PEMBEBANAN PADA STRUKTUR GELAGAR JEMBATAN

 **BEBAN GELAGAR JEMBATAN**

Vj

1,1

 VJ = ½ . vJ total = ½ .325 =162,5 t(↓) ,

 e =0,2 m

 Mj= 162,5 . 0,2 =32,5 tm(↓)

**BEBAN MATI TOTAL (M)**

 V = Va + Vtn – Vat + Vj

 = 476,0028 + 607,2718 – 379,316 + 162,5 = 866,4586 t (↓)

 My = Ma + Mtn – Mat + Mj + Mta + Mtv

 = -111,365 = 486,1818 – 263,047 + 32,5 – 1124,2825 – 404,4209

 = -586,9662tn (↓)

 Hx =εa – εp =485,352 – 289,1822 =196,1698 t(←)

**2.2 BEBAN HIDUP**

 a. Beban n

 Beban n berdasarkan PMJJR 1987

 -beban terbagi merata (go) = 2,2t/m1 L < 30 m

 -beban garis (P) =12 t/jalur

 -koefisien kejut(K) =1 +$\frac{20}{50+L}$ = 1+$\frac{20}{50+18}$ =1,294

 -lebar trotoar (Lt) 1= m

 -beban garis maksimum (B)= P.k = 12. 1,294=1553 t/jalur

 -kontrol lebar jalur,syarat 2,75 – 3,75 m(→)jalur.Lebar jalur =3,1 m

**DISTRIBUSI BEBAN**

100%ℓ

1,25

50%ℓ

Btotal(Bt)

Lt

Lt

½(B-5,5)=3m

½(B-5,5)=3m

5,5m

5,5

1,25

**-Beban terbagi merata**

 q´ =(q .5,5 . l + q . 50% (B – 5,5) .L)/ 2,75

 =2,2 . 5,5 . 18 +2,2 . 50% . 6 .18/2,75 =231,68 t

 p´=(B.5,5+B.50%(B-5,5.)L)

 =(15,53.5,5+15,53.50%-6)/2,75=39,53t

 Dx=q’+p’ =231,68+39,53 =291,21t(→) untuk 2 perletakan

 Vn= ½Dx =½ . 271,21 = 135,61 t untuk satu perletakan

 Mh= Vh . =155,61 .0,0 =47,122 t

**-Beban TROTOAR**

 Vtr=0,5 .n .B .L% =0,5 .q ;500kg/m2 =0,5 t/m2

 =0,5 . 25 .18 .0,5 =11,25 . 60% =6,75 t(untuk 1 pertalian)

 Mtr=Vtr .e =6,75 .0,2 =1,35 tm↓

**C. Beban di belakang Abutmen**

½H=4,875

ζ

ζ

1,875

2,9

Vm

3,83

4,87

Hba

0,5

H=8,75m

A

4,875m

Vba = 0,6 . δb .½ . H . B = 0,6 .1,885 . ½ . 8,75 .14 =62,2737 t ↓

Mba = 62,2717 .2,9 = 180,5937 tm ↓

Hba = 0,6 . 0,6 ka . H .B = 0,6 .1,885 .0,39 . 8,75 .14 = 54,0335 t ←

MHBa = 54,0335 .Y =54,0335 . 4,375 =236,3967 tm ↑

Perhitungan Beban Hidup Total (H)

 V=Cba. H4r + Vh = 62,2737 + 6,75 +135,61 = 204,6337 t↓

 Hy=Hba =54,0335 t ←

 My= Mh +mha +Mtr – Mhba

 =27,122 + 180,1937 + 4,35 -279,1967 = -27,331 tm ()

**2.3 Beban Sementara**

 a. Beban Angin

2m

1,1

Q=150kg/cm2

0,05

 F=luas bidang yang terkena angin

 =(0,5 .1,5 (0,05 + +2)L

 =(0,5 .1,5(3,15) 18 . 42,525 M2

 Hangin =F .q = 42,525 . 0,15 = 6,3288 t (↔)

 Mangin=H angin (½ (2+ 1,42 +0,05)+ H -1,1

 =6,3788 (½(2 +1,42 +0,05) + 8,75 -1,1)

 =58,8440 tm↓↑

b. Gaya Rem

HR

1,8m

1,1

L=18m

0,05

HA = 5% .Dx

Dx Tanpa koefisien beban kejut

Maka ;q’ =(q . 5,5 .L + q 50% (B – 5,5))/2,75

 =178,56 t

 P’=(p .5,5 + p.50% (B .5,5))/2,75

 =(12 .5,5 + 12 .50%(12,4 -5,5))/2,75

 =39,0545t

HR=(178,56 +39,0545) .5% = 10.881 t↔

MR=HR .(1,8 +0,05 +8,75)

 =10,881 .(1,8 +0,05 + 8,75)=96,1856 tm↓

C.Gaya Gempa (G)

 Hg = G.E

 G=Va + Vtn +Vj . Vat =515,97 + 607,2718 + 162,5 -379,310 =906,42586 ↓

 E=0,10→jembatan lokasi di Yogyakarta,termasuk daerah II

 Yj =H –0,512

 H=tinggi total

 R=tinggi balok

 Hg=906,4258 . 0,10 =90,64258↔

 Mg= Hg(H -½ .4,1)=90,64258 .(8,75 -½ .1,1)

 =743,2692 tm↑↓

D.Gaya akibat perlrtakan

 Up = F(Va +Vtn +Vj)

 =0,01(490,581 +672,1574 +162,5)

 =13,252 t↓

 Mp= Up . e e = beban gandar

 =13,252 . 0,2

 =2,65 tm ↓

**2.4 KOMBINASI BEBAN**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| BEBAN | V (ton) | Hx (ton) | Mx (tm) | Hy (ton) | My (tm) |
| M | 866,0586 ↓ | 196,1698 ← | - | - | -568,9662 |
| H | 204,6337 ↓ | - | - | 54,6335 ← | -2,7331 |
| A | - | 6,3788 ↔ | 58,8440 | - | - |
| R | 5,3436 ↓ | - | - | 10,881 ↔ | 96,1856 |
| Gx | - | 90,64258 ↔ | 743,2620 | - | - |
| Gy | - | - | - | 90,64258 ↔ | 743,2629 |
| F | 13,252 ↓ | - | - | - | 2,65 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| KOMBINASI BEBAN | V (ton) | Hx (ton) | Mx (tm) | Hy (tm) | My (tm) |
| I.M+H | 1071,0923 | 196,1698 | - | 54,6335 | -571,6993 |
| II.M+A+F | 870,7106 | 202,5486 | 58,8440 | - | -566,3162 |
| III.M+H+A+R+F | 1089,7106 | 202,5486 | 58,8440 | 65,5145 | -455,6736 |
| IV.M+Gx | 866,4586 | 286,81238 | 743,2629 | - | -568,9662 |
| V.M+Gy | 266,4686 | 196,1698 | - | 90,64258 | 174,2967 |

Ket :

 M= beban mati

 H= beban hidup

 A= beban angin

 R= gaya rem

 Gx= gaya gempa bumi searah as jembatan

 Gy= gaya gempa bumi tegak lurus as jembatan

 Hx= gaya horizontal searah as jembatan

 Hy= gaya horizontal tegar lurus as jembatan

 Mx= momen tagak lurus as jembatan

 My= momen searah as jembatan

**TINJAUAN KESTABILAN JEMBATAN**

7 m

7 m

3,1 m

y

14 m

6,2m

0

x

3,1 m

Luas dasar pondasi (A)

 A= 6,2.14=86,8 m2

 IX=1/12.6,2.143= 1417,7333 m3

 Iy= 1/12.14.6,23=278,0493 m3

**3.1 Analisis terhadap tekanan tanah**

 Αmax = V/A + MXY + MYX/IY ≤ n

Αmin = V/A - Mxy - Myx/Iy ≥ 0

**Kombinasi 1**

Αmin=$ \frac{1071,0923}{86,8} $+ $\frac{571,6903.3,1}{278,0493} $=1,871 kg/cm2

Αmax= 1071,0923/86,8 - 571,6993.3,1/278,0493=0,590 kg/cm2

Kombinasi II

 V=8,29,7106 t

My=566,3162 tm

Mx=58,8440 tm

δMin =879,7106/86,8 -58,8440 .7/1417,7333 -566,3162 .3,1/278,0493 =1,616 kg/cm2>0

δMax=879,7106/86,8+58,8440 .7/1417,7333 +566,3162 .3,1/278,0493 =0,411 kg/cm2<1,25.3,184 kg/cm2

Kombinasi III

 V=1089,6879 t

 My=-455,6736 tm

 Mx=58,8440 tm

$δMax=\frac{1089,6879}{86,8 }+\frac{58,8440 .7}{1417,7333 }-\frac{455,6736 .3,1}{278,0493}= $0,776kg/cm2<1,4 .3,16 . 4,48 kg/cm2

$δMin=\frac{1089,6879}{86,8 }-\frac{58,8440 .7}{1417,7333 }+\frac{455,6736 .3,1}{278,0493}=$1,734 kg/cm2

Kombinasi IV

 V=866,4586 t

 My=-568,9662 tm

 Mx=743,2629 tm

$$δMax=\frac{866,4586}{86,8 }+\frac{743,2629 . 7}{1417,7333 }-\frac{568,9662 .3,1}{278,0493 }=0,731kg/cm2$$

$$δMin=\frac{866,4586}{86,8 }-\frac{743,2629 . 7}{1417,7333 }+\frac{568,9662 .3,1}{278,0493 }=1,260 kg/cm2$$

Kombinasi V

 V=866,4586 t

 Mx=0

 My=174,2967 tδMin =866,4586/86,8 -174,296.3,1/278,0493= 0,804 kg/cm2 >0

$$δMax=\frac{266,4526}{86,8 }+\frac{174,296.3.1}{278,0493 }=1.19 kg/cm2$$

$$δMin=\frac{266,4526}{86,8 }-\frac{174,296.3.1}{278,0493 }=0.804 kg/cm2$$

Diagram tekanan Tanah

0,9m

2,0m

£min

£max

3,3m

Kombinasi 1

1,871kg/cm2

0,596kg/cm2

1,6116kg/cm2

0,411kg/cm2

Kombinasi 2

Kombinasi 3

1,734kg/cmcm2

0,776kg/cm2

0,731kg/cm2

Kombinasi 4

1,265kg/cm2

kombinsi 5

1,19kg/cm2

0,804kg/cm2