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 + = 1+ =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=+ =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

0,776kg/cm2<1,4 .3,16 . 4,48 kg/cm2

1,734 kg/cm2

Kombinasi IV

V=866,4586 t

My=-568,9662 tm

Mx=743,2629 tm

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

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