| | | | L2 U3 | 4 Req'd. | |
| 2 | Ls | 90 × 75 × 9 | 3.635 | 11.02 | 80.1 |
| 2 | " | " | 3.700 | " | 81.5 |
| 2 | P/s | 150 × 10 | 170 | 11.775 | 4.0 |
| | | | | | 165.6 × 4 = 662.4 |
| | | | U3 - L4 | 4 Req'd. | |
| 2 | Ls | 125 ×90 ×10 | 3.700 | 16.09 | 119.1 |
| 4 | " | 90 × 75 × 9 | 270 | 11.02 | 11.9 |
| 2 | P/s | 115 × 10 | 170 | 9.028 | 3.1 |
| | | | | | 134.1 × 4 = 536.4. |
| | | | L4 U5 | 4 Req'd. | |
| 2 | Ls | 125 × 90 ×10 | 3.700 | 16.09 | 119.1 |
| 2 | P/s | 115 × 10 | 170 | 9.028 | 3.1 |
| | | | | | 122.2 × 4 = 488.8 |

**JIUN MASUDA**
CONSULTING ENGINEER
SEIYU BLDG, TOKIO

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CALCULATIONS FOR

Material list of Ueyanagi-Bashi for Kumamoto-Ken.

| | | | | | |
|---|---|---|---|---|---|
| | | | U5 L6 | 4 Req'd. | |
| 2 | ∟s | 90×90×10 | 3.680 | 13.34. | 98.2 |
| 4 | " | 90×75× 9 | 180 | 11.02 | 7.9 |
| 2 | P/s | 80 × 10 | 170 | 6.280 | 2.6 ~~2.9~~ |
| | | | | | ~~107.0~~ × 4 = ~~428.0~~<br>108.2 432.8 |
| | | VERTICAL | L2U2, L4U4 & L6U6 | 10 Required | |
| 1 | ∟ | 100×90×10 | 3.295 | 14.13 | 46.6×10 = 466.0 |
| | | FLOOR BEAM | FB1 | 2 Required. | |
| 1 | I | 450 × 175 | 4.640 | 91.66 | 425.3 |
| 4 | ∟s | 90×90 ×10 | 365 | 13.34 | 19.5 |
| | | | | | 444.8×2 = 889.6 |
| | | | FB2 & FB3 | 5 Required. | |
| 1 | I | 450 ×175 | 4.640 | 91.66 | 425.3 |
| 2 | ∟s | 100 ×90×10 | 295 | 14.13 | 8.3 |
| | | | | | 433.6×5 = 2168.0 |
| | | STRINGERS. | S1 & S2 | 18 Required. | |
| 1 | I | 300 ×150 | 5.390 | 48.34 | 260.6 |
| 4 | ∟s | 90×90×10 | 220 | 13.34 | 11.7 |
| | | | | | 272.3×18 = 4901.4. |
| | | BOTTOM LATERAL BRACINGS. | | | |
| 4 | ∟s | 125×75×10 | 6.650 | 14.91 | 396.6 |
| 4 | p/s | 525 × 9 | 800 | 37.091 | 118.7 |
| 4 | ∟s | 150×90×9 | 208 | 16.32 | 13.6 |
| 4 | " | 125×75×10 | 3.215 | 14.91 | 191.7 |
| 4 | " | " | 3.275 | " | 195.3 |
| 2 | " | 75×75×9 | 6.650 | 9.96 | 132.5 |
| 2 | p/s | 300 × 9 | 520 | 21.195 | 22.0 |
| 2 | ∟s | 150×90×9 | 208 | 16.32 | 6.8 |
| 4 | " | 75×75×9 | 3.265 | 9.96 | 130.1 |
| | | | | | 1207.3 × 1 = 1207.3 |

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CALCULATIONS FOR

## Material list of Ueyanagi-Bashi for Kumamoto-Ken.

| | | | | | | |
|---|---|---|---|---|---|---|
| | BRACKET $BT1^{R}_{L}$ | | | | 10 Required. | |
| 1 | L | 90×90×10 | × | 3,010 | 13.34 | 40.2 ✓ |
| 1 | Pl. | 395×10 | × | 610 | 31.008 | 18.9 ✓ |
| 1 | L | 75×75×9 | × | 570 | 9.96 | 5.7 ✓ |
| 2 | Ls | 90×90×10 | × | 295 | 13.34 | 7.9 ✓ |
| 1 | Pl. | 165×9 | × | 170 | 11.657 | 2.0 ✓ |
| 1 | L | 150×90×9 | × | 140 | 16.32 | 2.3 ✓ |
| 1 | ” | ” | × | 555 | ” | 9.1 ✓ |
| | | | | | | 86.1 × 10 = 861.0 ✓ |

Summary of Truss for 1span 27,~~746.5~~ 681.7

| | | | |
|---|---|---|---|
| | SHOES (Cast steel only) | 1 Required. | |
| 2 | Cast steel shoes RS1 | @ 83.8 | 167.6 |
| 2 | ” ” Bed Pls BP1 | @ 93.0 | 186.0 |
| 2 | ” ” shoes FS1 | @ 158.0 | 316.0 |
| | | | 669.6 × 1 = 669.6 |

| | | | | | |
|---|---|---|---|---|---|
| | ACCESSORIES for SHOES | | | 1-Required | |
| 4 | Pins | $100^{\phi}$ | 184 | 61.65 | 45.4 ✓ ○ |
| 8 | Nuts | | | @ 1.7 | 13.6 ✓ ○ |
| 4 | Pls | 70×13 | 370 | 7.144 | 10.6 ✓ |
| 8 | Rollers | $90^{\phi}$ | 360 | 49.43 | 142.4 |
| 16 | Pins | $25^{\phi}$ | 45 | 3.85 | 2.8 |
| 4 | Bars | 30×13 | 470 | 3.062 | 5.8 |
| 4 | Ls | 150×100×9 | 470 | 17.02 | 32.0 |
| 4 | Pls | 117×6 | 386 | 5.511 | 8.5 |
| 16 | Anchorbolts | $32^{\phi}$ | 700 | @ 5.2 | 83.2 ○ |
| 16 | Pls | 150×10 | 150 | 11.775 | 28.3 ○ |
| | | | | | 372.6 × 1 = 372.6 |

Summary of Shoe for 1 Span 1,042.2

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CHECKED BY__________ DATE__________ **PAGE NO** 50M

CALCULATIONS FOR

## material list of Ueyanagi-Bashi for Kumamoto-Ken.

EXPANSION JOINT EJ1 (for 3 spans). 3 Required.

| | | | | | |
|---|---|---|---|---|---|
| 1 | Bar | 30 × 10 | 4.440 | 2.355 | 10.5 |
| 1 | L | 100×75×10 | 4.440 | 12.950 | 57.5 |
| 1 | Webpl | 200 × 8 | 3.970 | 12.560 | 49.9 |
| 1 | L | 65×65×8 | 4.300 | 7.660 | 32.9 |
| 2 | pls | 70 × 8 | 230 | 4.396 | 2.0 |
| | | | | | 152.8 × 3 = 458.4 |

EJ2 (for 3 spans). 3 Required.

| | | | | | |
|---|---|---|---|---|---|
| 1 | checkered pl. | 230 × 9. | 4.440 | 16.250 | 72.2 |
| 1 | L | 65×65×8 | 4.440 | 7.66 | 34.0 |
| 1 | web pl. | 205 × 8 | 3.970 | 12.874 | 51.1 |
| 1 | L | 65×65×8 | 4.300 | 7.660 | 32.9 |
| 2 | pls | 70 × 8 | 240 | 4.396 | 2.1 |
| | | | | | 192.3 × 3 = 576.9 |

BRACKET BJ1$\overset{R}{L}$ (for 3 spans) 15 Required.

| | | | | | |
|---|---|---|---|---|---|
| 1 | L | 90×90×10 | 130 | 13.34 | 1.7 |
| 2 | Ls | 〃 | 145 | 〃 | 3.9 |
| 1 | pl | 170 × 8. | 210 | 10.676 | 2.2 |
| 1 | bolt. | 19φ | 50 | @ 0.272 | 0.3 |
| | | | | | 8.1 × 15 = 121.5 |

Summary Expansion & brackets for 3 span 1,156.8

HAND RAILS (for 3 spans)

| | | | | | |
|---|---|---|---|---|---|
| 4 | Ls | 75×65×10 | 970 | 10.20 | 39.6 |
| 4 | pls | 135 × 9 | 290 | 9.5~~83~~38 | 11.1 |
| 4 | Ls | 150×90×9 | 170 | 16.32 | 11.1 |
| 36 | 〃 | 75×65×10 | 1.375 | 10.20 | 504.9. |
| 36 | pls | 135 × 9 | 225 | 9.5~~83~~38 | 77.~~8~~3 |
| 36 | Anchor bolts | 16φ | 200 | @ 0.417 | 15.0 |
| 4 | Ls | 75×65×10 | 970 | 10.20 | 39.6 |
| 4 | 〃 | 150×90×9 | 170 | 16.32 | 11.1 |
| 4 | pls | 135 × 9 | 290 | 9.5~~83~~38 | 11.1 |
| 4 | Ls | 75×65×10 | 970 | 10.20 | 39.6 |
| 4 | 〃 | 150×90×9 | 170 | 16.32 | 11.1 |
| 4 | pls | 135 × 9 | 285 | 9.5~~83~~38 | 10.9. |
| 4 | Ls | 65×65×8 | 3.055 | 7.66 | 93.6 |
| 4 | pls | 135 × 9 | 210 | 9.5~~83~~38 | 8.0 |
| 4 | 〃 | 〃 | 270 | 〃 | 10.3 |
| 12 | Ls | 65×65×8 | 2.630 | 7.66 | 241.7 |
| 24 | 〃 | 〃 | 5.425 | 〃 | 997.3 |
| 24 | pls | 135 × 9 | 270 | 9.5~~83~~38 | ~~62.1~~ 61.8 |
| 24 | Ls | 65×65×8 | 5.345 | 7.66 | 982.6 |
| 6 | 〃 | 〃 | 5.425 | 〃 | 249.3 |
| 6 | 〃 | 〃 | 5.360 | 〃 | 246.3 |
| 4 | 〃 | 〃 | 3.175 | 〃 | 97.3 |
| 4 | pls | 135 × 9. | 270 | 9.5~~83~~38 | 10.3 |
| 4 | 〃 | 〃 | 170 | 〃 | 6.5 |

CALCULATIONS FOR

## Material list of Meyanagi-Bashi for Kumamoto-Ken

| | | | | | |
|---|---|---|---|---|---|
| 4 | Ls | 65×65×8 | 290 | 7.66 | 8.9 |
| 4 | " | " | 410 | " | 12.6 |
| 4 | " | " | 2,760 | " | 84.6 |
| 4 | Ps. | 135×9 | 285 | 9.5~~83~~38 | 10.9 |
| 4 | " | " | 270 | " | 10.3 |
| 8 | bolts. | 19φ | 45 | 0.272 | 2.2 |
| | | | | | 3,91~~7.5~~6.9 ×1 = 3,91~~7.5~~6.9 |

RIVET HEADS (for 1 span)

| | | | | |
|---|---|---|---|---|
| 8,695 | Shop rivet heads | 19φ | 0.0648 | 563.4 |
| 5,491 | Field " " | " | " | 355.8 |
| 136 | " " " | 13φ | 0.0204 | 2.8 |
| 112 | Shop " " | 10φ | 0.0098 | 1.1 |
| 40 | " " " | 9φ | " | 0.4 |
| | | | | 923.5 ×1 = 923.5 |

Total Summary for 3-Span

| | | |
|---|---|---|
| Trusses | 27,~~746.5~~681.7 × 3 = | 83,~~239.5~~045.1 |
| Shoes | 1,042.2 × 3 = | 3,126.6 (内 669.6×3=2008.8 · Cast Steel ヲ含ム) |
| Expansion joint & brackets. | | 1,156.8 |
| hand Rails | | 3,91~~7.5~~6.9 |
| Rivet heads | 923.5 × 3 = | 2,770.5 |
| | | ~~94,210.9~~ |
| | | 94,015.9 |

**JIUN MASUDA**
CONSULTING ENGINEER
SEIYU BLDG, TOKIO

MADE BY K. Inaba DATE 3-9-14 FILE NO

CHECKED BY J. S. DATE PAGE NO 52M

CALCULATIONS FOR

Meyanagi-Bashi for Kumamoto Ken

Material List.

List for abutment R.

Concrete 1:2:4 mixture

| Description | | Req'd. no. | Section | Length | Volume | Remarks. |
|---|---|---|---|---|---|---|
| parapet wall | | 1 | ·3×·93 | 4.0 | 1.116 cub.m. | |
| column | | 2 | 1.0×1.0 | 5.19 | 10.380 | |
| Coping | | 1 | ·8×·3 | 5.8 | 1.392 | |
| front wall | | 1 | ·86×6.25 | 5.6 | 30.100 | |
| 〃 | | 1 | ·3×1.35 | 4.0 | 1.620 | Under parapet wall |
| buttress wall | A | 2 | ·8×1.4 | 3.04 | 6.810 | under column |
| 〃 | B | 1 | ·7×1.05 | 5.7 | 4.190 | |
| base | | 1 | 1.25×1.99 | 6.0 | 14.925 | toe |
| 〃 | | 1 | 1.01×1.5 | 6.0 | 9.090 | under front wall |
| 〃 | | 1 | 1.0×2.0 | 6.0 | 12.000 | heel |
| Chamfer | | 2 | ·5×·25 | 1.65 | 0.413 | between buttress walls. |
| 〃 | | 2 | ·5×·25 | ·2 | 0.050 | both ends of base. |
| | | | | | ✓92.086 cub.m. | |

Forms 杉板厚さ一寸

| Description | | Req'd.no. | Width | Length | Area | Remark. |
|---|---|---|---|---|---|---|
| parapet wall | | 1 | ·93 | 4.0 | 3.72 ㎡ | Front side |
| 〃 | | 1 | 2.28 | 4.0 | 9.12 | rear 〃 |
| 〃 | | 2 | ·3 | 1.65 | 0.99 | bottom plane |
| Column | | 2 | 3.7 | 1.18 | 8.73 | all around ☐ |
| 〃 | | 2 | ·3 | ·25 | 0.15 | above parapet ⬚ |
| 〃 | | 2 | 2.9 | 4.01 | 23.26 | below coping |
| 〃 | | 2 | ·2 | 1.0 | 0.40 | bottom plane |
| 〃 | | 2 | ·3 | 2.66 | 1.60 | under parapet inside |
| Coping | | 1 | ·4 | 5.8 | 2.32 | front |
| 〃 | | 2 | ·4 | ·8 | 0.64 | both ends |
| Shaft | | 1 | 5.6 | 6.25 | 35.00 | front |
| 〃 | | 2 | ·86 | 6.25 | 10.75 | both end planes |
| 〃 | | 2 | 1.65 | 5.7 | 18.81 | rear, between buttress |
| buttress wall | A | 2 | ·8 | 3.15 | 5.04 | rear face |
| 〃 | 〃 | 4 | 1.4 | 3.04 | 17.02 | both sides |
| 〃 | B | 1 | ·7 | 5.85 | 4.10 | rear face |
| 〃 | 〃 | 2 | 1.05 | 5.7 | 11.97 | both sides |
| base | | 2 | 1.0 | 6.0 | 12.00 | front & rear |
| 〃 | | 2 | ·71 | 1.65 | 2.34 | Chamfer |
| 〃 | | 2 | ·71 | ·2 | 0.28 | 〃 both ends |
| 〃 | | 2 | 1.0 | 5.0 | 10.00 | |
| 〃 | | 2 | ·5 | 2.26 | 2.26 | |
| | | | | | ✓180.50 ㎡ | |

Reinforcements. plain bars 2.408 kg tons. see drawing sheet No. 7.

Piles 内地産赤松 27-piles - 18 cm∅ at tip 4.0 meter long

蹴込石 花崗石 5 - ·~~80~~ 19 ×·22×·80 = 0.~~176~~ 167 cub. meter

捨締切. 松矢板 8cm厚・4.0m長 延長 16.~~0~~ 16 m

横木 松角 15cm×20cm×3.5m — 8本.

〃 〃 15×20×5.5m — 8本.

ボールト 3/4"φ×~~14~~" 7 — 40本.

掘鑿. Bottom area 6.0×5.0 = 30.0 ㎡

Mean penetration 5.8m ✓

Excavation 30×5.8 = 174. cub meters

Meyanagi-Bashi for Kumamoto Ken.

②

Material List for Abutment L.

Concrete 1:2:4 mixture.

| Description | Reqd. no. | section | Length | Volume | Remarks. |
|---|---|---|---|---|---|
| parapet wall | 1 | ·3 × ·93 | 4.0 | 1.116 cub.m. | |
| column | 2 | 1.0 × 1.0 | 4.63 | 9.260 | |
| coping | 1 | ·8 × ·3 | 5.8 | 1.392 | |
| front wall | 1 | ·826 × 5.6 | 5.05 | 23.359 | |
| " | 1 | ·3 × 1.35 | 4.0 | 1.620 | Under parapet wall |
| buttress wall A | 2 | ·8 × 1.4 | 2.4 | 5.376 | under column |
| " B | 1 | ·7 × 1.05 | 4.5 | 3.308 | |
| base | 1 | ·95 × 1.5 | 6.0 | 8.550 | under front wall |
| " | 1 | 1.0 × 2.0 | 6.0 | 12.000 | at heel |
| " | 1 | 1.25 × 1.55 | 6.0 | 11.625 | at toe |
| Chamfer | 2 | ·5 × ·25 | 1.65 | 0.413 | between buttress walls. |
| " | 2 | ·5 × ·25 | ·2 | 0.050 | both ends of base. |
| | | | | 78.069 cub.m. | |

Forms. 松板厚五一寸

| Description | Reqd. no. | Width | Length | Volume | Remark. |
|---|---|---|---|---|---|
| parapet wall | 1 | ·93 | 4.0 | 3.72 om | Front side |
| " | 1 | 2.28 | 4.0 | 9.12 | rear side |
| " | 2 | ·3 | 1.65 | 0.99 | bottom plane |
| Column | 2 | 3.7 | 1.18 | 8.73 | all around ☐ |
| " | 2 | ·3 | ·25 | 0.15 | above parapet ☐ |
| " | 2 | 2.9 | 3.45 | 20.01 | below coping |
| " | 2 | ·2 | 1.0 | 0.40 | bottom plane |
| " | 2 | ·3 | 2.1 | 1.26 | under parapet, inside |
| Coping | 1 | ·4 | 5.8 | 2.32 | front |
| " | 2 | ·4 | ·8 | 0.64 | both ends |
| shaft | 1 | 5.6 | 5.05 | 28.28 | front |
| " | 2 | ·83 | 5.05 | 8.38 | both end planes |
| " | 2 | 1.65 | 4.5 | 14.85 | rear, between buttresses |
| buttress wall A | 2 | ·8 | 2.5 | 4.00 | rear faces |
| " " | 4 | 1.4 | 2.4 | 13.44 | both sides |
| " B | 1 | ·7 | 4.7 | 3.29 | rear face |
| " " | 2 | 1.05 | 4.5 | 9.45 | both sides |
| base | 2 | 1.0 | 6.0 | 12.00 | front and rear |
| " | 2 | ·71 | 1.65 | 2.34 | Chamfer between buttresses |
| " | 2 | ·71 | ·2 | 0.28 | " both ends of base |
| " | 2 | 1.0 | 4.5 | 9.00 | both ends ▨ |
| " | 2 | ·5 | 1.98 | 1.98 | " ▭ |
| | | | | 154.63 om. | |

Reinforcements, Plain bars 1.969 ~~kg~~ tons see drawing sheet No. 7.

Piles 内地産赤松 26 − 18 cm ϕ at tip 4.0 m. long

敷込石 花崗石 5 − ~~.22~~ 19 × .22 × .8 = ~~0.176~~ 167 cub. m.

掘鑿 Bottom area = 4.5 × 6.0 = 27.0 om

mean penetration = 3.8 mt.

excavation = 27.0 × 3.8 = 102.6 cub. m.

(41)

**JIUN MASUDA**
CONSULTING ENGINEER
SEIYU BLDG, TOKIO

MADE BY K.G. DATE 3-9-17 FILE NO

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CALCULATIONS FOR

Meyanagi Bashi for Kumamoto Ken. ③

Material List for Pier. all piers.

Concrete. 1:2:4 mixture see page piers Nos 1&5 for Maekawa Bashi.

Shaft. ✓ 39.196 cub.m.

well Shell ✓ 59.149 } 100.814

top and bottom filling ✓ 41.665

✓ 140.010 cub.m.

Sand filling ✓ 53.919 cub.m.

Forms for pier.

Shaft. 105.58 ☐m ✓

well (7.5m) 297.73 ✓

403.31 ✓

Reinforcements plain bars.

Shaft ✓ 1.186

well (7.5m) ✓ 2.714

✓ 3.900 kg tons.

Steel for curb shoes. ✓ 0.992 kg tons.

Excavation. See excavation of piers for Maekawa Bashi.

well sinking 7.5m well volume of well ~~153.3~~ 154.74 ✓ cub.m

~~excavation above top of well. slope of cutting 1:1 on all sides.~~

| | ~~mean depth~~ | ~~mean width~~ | ~~mean length~~ | ~~volume~~ |
|---|---|---|---|---|
| pier No.1. | 0.2 | 6.2 | 11.2 | 13.89 |
| ~~No.2.~~ | 1.3 | 7.3 | ~~12.3~~ | ✓ 116.73 |
| | | | | ✓ ~~130.62~~ cub.m. |

Materials for Floor

Total length of slab 99.41m

Construction Jts. less 6@.01 = −.06

expansion Jts. " 2@.12 = −.24

✓ 99.11m net.

Cross section of slab 0.607 ☐m see Maekawa Bashi.

Concrete for slab. 99.11 × .607 = ✓ 60.16 cub.m

Extra depth of slab at ends of spans.

length .5 × .3 = ✓ 1.5m

1 × .5 = ✓ .5

✓ 2.0m

extra sectional area .02 × 3.6 = ✓ .072 × 2.0 = ✓ .14 cub.m.

Total vol. of slab concrete = 60.3 cub.m.

less F.B. flange (175 × 21 = 3.68)

99.11 − 3.68 = 95.43

Forms of slab. ~~99.11~~ 95.43 × 4.89 (5) = ~~484.65~~ 438.02 ☐m

see for Maekawa Bashi.

Slab Reinforcements plain bars.

8.013 kg tons. ✓

Construction Jt. 7ヶ所 @ 4.3m

Pavement granolithic pavement 5.0cm ~~thick~~.

total length of slab 99.11m net

width 4.0m

Drains 30 @ .03 = 0.9

Area of pavement = 99.11 × 4.0 = 396.44 ☐m − 0.90 (drain) = 395.54 ☐m.

Cement mortar finish for coping

total length of coping net = 2 @ 99.11m = 198.22m

Area of finish = 198.22 × .52 = 103.07 ☐m.

Drains. Cast iron. 30 ✓ required @ 2.82kg = 84.6kg

MADE BY K. J. DATE 3-9-17 FILE NO

CHECKED BY J.S. DATE PAGE NO 55 M

CALCULATIONS FOR

Meyanagi-Bashi for Kumamoto Ken.

materials for Light pedestals.

| | | |
|---|---|---|
| Concrete 1:2:4 mix. | 0.796 | cub m per pedestal. |
| Reinforcement plain bars | ✓0.053 | kg/m 〃 〃 |
| 人造洗出仕上 | $5.\underset{5}{\cancel{8}}8$ | m² 〃 〃 |
| forms | 5.14 | m² 〃 〃 |
| Casting | 65.0 | kg |
| gas pipes | 4 — 7.2 φ × ~~3.05~~ 1.5 m | |
| 〃 | 1 — 5 φ × ~~2.6~~ 1.3 | |
| Glass globe (milkwhite) | 4 — 0.8 ft φ | |
| ~~Blass~~ Bronze socket | 4 — 100 watt lamp (B) | |
| name plate | 1 | |

Lamp fixture on top chordmember. 3×2 = 6 required.