TUGAS AKHIR

PERENCANAAN GEDUNG MAGISTER MANAJEMEN UNIVERSITAS GADJAH MADA YOGYAKARTA

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JURUSAN TEKNIK SIPIL
FAKULTAS TEKNIK SIPIL DAN PERENCANAAN
UNIVERSITAS ISLAM INDONESIA
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LEMBAR PENGESAHAN TUGAS AKHIR

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KATA PENGANTAR

بسم الله الرحمن الرحيم

Assalamu' alaikum.Wr. Wb.

Penulis memanjatkan puji syukur kepada Allah SWT, karena hanya berkat rahmat dan hidayah*Nya* penulis dapat menyelesaikan penyusunan tugas akhir ini. Tugas Akhir ini merupakan syarat untuk memperoleh gelar sarjana pada Jurusan Teknik Sipil Fakultas Teknik Sipil dan Perencanaan Universitas Islam Indonesia Yogyakarta.

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Yogyakarta, April 1998

Penulis

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DAFTAR NOTASI

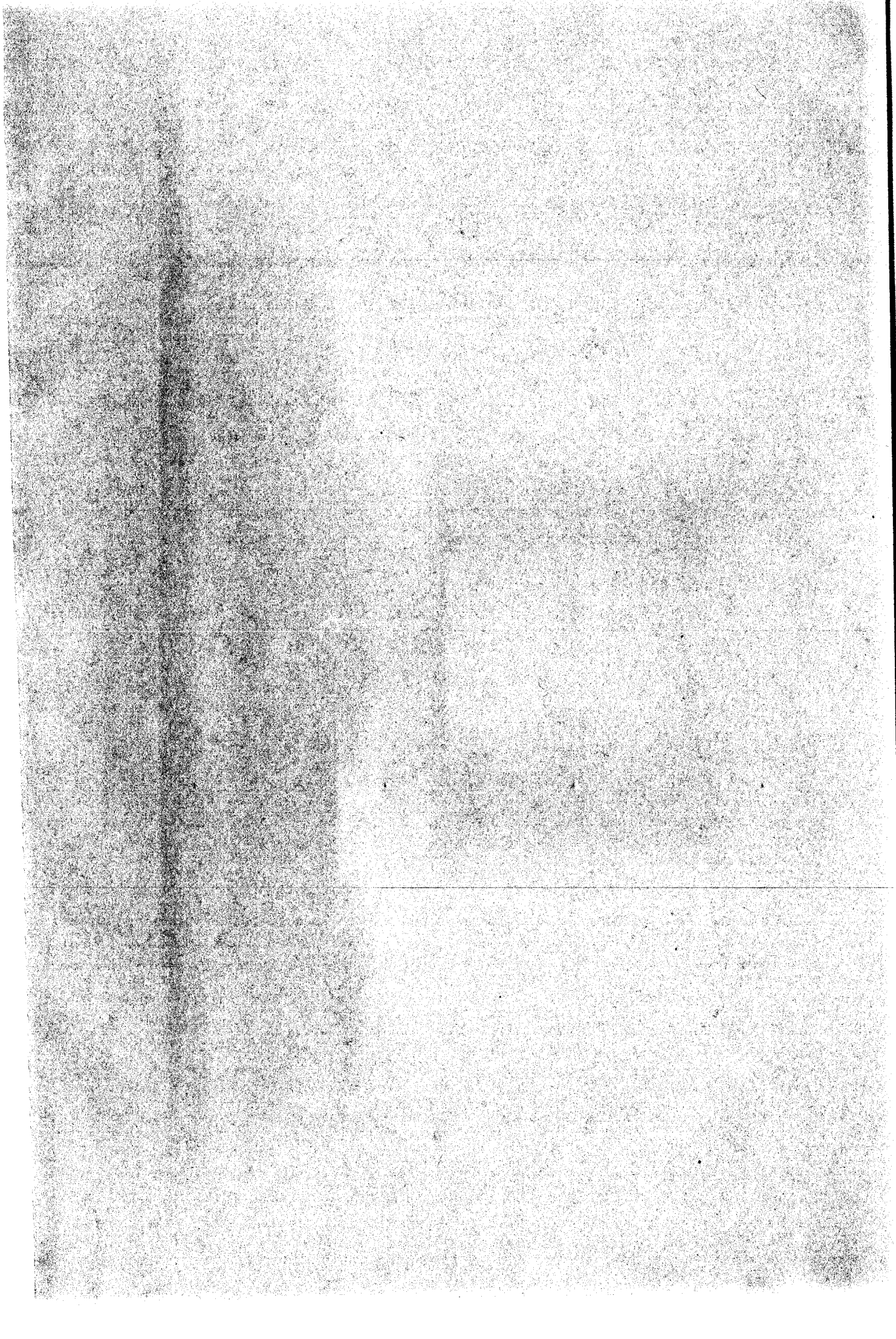
As	=	luas tulangan tarik non-pratekan, mm^2
As'	=	luas tulangan tekan, mm^2
As_{min}	=	luas tulangan minimum, mm^2
b	=	lebar dari muka tekan komponen struktur, mm
d	=	jarak dari serat tekan terluar ke pusat tulangan tarik, mm
d'	=	jarak dari serat tekan terluar ke pusat tulangan tekan, mm
pb	=	penutup beton
fc'	=	kuat tekan beton yang disyaratkan, MPa
fy	=	tegangan leleh yang disyaratkan dari tulangan non-pratekan, MPa
fs'	=	tegangan leleh tulangan tekan dari tulangan non-pratekan, Mpa
qu	=	kekuatan yang diperlukan untuk menahan beban terfaktor atau momen dan gaya dalam yang berhubungan dengannya.
q_d	=	Beban mati adalah berat dari semua bagian dari suatu gedung yang bersifat tetap, termasuk segala tambahan, penyelesain mesin-mesin serta peralatan tetap yang merupakan bagian yang tak terpisahkan dari gedung tersebut.
q_l	=	beban hidup adalah semua beban yang terjadi akibat pemakaian dan penghunian suatu gedung, termasuk beban-beban pada lantai yang berasal dari barang-barang yang dapat berpindah dan atau beban akibat air hujan pada atap.
Mu	=	Momen terfaktor pada penampang
Mn	=	Momen nominal pada penampang
Lx	=	panjang sisi terpendek dari pelat
ρ	=	rasio tulangan tarik non-pratekan
ρ'	=	rasio tulangan tekan non-pratekan
ρ_b	=	rasio tulangan yang memberikan kondisi regangan yang seimbang.
β_1	=	faktor kekuatan beton
Φ	=	faktor reduksi kekuatan
a	=	tinggi balok tegangan persegi ekivalen.
Vu	=	gaya geser terfaktor pada penampang

Vc	=	kuat geser nominal yang disumbangkan oleh beton.
Vn	=	kuat geser nominal
Vs	=	kuat geser nominal yang disumbangkan oleh tulangan geser.
Av	=	luas tulangan geser yang tegak lurus terhadap tulangan lentur tarik
Tu	=	momen torsi terfaktor pada penampang
Tn	=	kuat momen torsi nominal
Tc	=	kuat momen torsi nominal yang disumbangkan oleh beton
x	=	dimensi pendek dari bagian berbentuk persegi dari penampang
y	=	dimensi panjang dari bagian berbentuk persegi dari penampang
Ts	=	kuat momen torsi nominal yang disumbangkan oleh tulangan torsi
αt	=	sudut antara tulangan geser -friksi dengan bidang geser
At	=	luas satu kaki dari sengkang tertutup dalam daerah sejarak s yang menahan torsi, mm^2
s	=	spasi dari tulangan geser
X1	=	dimensi pusat ke pusat yang pendek dari sengkang persegi tertutup
Y1	=	dimensi pusat ke pusat yang panjang dari sengkang persegi tertutup

ABSTRAKSI

Proyek Pembangunan Komplek Gedung II Program Studi Magister Manajemen Universitas Gadjah Mada terletak di Barek, Depok, Sleman, Lokasi proyek menempati areal 7150 m^2. Untuk dasar-dasar perencanaan yang dipakai dalam merencanakan gedung adalah Tata cara perhitungan Struktur Beton untuk Bangunan Gedung (SK-SNI T-15-1991-03). Dan sfesifikasi bangunan yang direncanakan untuk beton menggunakan fc' = 20 MPa dan Mutu baja tulangan yang digunakan untuk ≤ ∅ 12 mm dipakai fy = 240 MPa, untuk > ∅12 mm dipakai fy = 400 MPa, sedangkan analisis struktur dengan menggunakan program SAP 90.

Dimensi kolom terbesar 70/60 cm, dimensi kolom terkecil 50/50. Struktur atap menggunakan rangka baja dengan bentang 24 m, dimenssai batang atas 2L3x3x3/16, dimensi batang bawah 2Lx2x2x1/4, dimensi batang horizontal dan vertikal 2Lx2x2x1/8. Dan untuk ukuran pondasi yang terkecil 300x300 cm, yang terbesar 350x350 m.



BAB I

PENDAHULUAN

1.1. Latar Belakang

Pendidikan merupakan suatu wadah transfer ilmu pengetahuan yang diadakan secara terkoordinir dan rutin, dengan semakin maraknya pembangunan kampus bagi perguruan-perguruan tinggi di Yogyakarta, yang tentunya dengan pembangunan lokal kelas baru akan dapat menampung mahasiswa dengan jumlah yang lebih proporsional terhadap kelas yang ada. Dengan demikian proses belajar mengajar diharapkan akan lebih baik.

Suatu usaha mencapai tujuan selalu menghadapi berbagai permasalahan khususnya berkaitan dengan kendala waktu maupun sumber daya dan sumber dana yang tersedia. Kendala-kendala tersebut akan menimbulkan permasalahan bagi Program Magister Manajemen Universitas Gadjah Mada dalam pelaksanaan misinya. Permasalahan daya tampung, menjadi masalah yang cukup serius dan menjadi faktor penghambat bagi pengembangan, Demikian juga keadaan dan kemampuan penyediaan fasilitas belajar mengajar yang terbatas, sehingga perlu perencanaan yang cermat untuk mengembangkan fasilitas belajar mengajar bagi program Magister Manajemen Universitas Gadjah Mada, didasari oleh berbagai kondisi diatas maka sarana dan prasarana fisik yang telah ada perlu ditingkatkan lagi dengan jalan membangun kampus yang baru dengan luas tanah yang jauh lebih besar dari pada kampus yang ada sekarang.

1.2. Lokasi Proyek

Proyek Pembangunan Komplek Gedung II Program Studi Magister Manajemen Universitas Gadjah Mada terletak di Barek, Depok, Sleman, Lokasi proyek menempati areal 7150 m^2. Lokasi ini sebelumnya berupa lahan bekas Jurusan Teknik Arsitektur, Fakultas Teknik, UGM dengan permukaan tanah lokasi relatif mendatar.

Adapun batas-batas lokasi proyek adalah sebagai berikut :

1. Sebelah Utara : Pemukiman Penduduk
2. Sebelah Timur : Jalan Kaliurang,
3. Sebelah Selatan : Selokan, bersebelahan dengan jalan. Teknika Utara,
4. Sebelah Barat : Gedung Universitas Terbuka.

1.3. Data Teknis Proyek

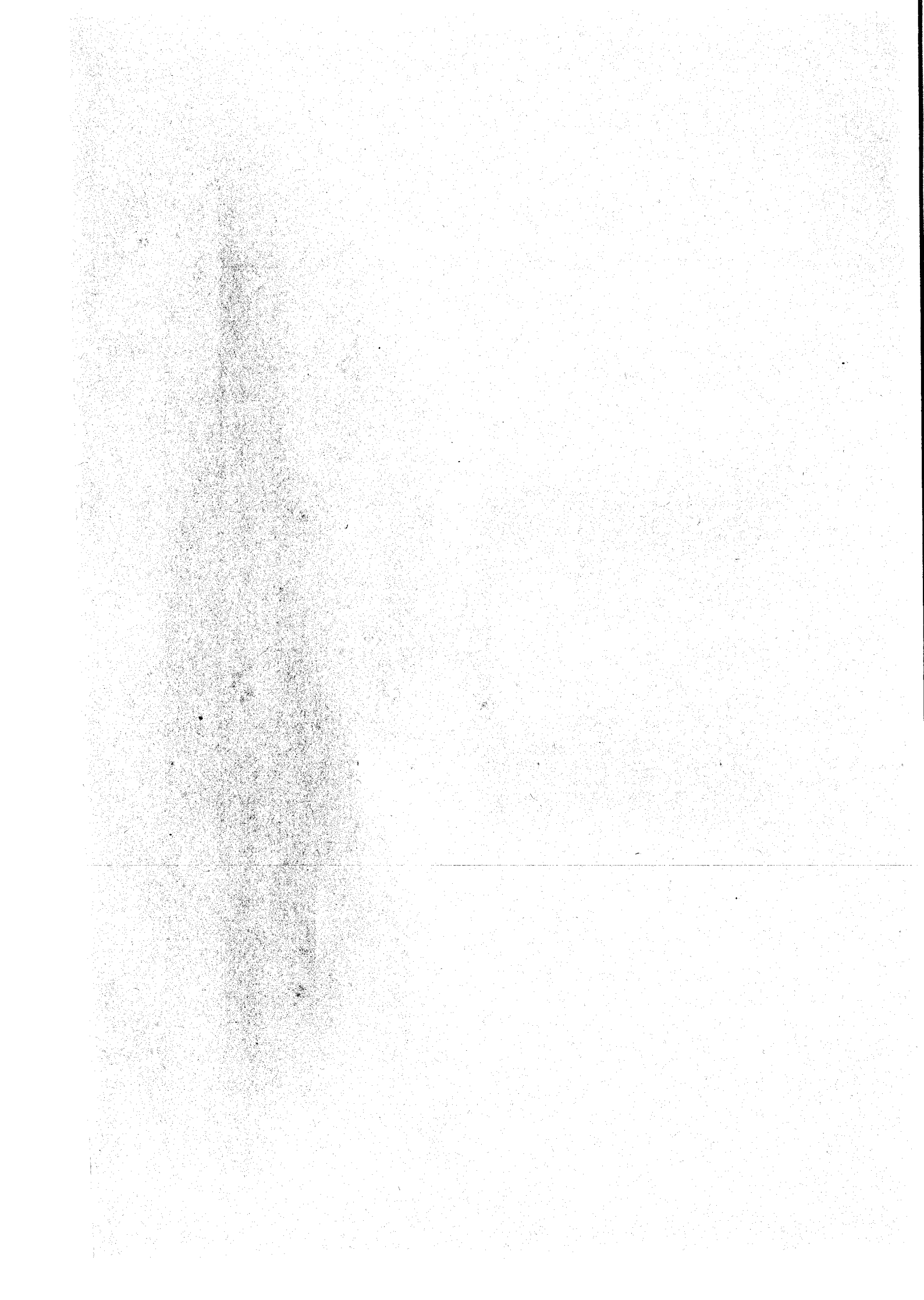
Proyek Pembangunan Komplek Gedung II Program Studi Magister Manajemen Universitas Gadjah Mada terdiri dari lima lantai, dengan menggunakan struktur beton bertulang konvensional. Elevasi lantai satu, lantai dua, lantai tiga, lantai empat dan lantai lima berturut-turut adalah +0.00 m, +4.50 m, +9.00 m, +13.50 m dan +18.00 m.

Fungsi bangunan secara umum adalah sebagai berikut :

1. Lantai Satu : Ruang Bookstack, Counter Pelayanan, Gudang, Ruang Mahasiswa, Mushola,
2. Lantai Dua : Ruang Baca, Audio Visual, Ruang Kelas, Ruang Diskusi, Void, Workstation,

3. Lantai Tiga : Ruang Lab. Bahasa, Lab. Komputer, Mushola, Ruang Kelas, Ruang Diskusi,
4. Lantai Empat : Ruang Kelas, Ruang Diskusi dan
5. Lantai Lima : Ruang Sekretariat, Ruang Rapat, Ruang Administrasi, Common Fasilities, Mushola.

Bangunan pelengkap pada gedung ini adalah bagunan lavatory, bangunan tangga yang terdiri dari satu tangga utama , dua tangga darurat dari lantai satu sampai lantai lima dan dua lift pada setiap lantai serta satu tangga layang pada lantai pertama yang menuju ke ruang perpustakaan di lantai dua.



BAB II

PERENCANAAN

2.1. Tinjauan Pustaka

Pada penggunaan komponen struktur bangunan gedung yang terbuat dari beton konvensional, umumnya beton diperkuat dengan tulangan baja sebagai bahan yang dapat bekerja sama dan mampu membantu kelemahannya. Terutama pada bagian yang menahan gaya tarik. Dengan demikan tersusun pembagian tugas, dimana tulanan baja memperkuat dan memahan gaya tarik, sedangkan beton hanya diperhitungkan untuk menahan gaya tekan. (Istimawan Dipohusodo, 1994, Struktur Beton Bertulang, PT. Gramedia Pustaka Utama, Jakarta).

Struktur gedung terdiri dari bagian-bagian seperti atap, pelat lantai, balok, kolom, tangga dan pondasi.

Atap mempunyai fungsi sebagai penutup bagian atas dari suatu bangunan. Atap pada gedung ini direncanakan menggunakan genteng keramik berglazur.

Pelat lantai berfungsi sebagai pendukung beban akibat berat sendiri dan beban berguna yang ada diatasnya, dalam perencanaan pelat lantai ini yang ditinjau adalah beban pengaruh beban gravitasi.

Balok merupakan bagian horizontal dari portal yang menahan gaya vertikal dari pelat lantai dan berat dinding.

Kolom berfungsi meneruskan beban ke pondasi bangunan yang ada di bawahnya, bentuk kolom gedung ini direncanakan berbentuk persegi.

Tangga berfungsi sebagai sarana penghubung dari masing-masing lantai, direncanakan terdiri dari bordes dan pelat tangga disamping itu disediakan lift yang fungsinya sama dengan tangga, hanya saja lebih efisien.

Pondasi merupakan struktur bawah yang berada di dalam tanah yang merupakan tempat bertumpunya seluruh struktur bangunan yang berada diatasnya dan meneruskan ke tanah.

2.2. Perencanaan Konstruksi

2.2.1. Dasar Perencanaan

Dalam perencanaan ini menggunakan metode kekuatan batas dimana beban kerja dinaikkan dengan memberikan suatu faktor beban sehingga diperoleh suatu beban pada akhir keruntuhan.

Menurut SK-SNI T-15-1991-03 subbab 3.2.2 faktor beban ditentukan sebagai berikut ini :

1. Beban mati = D
2. Beban Hidup = L
3. Beban Gempa = E

$U = 1{,}2\ D + 1{,}6\ L$ (2.1)

$U = 0{,}9\ (D \pm E)$ (2.2)

$U = 1{,}05\ (D + \Phi.\ L \pm E)$ (2.3)

dimana :

U = Kuat perlu adalah kekuatan suatu komponen struktur atau penampang yang diperlukan untuk menahan beban terfaktor atau momen dan gaya dalam yang berkaitan dengan beban tersebut dalam suatu kombinasi .

D = Beban mati adalah berat dari semua bagian dari suatu gedung yang bersifat tetap, termasuk segala tambahan, penyelesaian mesin-mesin serta peralatan tetap yang merupakan bagian yang tak terpisahkan dari gedung tersebut.

L = Beban hidup adalah semua beban yang terjadi akibat pemakain dan penghunian suatu gedung, termasuk beban-beban pada lantai yang beraal dari barang-barang yang dapat berpindah dan atau beban akibat air hujan pada atap.

E = Beban gempa .

Kepastian kekuatan beban terhadap pembebanan dianggap sebagai faktor reduksi kekuatan (Φ). Menurut SK-SNI T-15-1991-03 subbab 3.2.3 faktor reduksi kekuatan ditentukan sebagai berikut ini :

1. Lentur, tanpa beban aksial $\Phi = 0.8$
2. Aksial tarik dan aksial tarik dengan lentur $\Phi = 0.8$
3. Aksial tekan dan aksial tekan dengan lentur $\Phi = 0.65$
4. Geser dan torsi $\Phi = 0.6$

Faktor reduksi kekuatan diatas juga dipakai untuk mereduksi kekuatan beton dan baja berikut ini :

1. Untuk beton : f'c (kuat tekan beton yang disyaratkan)
2. Untuk baja : fy (tegangan leleh baja).

2.2.2. Perencanaan dan Standar yang digunakan

Perencanaan pada hakekatnya adalah penuangan ide-ide pemikiran secara konseptual yang dituangkan dalam bentuk rencana proyek. Sasaran yang hendak dicapai dalam perencanaan ini adalah :

1. Perencanaan sesuai dengan data proyek

2. Fungsi proyek terpenuhi,
3. Proyek tidak merusak lingkungan,
4. Proyek mempunyai ciri tersendiri sesuai dengan keinginan pemilik,
5. Jadwal yang tepat,
6. Biaya ekonomis,
7. Kualitas maksimal.

Untuk dasar-dasar perencanaan yang dipakai dalam merencanakan gedung adalah :

1. Tata cara perhitungan Struktur Beton untuk Bangunan Gedung (SK-SNI T-15-1991-03).
2. Peraturan Pembebanan untuk Gedung 1983.
3. Peraturan Perencanaan Bangunan Tahan Gempa Indonesia untuk Gedung 1983.
4. Peraturan Perencanaan Bangunan Baja Indonesia (PPBBI-1984).
5. Hasil Penyelidikan Tanah di Lokasi.
6. Peraturan lain yang ada hubungannya dengan Perencanaan bangunan untuk Gedung yang berlaku di Indonesia.

Metode yang digunakan dalam perencanaan Gedung Magister Manajemen Universitas Gadjah Mada ini adalah SK-SNI T-15-1991-03 dan untuk membantu perhitungan mekanika dengan menggunakan program paket SAP-90.

2.3. Kritetia Perencanaan Struktur

2.3.1. Pembebanan Atap

a. Beban penutup atap genteng = 50 kg/m^2

b. Beban gording = 10 kg/m'

c. Beban pekerja = (40-(0,8x24,9°)) = 20 kg/ m^2

d. Beban plafond (asbes) = 18 kg/m^2

e. Beban kuda-kuda = (10+(12/3x5))x4 = 120 kg/m'

f. Beban angin = 25 kg/m^2

2.3.2. Pembebanan Pelat

a. Beban Mati

Tebal Pelat diambil 0,12m

1). Berat sendiri	= 0,12 x 23	= 2,76 KN/m^2
2). Ubin 2 cm	= 0,02 x 23	= 0,46 KN/m^2
3). Spesi 1 cm	= 0,01 x 23	= 0,23 KN/m^2
4). Pasir 5 cm	= 0.05x 23	= 1,15 KN/m^2
5). Langit^2 + Penggantung = 18x0,00981		= 0,1766 KN/m^2
		qd = 4,7766 KN/m^2

b. Beban Hidup (ql)

1). Kantor/ruang kuliah	= 250 kg/m^2
2). Perpustakaan	= 400 kg/m^2
3). Selasar	= 300 kg/m^2
4). Tangga	= 300 kg/m^2

2.3.3. Pembebanan Balok

a. Beban Mati (Pada bagian balok yang ada temboknya)

1). Beban plat

2). Berat tembok

3). Berat Balok

b. Beban Hidup

2.4 Perencanaan Pelat

Untuk perencanaan penulangan pelat digunakan ketentuan sebagai berikut :

$$As = \frac{Mn}{fy.(0,9)d}$$

Cek rasio penulangan (ρ) :

1. Bila $As < As\,min$

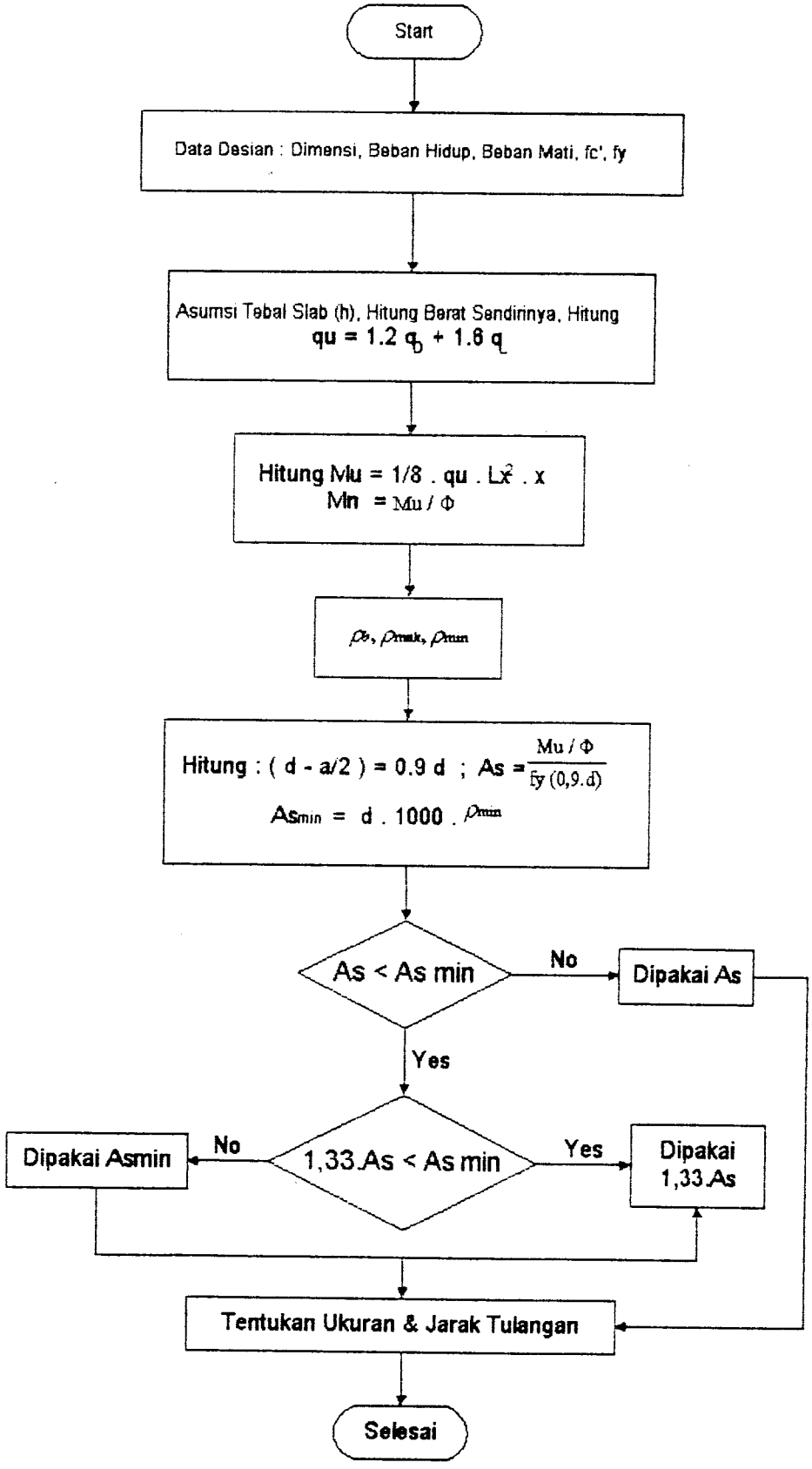
$$As\,min = \frac{1,4}{fy}.b.d$$

dan

2. a). $1,33.As > Asmin \Rightarrow$ dipakai Asmin

b). $1,33\,As < Asmin \Rightarrow$ dipakai $1,33\,As$

Untuk perencanaan pelat ini akan lebih mudah dengan memakai flowchart seperti gambar 2.1



Gambar 2.1 Diagram Alir Desain Pelat Lantai

2.5. Perencanaan Balok

2.5.1. Perencanaan Balok Lentur

A. Perencanaan Balok Tulangan Rangkap

Diketahui : $Mn = \frac{Mu}{\phi}$; b, h, fc', fy, d', d

ρ-ρ'diambil = 0,5 $\rho b = \rho_1$

B. Menentukan Mn_1

$$As1 = \rho_1 . b . d$$

$$a = \frac{As1.fy}{0,85.f'c.b}$$

$$Mn1 = As1.fy\left(d - \frac{a}{2}\right) < Mu/\phi \Rightarrow \text{dipakai tulangan rangkap}$$

C. Kontrol Mn

$$\rho = \frac{As}{b.d} \quad ; \quad \rho = \frac{As'}{b.d}$$

$$fs' = 600.\left(1 - \frac{0,85.f'c.\beta_1.d'}{(\rho - \rho').fy.d}\right) \leq fy$$

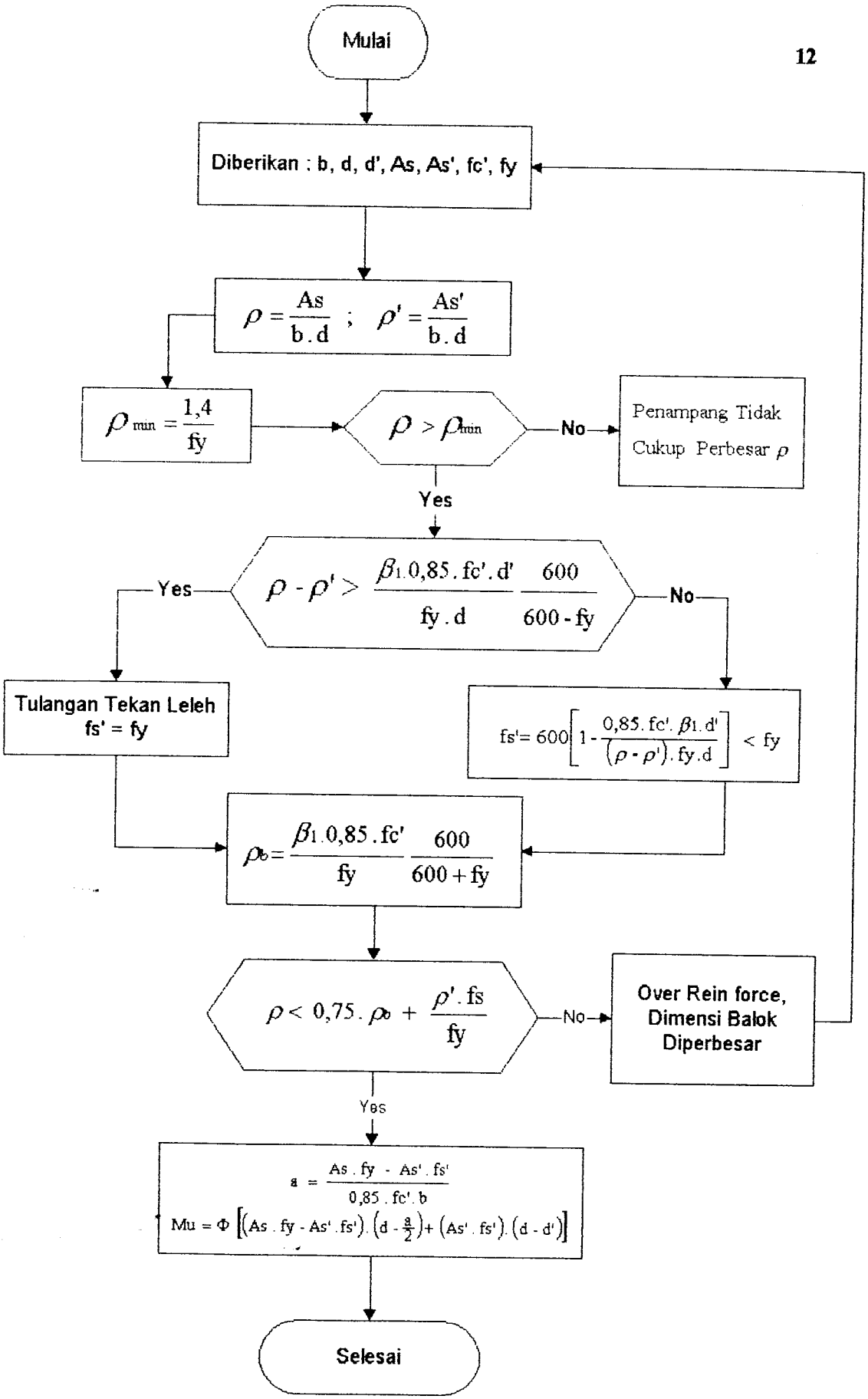
$$a = \frac{As.fy - As'.fs'}{0,85.f'c.d}$$

$$Mn1 = (As\text{-}As') . fy \ (d - a/2)$$

$$Mn2 = As'. fy \ (d - d')$$

$$Mn1 + Mn2 > Mn$$

Untuk perencanaan balok dengan desain tulangan rangkap ini akan lebih mudah dengan memakai flowchart seperti gambar 2.2



Gambar 2.2. Diagram Alir Desain Balok Tulangan Rangkap

2.5.2. Penulangan Geser dan Torsi

Pada analisis struktur tiga dimensi dengan kondisi beban yang berbeda serta letak komponen struktur yang tidak simetris dapat menimbulkan torsi dan geser pada masalah ini dipakai tulangan geser dan torsi. Perencanaan tulangan sebagai berikut :

A. Penulangan geser

Syarat-syarat tulangan geser berdasarkan SK SNI T-15-1991-03

1. $Vu \leq \frac{1}{2} \Phi Vc$

   Tidak perlu tulangan geser, dipakai tulangan geser minimum

2. $\frac{1}{2} \Phi Vc \leq Vu \leq \Phi Vc$

   dipakai tulangan geser dimana $\Phi Vs_{min} = \Phi Av \,.\, fy \,.\, d \;/\; S_{max}$

   jarak (s) $= S_{max} \leq \frac{1}{2}\, d$

   $S_{max} \leq 600$ mm

   $S_{max} = Av \,.\, fy \,.\, d \;/\; Vs_{min}$

   Syarat ini tidak berlaku untuk pelat lantai, pelat pondasi, balok dengan $d \leq 250$ mm atau $d \leq 2{,}5$ x tebal sayap.

3. $\Phi Vc \leq Vu \leq \Phi (Vc + Vs_{min})$

   dipakai syarat no. 2 dan dihitung jarak sengkang berdasarkan

   $Vs_{perlu} = Vu / \Phi - Vc$

4. $\Phi (Vc + Vs_{min}) \leq Vu \leq 3 \Phi Vc$

   dipakai syarat no. 2 dan dihitung jarak sengkang berdasarkan

   $Vs_{perlu} = Vu / \Phi - Vc$

5. $3 \Phi Vc \leq Vu \leq 5 \Phi Vc$

At/s =

Luas t

Al =

N = A

.6 Perenca

Perhitur

serta bebar

dan tabel.

Pembag

dua cara :

1. Tulang

arah ler

2. Tulang

= As' =

A. Perenca

1. Pene

Mu =

Pu =

Ag =

Untuk p

memakai fl

jarak (s) = $S_{max} \leq \frac{1}{4} d$

$S_{max} \leq 300$ mm

$S_{max} = Av \,.\, fy \,.\, d \;/\; Vs_{min}$

dipakai syarat no. 2 dan dihitung jarak sengkang berdasarkan

$Vs_{perlu} = Vu / \Phi - Vc$

Tulangan Geser :

Vu dari hitungan SAP 90.

$Vc = \frac{1}{6} \,.\, (\sqrt{fc'}) \,.\, b \,.\, d$

$Av = 2 \,.\, A_{1\varnothing\ geser}$

jarak (s) = $S_{max} \leq \frac{1}{2} d$

$S_{max} \leq 600$ mm

$S_{max} = Av \,.\, fy \,.\, d \;/\; Vs_{min}$

S_{max} dipakai yang terkecil

$\Phi\, Vs_{min} = \Phi\, Av \,.\, fy \,.\, d \;/\; S_{max}$

Tulangan geser yang dipakai disesuaikan dengan syarat-syarat diatas.

B. Penulangan torsi

Dari analisis program SAP 90 didapatkan gaya torsi (Tu).

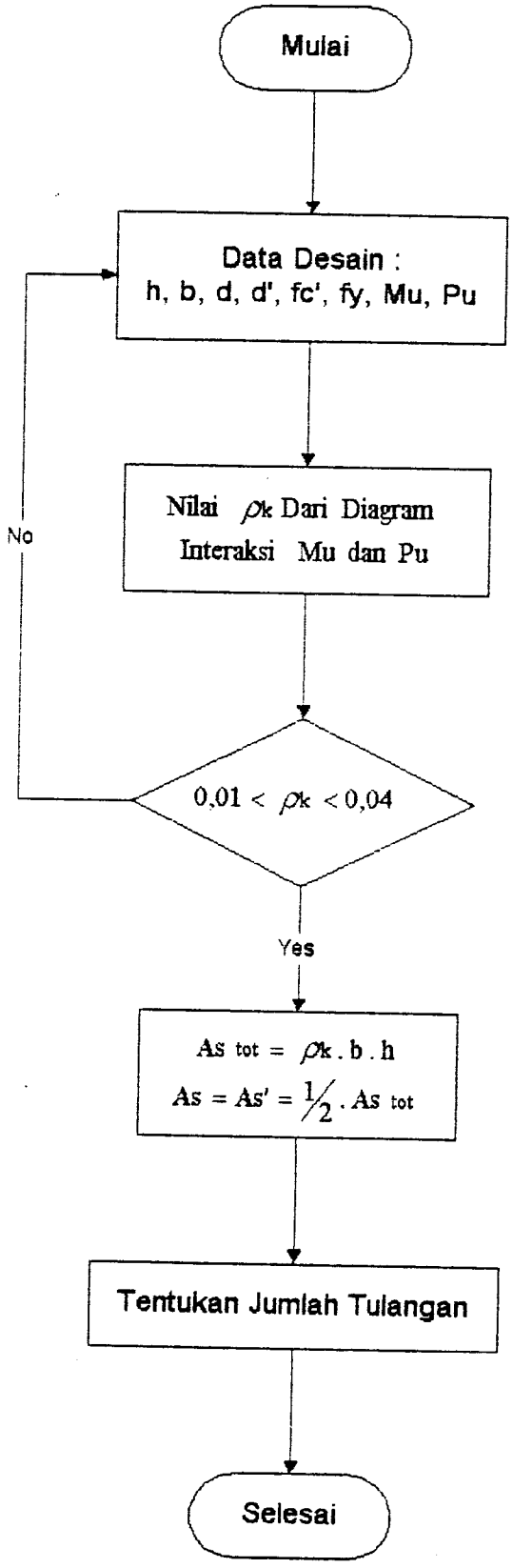
$Tn = Tu / 0{,}6$

$$Tc = \frac{\sqrt{fc'}}{15} \,.\, \sum x^2 \,.\, y$$

$Ts = Tn - Tc$

$X1 = x \,.\, 2\,(\, pb + ts / 2\,)$; $Y1 = y - 2\,(\, pb + ts / 2\,)$

$\alpha t = 1/3 \,.\, (\, 2 + (Y1 / X1)) < 1{,}5$



Gambar 2.3 Diagram Alir Desain Kolom Persegi

2.7 Perencanaan Pelat Pondasi

Pondasi yang direncanakan dalam perhitungan gedung ini adalah pondasi telapak, kondisi tanah pada lokasi adalah tanah baik. Cara perencanaan pondasi pelat ini sama dengan perencanaan pelat dua arah pada umumnya hanya pada bagian bawah dari pelat pondasi ini diberi balok sloof yang berfungsi sebagai pengikat kolom.

Perencanaan pondasi telapak :

1. Pemeriksaan terhadap kuat geser

   Gaya geser total terfaktor yang bekerja pada penampang kritis :

   $Vu = pu (A^2 - B^2)$

   pu = Tekanan tanah terfaktor yang diakibatkan beban yang bekerja

   A = Luas telapak pondasi empat persegi panjang

   B = Lebar kolom + tinggi efektif

   Kuat geser beton :

   $Vc = (1 + (2/\beta c)) . (2.\sqrt{f'c} . bo . d) \leq 4 \sqrt{f'c} . bo . d$

   βc = rasio panjang / lebar kolom = 1

   bo = 4B

   sehinggga kuat geser maksimum adalah :

   $Vc = 4 \sqrt{f'c} . bo . d$

   $\phi Vn = \phi Vc \Rightarrow Vu < \phi Vn$

2. Penulangan Momen

   Untuk perencanaan penulangan pondasi sama dengan penulangan pelat digunakan ketentuan sebagai berikut :

$$As = \frac{Mn}{fy.(0,9)d}$$

Cek rasio penulangan (ρ) :

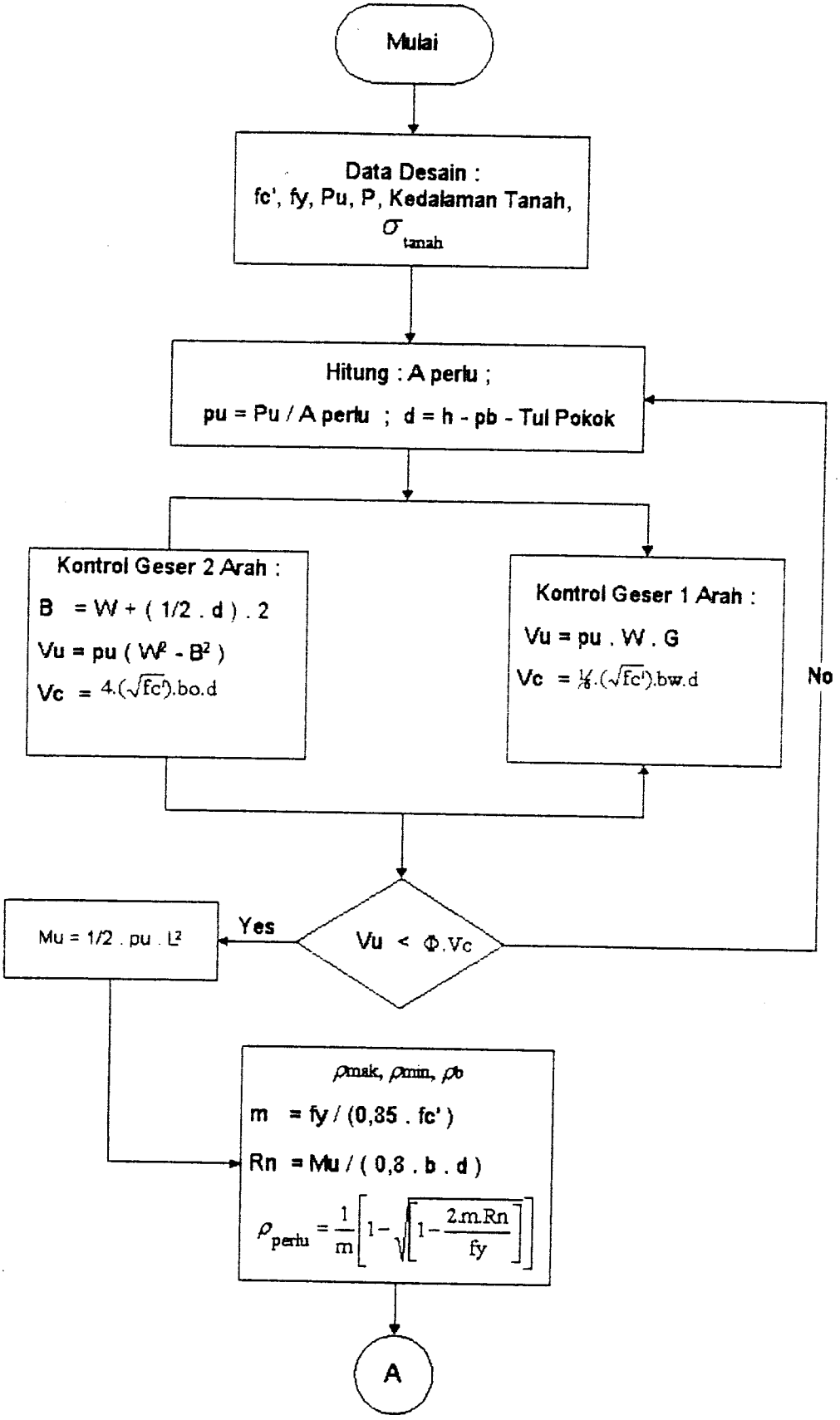
a. Bila $As < Asmin$

$$As\,min = \frac{1,4}{fy}.b.d$$

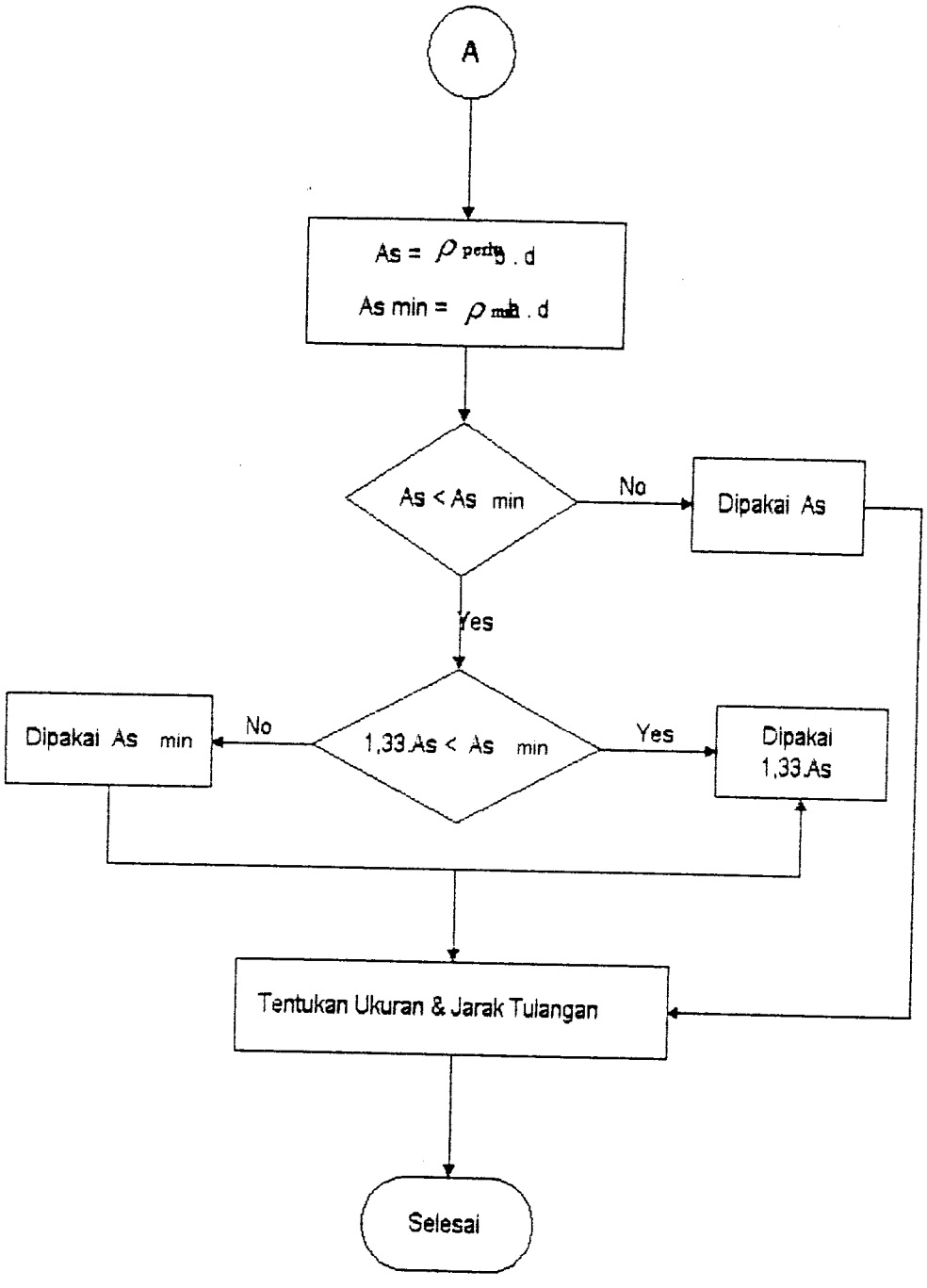
dan

b. 1). $1,33.As > Asmin \Rightarrow$ dipakai Asmin

2). $1,33\,As < Asmin \Rightarrow$ dipakai $1,33\,As$



Gambar 2.4 Diagram Alir Desain Pondasi



Sambungan Gambar 2.4

2.8. Perencanaan Kuda-kuda

Ketentuan umum perencanaan kuda-kuda baja menggunakan rumus-rumus AISC (American Institute of Steel Construction).

A. Perencanaan Gording

$$\frac{fb\perp}{0{,}66 \cdot Fy} + \frac{fb//}{0{,}75 \cdot Fy} \leq 1$$

Lendutan :

$$\delta\perp = \frac{5}{384} \cdot \frac{q\perp (Ly)^4}{E \cdot Ix} \leq L/360$$

$$\delta// = \frac{5}{384} \cdot \frac{q.//.(Lx/(a+1))^4}{E \cdot Iy} \leq L/360$$

a = jumlah sagrod dalam satu lubang

B. Perencanaan Sagrod

$$A_{sagrod} = \frac{P}{0{,}33 \cdot Fu} = \tfrac{1}{4} \cdot \pi \cdot D^2_{sagrod}$$

D yang dipakai = D_{sagrod} + 3 mm

C. Perencanaan Tierod

$$T = P// \cdot \cos\alpha \quad ; \quad A_{tierod} = \frac{T}{0{,}33 \cdot Fu} = \tfrac{1}{4} \cdot \pi \cdot D^2_{tierod}$$

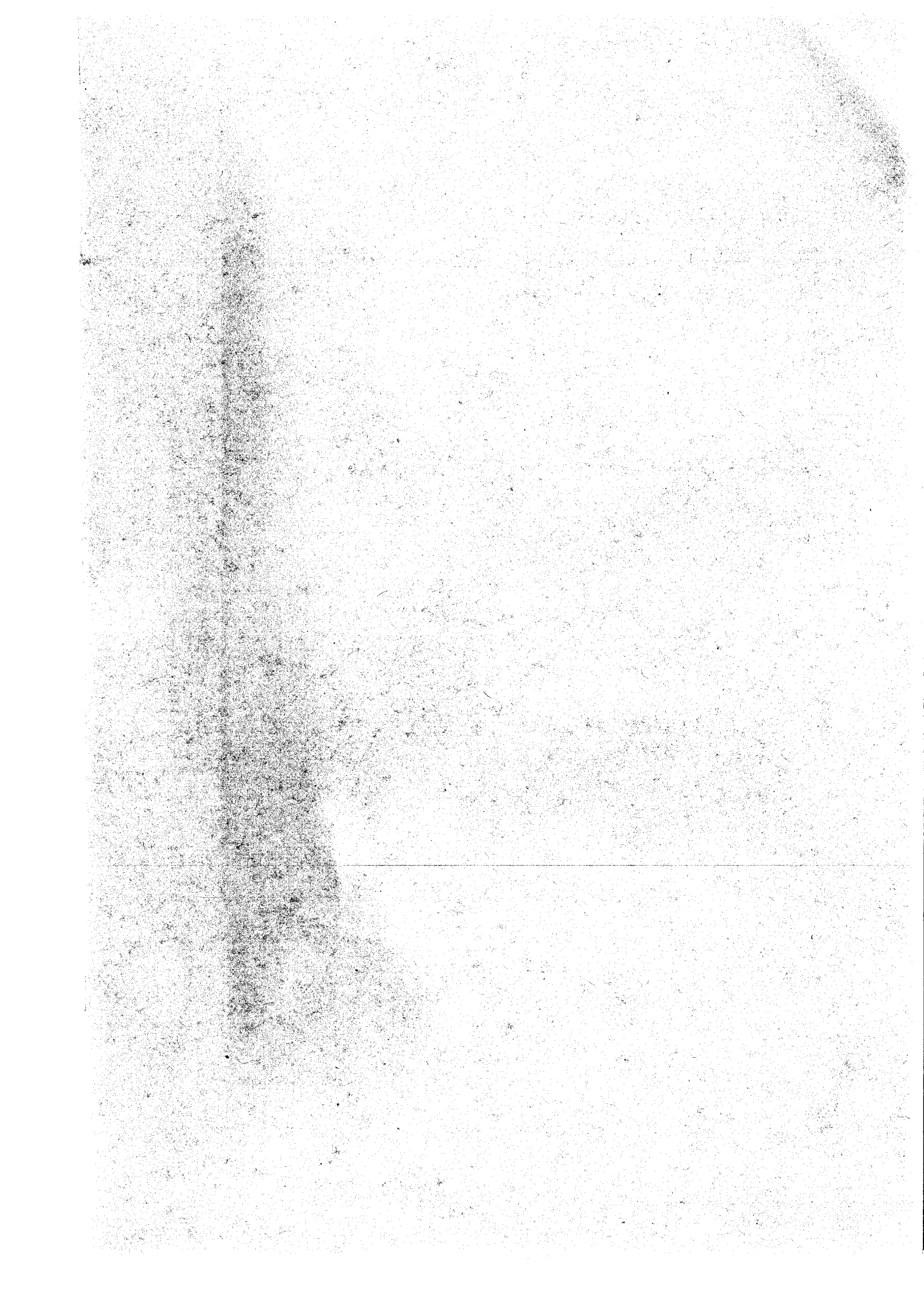
D yang dipakai = D_{tierod} + 3 mm

D. Perencanaan Sambungan

$P_{tumpuan} = tp \cdot D_{baut} \cdot 1{,}2 \cdot Fu \cdot n$

$P_{geser} = \tfrac{1}{4} \cdot \pi \cdot D^2 \cdot 0{,}33 \cdot Fu \cdot 2n$

Diambil P yang terkecil.

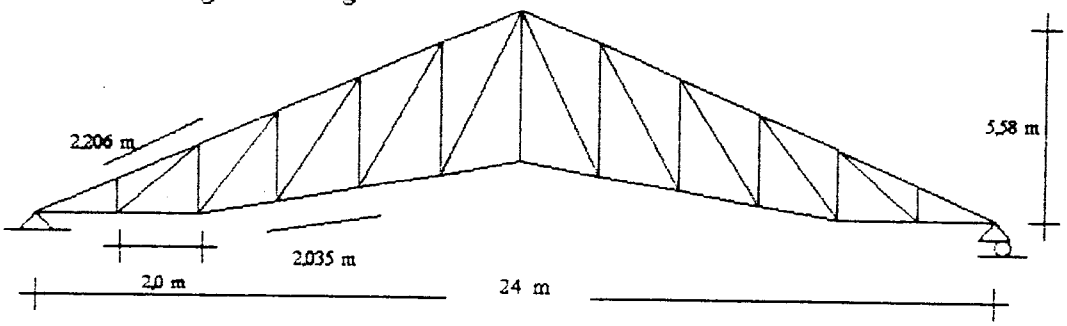


BAB III

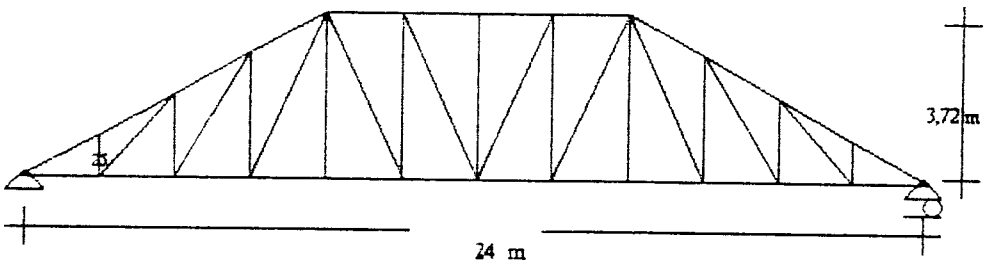
PERHITUNGAN KONSTRUKSI

3.1. Perancangan Kuda-Kuda

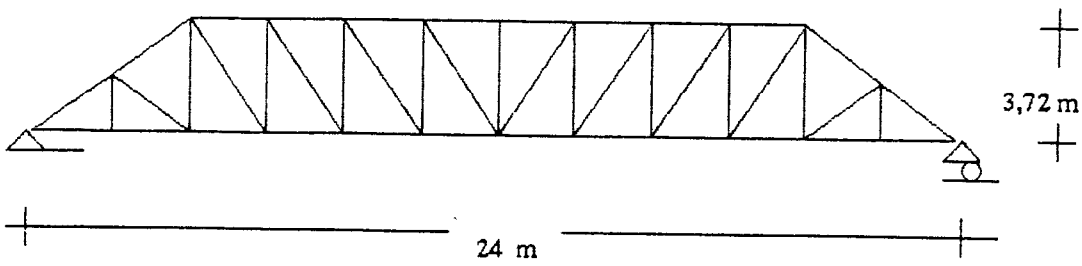
3.1.1. Perancangan Gording



Gambar 3.1 Kuda - Kuda KT



Gambar 3.2 Kuda-kuda KT1



Gambar 3.3 Kuda-kuda KT2

1. Pembebanan Gording

A. Beban tetap

1. berat penutup atap = 50 . 2,206 = 110,3 kg / m
2. beban hidup = 20 . 2,206 = 44,12 kg / m
3. beban gording = 6,76 kg / m

q = 161,18 kg / m

Beban Sejajar Atap (q //) = q . sin α

= 161,18 . sin 25°

= 68,12 kg / m

Beban Tegal Lurus Atap (q $\perp$) = q . cos α

= 161,08 . cos 25°

= 146,08 kg / m

B. Beban angin (w)

1. angin tekan (wt)

C_1 = 0,02 . α - 0,4

= 0,02 . 25° - 0,4

= 0,1

wt = C_1 x w x jarak gording

= 0,1 . 25 . 2,206

= 5,515 kg / m

2. angin hisap (wh)

C_2 = - 0,4

wt = C_2 x w x jarak gording

= - 0,4 . 25 . 2,206

= - 22,06 kg / m

2. Perhitungan Momen

A. akibat beban tetap

$q // = 68,12 \text{ kg / m}$

$q \perp = 146,08 \text{ kg / m}$

1. $M \perp = \frac{1}{8} . q_{\perp} . L_{\perp}^2 = \frac{1}{8} . 146,08 . 4^2 = 292,16 \text{ kgm}$

2. $M // = \frac{1}{90} . q_{//} . L_{//}^2 = \frac{1}{90} . 68,12 . 4^2 = 12,11 \text{ kgm}$

B. akibat beban angin

wh = - 22,06 kg/m

wt = 5,515 kg/m

$M \max = \frac{1}{8} . 5,515 . 4^2 = 11,03 \text{ kgm}$

3. Dimensi Gording

A. Data profil C 150x50x20x3,2 dengan berat 6,76 kg / m

Ix = 280 cm^4 Iy = 28,3 cm^4

wx = 37,4 cm^3 wy = 8,19 cm^3

akibat beban tetap

$$fbx = \frac{M \perp}{wx} = \frac{292,16.10^2}{37,4} = 781,176 \text{ kg / cm}^2$$

$$fby = \frac{M //}{wy} = \frac{12,1110^2}{8,19} = 147,86 \text{ kg / cm}^2$$

$$\frac{fbx}{0,66.Fy} + \frac{fby}{0,75.Fy} = \frac{781,176}{0,66.2500} + \frac{147,86}{0,75.2500}$$

$$= 0,55 < 1,0$$

4. Kontrol Lendutan

$$\delta_{\perp} = \frac{5}{384}.\frac{q_{\perp}.Ly^4}{E.Ix} = \frac{5}{384}.\frac{146,08.10^{-2}.400^4}{2,1.10^6.280} = 0,828\ cm \leq 400/360 = 1,11cm$$

$$\delta_{//} = \frac{5}{384}.\frac{q_{//}.Lx^4}{E.Iy} = \frac{5}{384}.\frac{68,12.10^{-2}.[400/(2+1)]^4}{2,1.10^6.28,3} = 0,0344\ cm \leq 1,11\ cm$$

5. Perencanaan Sagrod dan Tierod

A. Beban Sagrod

1. berat penutp atap x (1/2.L/cos α)

= 50.1/2.24 /cos25 ° = 662,027 kg/m

2. beban hidup x (1/2.L /cos α)

= 20.1/2.24 / cos25 ° = 264,81 kg/m

3. jumlah gording satu sisi x berat gording

= 7.6,76 = 47,32 kg/m

P = 974,157 kg/m

$P_{//}$ = P.sin α . jarak antar sagrod

= 974,157 sin 25 °.4/3

= 548,928 kg

B. Dimensi Sagrod.

$$A\ sagrod = \frac{P_{//}}{0,33.Fu} = \frac{548,928}{0,33.3600} = 0,46\ cm^2$$

$$D = \sqrt{\frac{4.P}{0,33.Fu.\pi}}$$

$$D = \sqrt{\frac{4.548,928}{0,33.3600.\pi}}$$

D = 0,767 cm

dipakai diameter sagrod

D sagrod = D + 3 mm

= 0,767 + 0,3

= 1,067 cm = 10,67 mm ≈ 12 mm → ∅ 12

A ∅ 12 = ¼ π. D^2 = ¼ π. $1,2^2$

= 1,13 cm^2 > 0,46 cm^2

chek :

$$\frac{P_{//}}{A\ sagrod} \leq 0,33.Fu$$

$$\frac{548,928}{1,13} \leq 1188$$

485,77 ≤ 1188 kg/cm^2

C. Dimensi Tierod

T = P// cos α

= 548,928 cos 25°

= 497,498 kg

$$A\ tierod = \frac{T}{0,33.Fu} = \frac{497,498}{0,33.3600} = 0,418 cm^2$$

$$D = \sqrt{\frac{4.T}{0,33.Fu.\pi}}$$

$$= \sqrt{\frac{4.497,498}{0,33.3600.\pi}}$$

= 0,73 cm

dipakai diameter tierod

D tierod = D + 3 mm

= 0,73 + 0,3

= 1,03 cm = 10,3 mm ≈ 12 mm → ∅ 12

A ∅ 12 = ¼ π .D^2 = ¼ π. $1,2^2$

= 1,13 cm^2 > 0,46 cm^2

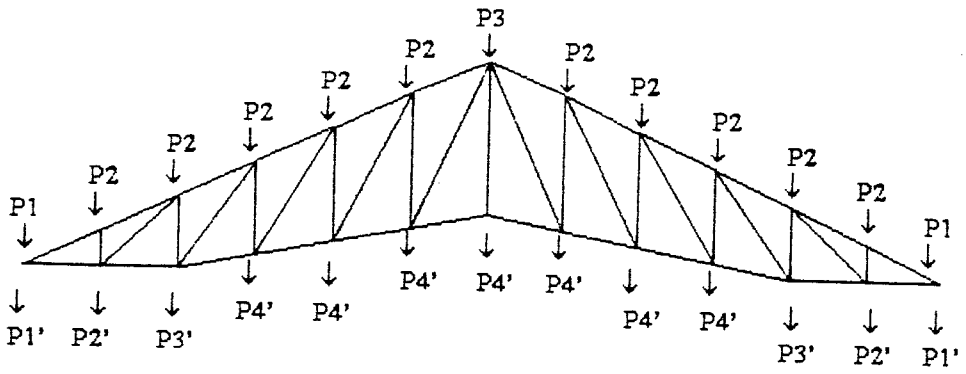
chek :

$$\frac{T}{A \text{ tierod}} \leq 0,33.Fu$$

$$\frac{497,498}{1,13} \leq 1188$$

440,26 ≤ 1188 kg/cm^2

3.1.2. Perencanaan Kuda-kuda KT



Gambar 3.4 Kuda - Kuda KT Akibat Beban Tetap

1. Pembebanan kuda-kuda KT

A. Beban tetap

1. berat gording = 6,76 kg / m
2. berat eternit + penggantung = 18 kg / m^2
3. berat penutup atap = 50 kg / m^2
4. beban hidup = 20 kg / m^2
5. taksiran berat kuda-kuda = 120 kg / m

a. Beban masing-masing joint

1. P1

berat gording = 6,76 . 4 = 27,04 kg
berat penutup atap = 50 . 4 . ½ . 2,206 = 220,6 kg
beban hidup = 20 . 4 . ½ . 2,206 = 88,24 kg
P1 = 335,08 kg

2.P2

berat gording = 6,76 . 4 = 27,04 kg
berat penutup atap = 50 . 4 . 2,206 = 441,2 kg
beban hidup = 20 . 4 . 2,206 = 176,48 kg
P2 = 644,72 kg

3. P3

berat gording = 2 . 6,76 . 4 = 54,08 kg
berat penutup atap = 50 . 4 . 2,206 = 441,2 kg
beban hidup = 20 . 4 . 2,206 = 176,48 kg
P3 = 671,76 kg

4. P1'

berat eternit + plafond = 18 . 4 . ½ . 2 = 72 kg
berat taksiran kuda-kuda = 120 . ½ . 2 = 120 kg
P1' = 192 kg

5. P2'

berat eternit + plafond = 18 . 4 . 2 = 144 kg

berat taksiran kuda-kuda = 120 . 2 = 240 kg

P2' = 384 kg

6. P3'

berat eternit + plafond = 18 . 4 . ½ . (2 + 2,035) = 145,26 kg

berat taksiran kuda-kuda = 120 . ½ . (2 + 2,035) = 242,1 kg

P3' = 387,36 kg

7. P4'

berat eternit + plafond = 18 . 4 . 2,035 = 146,52 kg

berat taksiran kuda-kuda = 120 . 2,035 = 244,2 kg

P1' = 390,72 kg

B. Beban angin

muatan angin = 25 kg / m^2

a. beban yang bekerja

C1 = 0,02 . 25 - 0,4 = 0,1

C2 = - 0,4

wt = 0,1 . 25 = 2,5 kg / m^2

wh = - 0,4 . 25 = - 10 kg / m^2

b. angin kiri

1. sisi kiri

w1 = 2,5 . ½ . 2,206 . 4 = 11,03 kg

w2 = 2,5 . 2,206 . 4 = 22,06 kg

2. sisi kanan

w1 = - 10 . ½ . 2,206 . 4 = - 44,12 kg

w2 = - 10 . 2,206 . 4 = - 88,24 kg

c. angin kanan

1. sisi kanan

w1 = 2,5 . ½ . 2,206 . 4 = 11,03 kg

w2 = 2,5 . 2,206 . 4 = 22,06 kg

2. sisi kiri

w1 = - 10 . ½ . 2,206 . 4 = - 44,12 kg

w2 = - 10 . 2,206 . 4 = - 88,24 kg

3.1.3. Perencanaan Plat Tumpuan Kuda - Kuda

P = 6225,48 kg

fc ' = 20 Mpa = 200 kg/cm^2

$$A \text{ perlu} = \frac{P}{0{,}33.fc'}$$

$$= \frac{6225{,}48}{0{,}33.200}$$

$$= 94{,}325 \text{ cm}^2$$

dipakai B = 15 cm ; L = 20 cm

$$q = \frac{P}{B.L}$$

$$= \frac{6225{,}48}{15.20}$$

$$= 20{,}75 \text{ kg/cm}^2$$

diambil b = 1 satuan

maka, q = 20,75 . 1

= 20,75 kg/cm

$M = \frac{1}{2} . q . x^2$

$= \frac{1}{2} . 20,75 . 2,88^2$

= 86,05 kgcm

$tp = \sqrt{10 \frac{M}{Fy}}$

$= \sqrt{10 \frac{86,05}{2500}}$

= 0,587 cm ≈ 6 mm

dipakai plat tumpu : 150 x 200 x 6

3.1.4. Perencanaan Dukungan Arah Lateral

Lc = Jarak kuda-kuda = 4,0 m

Lb = Panjang satu batang atas = 2,206 m

$L = \sqrt{Lc^2 + Lb^2}$

$L = \sqrt{4,0^2 + 2,206^2}$

L = 4,56 m

Dipakai Profil ∅ 16

3.1.5. Perencanaan Baut dan Sambungan

1. Perhitungan kekuatan baut ijin

Dipakai baut ϕ 1/2" = 1,27 cm

Tebal plat sambung (tp) = 1 cm

Tegangan luluh baja profil (Fy) = 2500 kg/cm^2

Kuat Tarik Baja Profil (Fu) = 3700 kg/cm^2

Fa tarik = 0,33. Fu

= 0,33 . 3700

= 1227 kg/cm^2

Fa tumpuan = 1,2 . Fu

= 1,2 . 3700

= 4440 kg/cm^2

P tumpuan = tp . D baut . 1,2 . Fu . n

= 1 . 1,27 . 1,2 . 3700 . n

= 5638,8 n

P geser = ¼ . π . D^2 . 0,33 . Fu . 2n

= ¼ . π . 1,27^2 . 0,33 . 3700 . 2n

= 3093,449 n

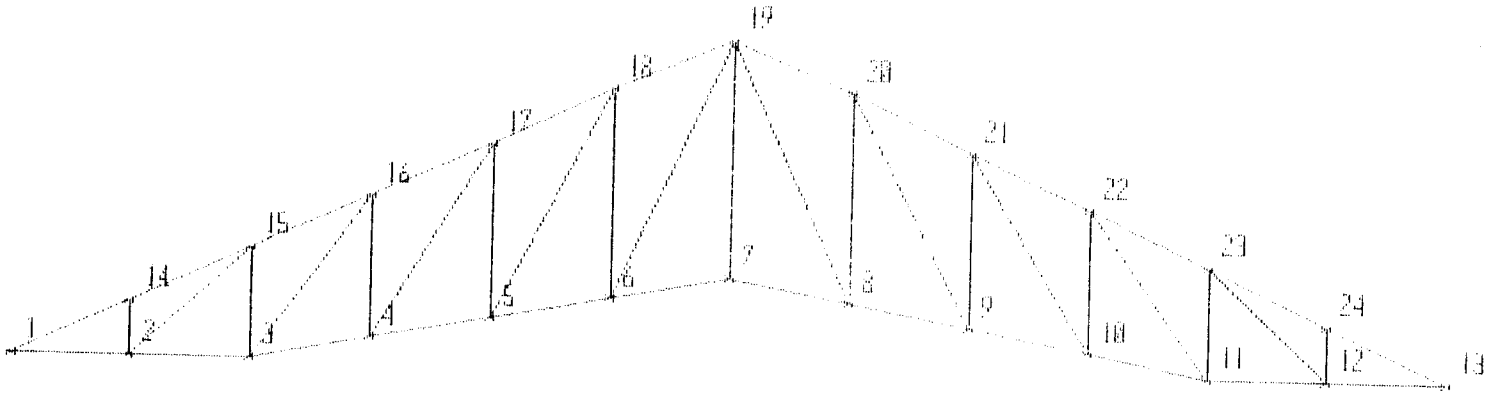
Diambil P yang kecil P = 3093,449 n

3.1.6. HITUNGAN KUDA - KUDA KT

```
HITUNGAN KUDA-KUDA TON-METER
SYSTEM
L=3
JOINTS
1 X=0    Y=0      Z=0
3        Y=4      Z=0          G=1,3,1
4        Y=6      Z=0.375
5        Y=8      Z=0.75
6        Y=10     Z=1.125
7        Y=12     Z=1.5
8        Y=14     Z=1.125
9        Y=16     Z=0.75
10       Y=18     Z=0.375
11       Y=20     Z=0
13       Y=24     Z=0          G=11,13,1
14       Y=2      Z=0.93
15       Y=4      Z=1.86
16       Y=6      Z=2.79
17       Y=8      Z=3.7
18       Y=10     Z=4.65
19       Y=12     Z=5.5
20       Y=14     Z=4.65
21       Y=16     Z=3.7
22       Y=18     Z=2.79
23       Y=20     Z=1.86
24       Y=22     Z=0.93
:
RESTRAINTS
1            R=1,1,1,0,1,1
13           R=1,0,1,0,1,1
2   12   1   R=1,0,0,0,1,1
14  24   1   R=1,0,0,0,1,1
:
FRAME
NM=4     Z=-1
C MATERIAL PROPERTIES
1       SH=2L2X2X1/4       W=2*5.42E-3          E=2.1E7
2       SH=2L2X2X1/8       W=2*4.95E-3
3       SH=2L2X2X1/8       W=2*4.95E-3
4       SH=2L3X3X3/16      W=2*7.94e-3
C ELEMEN LOCATION DATA
C BATANG BAWAH
1   1   2    LR=1,1,0,1,1,1        G=1,1,1,1        M=1        LP=3,0
3   3   4    LR=1,1,0,1,1,1        G=7,1,1,1
11  11  12   LR=1,1,0,1,1,1        G=1,1,1,1
C BATANG VERTIKAL
13  2   14   LR=1,1,0,1,1,1        G=1,20,10,10     M=2        LP=3,0
15  3   15   LR=1,1,0,1,1,1        G=1,16,8,8
17  4   16   LR=1,1,0,1,1,1        G=1,12,6,6
19  5   17   LR=1,1,0,1,1,1        G=1,8,4,4
21  6   18   LR=1,1,0,1,1,1        G=1,4,2,2        M=4
23  7   19   LR=1,1,0,1,1,1                         M=2
C BATANG DIAGONAL
14  2   15   LR=1,1,0,1,1,1        G=1,18,10,8      M=3    LP=3,0
16  3   16   LR=1,1,0,1,1,1        G=1,14,8,6
```

```
18   4    17    LR=1,1,0,1,1,1          G=1,10,6,4
20   5    18    LR=1,1,0,1,1,1          G=1,6,4,2
22   6    19    LR=1,1,0,1,1,1          G=1,2,2,0
C BATANG ATAS
34    1    14 LR=1,1,0,1,1,1                              M=4          LP=3,0
35   14    15 LR=1,1,0,1,1,1          G=9,1,1,1
45   24    13 LR=1,1,0,1,1,1
:
LOADS
C BEBAN PADA JOINT
14   18    1           F=0,0,-0.64472,0,0,0                    L=1
19                     F=0,0,-0.67176,0,0,0
20   24    1           F=0,0,-0.64472,0,0,0
2                      F=0,0,-0.384,0,0,0
3                      F=0,0,-0.38736,0,0,0
4    10    1           F=0,0,-0.39072,0,0,0
11                     F=0,0,-0.38736,0,0,0
12                     F=0,0,-0.384,0,0,0
C AKIBAT BEBAN ANGIN KIRI
14   18    1           F=0,0.00932,-0.01999,0,0,0              L=2
19                     F=0,0.02331,0.03,0,0,0
20   24    1           F=0,0.03729,0.07997,0,0,0
C AKIBAT BEBAN ANGIN KANAN
14   18    1           F=0,-0.03729,0.07997,0,0,0              L=3
19                     F=0,-0.02331,0.03,0,0,0
20   24    1           F=0,-0.00932,-0.01999,0,0,0
:
COMBO
1    C=1,0,0
2    C=1,1,0
3    C=1,0,1


HITUNGAN SAPSTL KUDA - KUDA KT
DATA BAJA UNTUK TRUSS KUDAS
CONTROL
IX=0    IP=0  IU=M IT=1
COMBO
1       C=1000
2       C=1000,1000,0
3       C=1000,0,1000
:
SECTIONS
C MATERIAL PROPERTIES
1 SH=2L2X2X1/4   E=2.1E10 MN=S FY=2.5E7
F=1.7E7,1.7E7,1.7E7,1.25E7,1.42E7
2 SH=2L2X2X1/8   E=2.1E10 MN=S FY=2.5E7
F=1.7E7,1.7E7,1.7E7,1.25E7,1.42E7
3 SH=2L2X2X1/8   E=2.1E10 MN=S FY=2.5E7
F=1.7E7,1.7E7,1.7E7,1.25E7,1.42E7
4 SH=2L3X3X3/16  E=2.1E10 MN=S FY=2.5E7
F=1.7E7,1.7E7,1.7E7,1.25E7,1.42E7
```



Gambar 3.5. Nomer Joint Struktur Rangka " Kuda-Kuda KT "

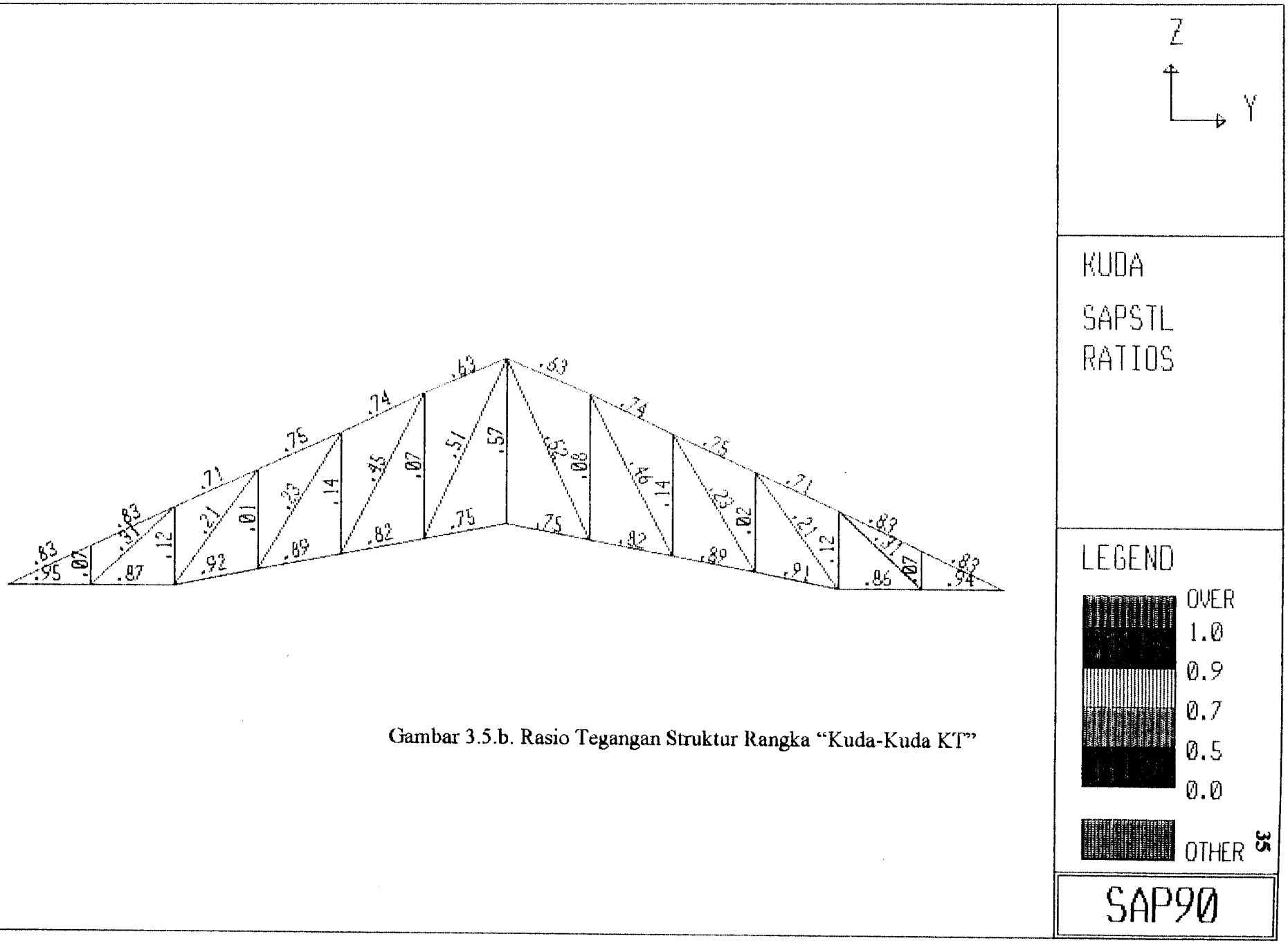
kuda

UNDEFORMED SHAPE

OPTIONS

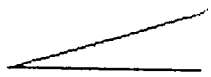
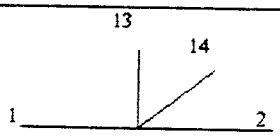
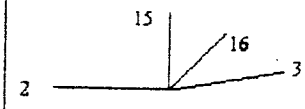
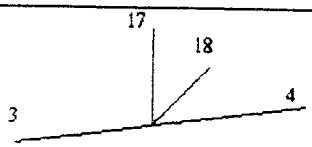
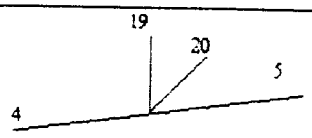
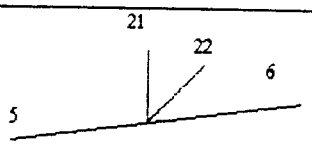
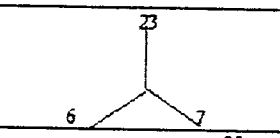
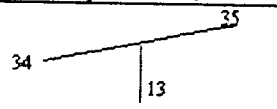
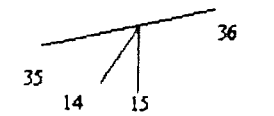
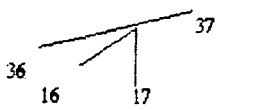
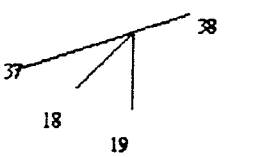
JOINT IDS
ALL JOINTS
WIRE FRAME

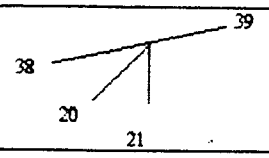
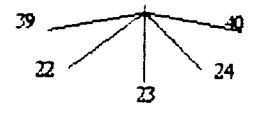
SAP90



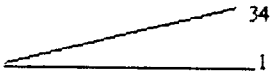
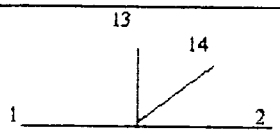
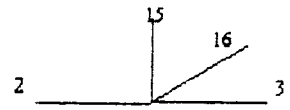
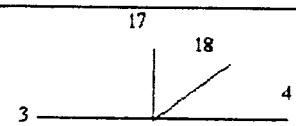
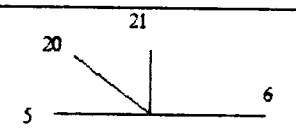
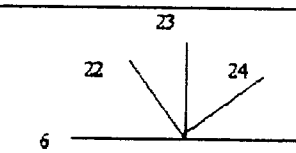
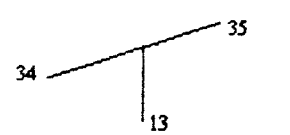
Gambar 3.5.b. Rasio Tegangan Struktur Rangka "Kuda-Kuda KT"

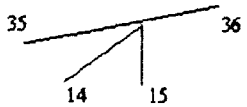
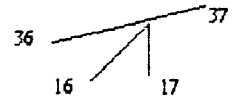
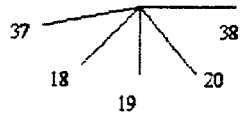
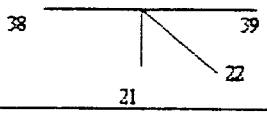
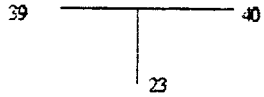
TABEL 3.1 PERHITUNGAN KEBUTUHAN BAUT KUDA-KUDA KT

Titik	ARAH GAYA		ϕBAUT cm	Gaya Batang kg	Daya Dukung Baut kg	Jumlah Baut
1		34 1	1,27 1,27	13510 12360	3093,45	5 4
2		1 2 13 14	1,27 1,27 1,27 1,27	12360 11220 670 1550	3093,45	4 4 2 2
3		2 3 15 16	1,27 1,27 1,27 1,27	11220 11860 1200 790	3093,45	4 4 2 2
4		3 4 17 18	1,27 1,27 1,27 1,27	11860 11480 150 720	3093,45	4 4 2 2
5		4 5 19 20	1,27 1,27 1,27 1,27	11480 10490 1340 2150	3093,45	4 4 2 2
6		5 6 21 22	1,27 1,27 1,27 1,27	10490 9520 1610 2400	3093,45	4 4 2 2
7		6 7 23	1,27 1,27 1,27	9520 9520 3900	3093,45	4 4 2
14		13 34 35	1,27 1,27 1,27	670 13510 13510	3093,45	2 5 5
15		14 15 35 36	1,27 1,27 1,27 1,27	1550 1200 13510 12290	3093,45	2 2 5 4
16		16 17 36 37	1,27 1,27 1,27 1,27	790 150 12290 12740	3093,45	2 2 4 5
17		18 19 37 38	1,27 1,27 1,27 1,27	720 1340 12740 12470	3093,45	2 2 5 5

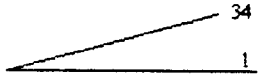
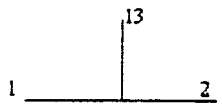
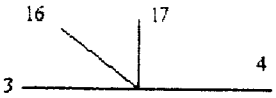
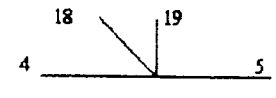
18		20 21 38 39	1,27 1,27 1,27 1,27	2150 1610 12470 11200	3093,45	2 2 5 4
19		22 23 24 39 40	1,27 1,27 1,27 1,27 1,27	2400 3900 2440 11200 11200	3093,45	2 2 2 4 4

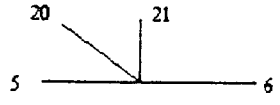
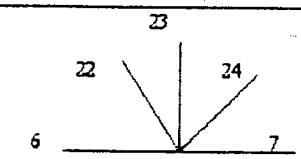
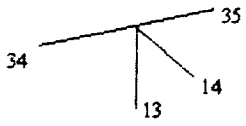
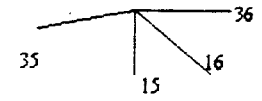
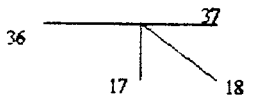
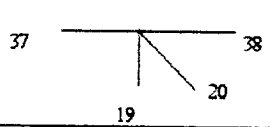
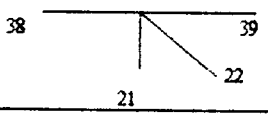
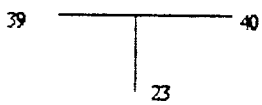
TABEL 3.2 PERHITUNGAN KEBUTUHAN BAUT KUDA-KUDA KT1

Titik	ARAH GAYA		ϕBAUT cm	Gaya Batang kg	Daya Dukung Baut kg	Jumlah Baut
1		34 1	1,27 1,27	12200 13280	3093,45	4 5
2		1 2 13 14	1,27 1,27 1,27 1,27	12200 11070 670 1550	3093,45	4 4 2 2
3		2 3 15 16	1,27 1,27 1,27 1,27	11070 9940 1200 1940	3093,45	4 4 2 2
4		3 4 17 18	1,27 1,27 1,27 1,27	9940 8850 1620 2280	3093,45	4 3 2 2
5		4 5 19	1,27 1,27 1,27	8850 8850 380	3093,45	3 3 2
6		5 6 20 21	1,27 1,27 1,27 1,27	8850 9590 1790 1190	3093,45	3 4 2 2
7		6 7 22 23 24	1,27 1,27 1,27 1,27 1,27	9590 9470 690 590 670	3093,45	4 4 2 2 2
14		13 34 35	1,27 1,27 1,27	670 13280 13290	3093,45	2 5 5

15		14 15 35 36	1,27 1,27 1,27 1,27	1550 1200 13290 12050	3093,45	2 2 5 4
16		16 17 36 37	1,27 1,27 1,27 1,27	1940 1620 12050 10770	3093,45	2 2 4 4
17		18 19 20 37 38	1,27 1,27 1,27 1,27 1,27	2280 380 1790 10770 9460	3093,45	2 2 2 4 4
18		21 22 38 39	1,27 1,27 1,27 1,27	1190 690 9460 9720	3093,45	2 2 4 4
19		23 39 40	1,27 1,27 1,27	590 9720 9720	3093,45	2 4 4

TABEL 3.3 PERHITUNGAN KEBUTUHAN BAUT KUDA-KUDA KT2

Titik	ARAH GAYA		ϕBAUT cm	Gaya Batang kg	Daya Dukung Baut kg	Jumlah Baut
1		34 1	1,27 1,27	11920 13070	3093,45	4 5
2		1 2 13	1,27 1,27 1,27	11920 11920 380	3093,45	4 4 2
3		2 3 15 16	1,27 1,27 1,27 1,27	11920 10730 1210 940	3093,45	4 4 2 2
4		3 4 17 18	1,27 1,27 1,27 1,27	10730 14330 5030 3050	3093,45	4 6 2 2
5		4 5 18 19	1,27 1,27 1,27 1,27	14330 16890 3610 2080	3093,45	5 6 2 2

6		5 6 20 21	1,27 1,27 1,27 1,27	16890 18410 2180 1110	3093,45	6 6 2 2
7		6 7 22 23 24	1,27 1,27 1,27 1,27 1,27	18410 18340 760 590 760	3093,45	6 6 2 2 2
14		13 14 34 35	1,27 1,27 1,27 1,27	380 1310 13070 11790	3093,45	2 5 5 4
15		14 15 35 36	1,27 1,27 1,27 1,27	940 5030 11790 14280	3093,45	2 2 4 5
16		17 18 36 37	1,27 1,27 1,27 1,27	3050 3610 14280 16830	3093,45	2 2 5 6
17		19 20 37 38	1,27 1,27 1,27 1,27	2080 2180 16830 18350	3093,45	2 2 6 6
18		21 22 38 39	1,27 1,27 1,27 1,27	1110 760 18350 18840	3093,45	2 2 6 7
19		23 39 40	1,27 1,27 1,27	590 18840 18840	3093,45	2 7 7

3.2. Perhitungan Pelat

3.2.1. Pembebanan

1. Beban Mati Pelat

Tebal Pelat diambil 0,12 m

Berat sendiri = 0,12 x 23 = 2,76 KN/m^2

Ubin 2 cm = 0,02 x 23 = 0,46 KN/m^2

Spesi 1 cm = 0,01 x 23 = 0,23 KN/m^2

Pasir 5 cm = 0.05x 23 = 1,15 KN/m^2

Langit-langit +

Penggantung = 18x0,00981 = 0,1766 KN/m^2

qd = 4,766 KN/m^2

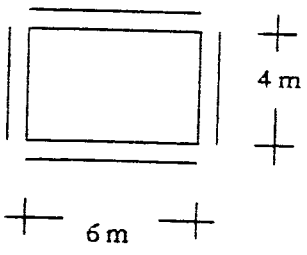
2. Beban Hidup Pelat

Tabel 3.1 Data beban hidup pelat

Pelat AC	=	100 kg/m^2
R. Baca, A. Visual, Gudang Kelas, Kelas Kecil, R. Diskusi, Kantor, Musolla,Toilet.	=	250 kg/m^2
Selasar, Kelas Kecil Tingkat, Kelas Besar Tingkat, Hall.	=	300 kg/m^2
Common Fasilities, Perpustakaan, Laboratorium, Gudang Lift.	=	400 kg/m^2

3.2.2. Perhitungan Pelat

1. Pelat C



ql = 250 kg/m^2 = 2,5 KN/m^2

qd = 4,766 KN/m^2

Tebal pelat lantai = 12 cm

Penutup beton = 25 mm

Diameter tulangan pokok = ∅ 10 ⇒ Fy = 240 Mpa

d = 120 - 25 - 10/2 = 90 mm

Konstruksi dianggap terjepit elastis

Ly / Lx = 6 / 4 = 1,5

qu = 1,2 . qd + 1,6 . ql

= 1,2 . 4,766 + 1,6 . 2,5

= 9,719 KN/m

Koefisien momen

Mlx = - (Mtx) = 0,001 . qu . Lx^2 . x = 0,001 . 9,719 . 4^2 . 56 = 8,708 KN m

(Mly) = 0,001 . qu . Lx^2 . x = 0,001 . 9,719 . 4^2 . 37 = 5,754 KN m

- (Mty) = 0,001 . qu . Lx^2 . x = 0,001 . 9,719 . 4^2 . 37 = 5,754 KN m

a. Perhitungan pemulangan arah lx dan tx (diambil b = 1000 mm = 1 m)

Mulx = 8,708 KN m

Mulx / Φ = 8,708 / 0,8 = 10,885 KN m

$$\rho b = \frac{0{,}85 . F'c . \beta 1}{Fy}\left(\frac{600}{600+Fy}\right) = \frac{0{,}85 . 20 . 0{,}85}{240}\left(\frac{600}{600+240}\right) = 0{,}043$$

ρ mak = 0,75 . ρb = 0,75 . 0,043 = 0,03225

$$\rho \text{ min} = \frac{1{,}4}{Fy} = \frac{1{,}4}{240} = 0{,}00583$$

Misal (d - a/2) = 0,9 . d = 0,9 . 90 = 81 mm

$$As = \frac{Mu / \Phi}{Fy . (d - a/2)} = \frac{10{,}885 . 10^6}{240 . 81} = 559{,}954 \text{ mm}^2$$

As min = ρ min . 1000 . d = 0,00583 . 1000 . 90 = 524,7 mm^2 < As

Dipakai As = 559,945 mm^2 ; dengan ∅ 10 = ¼ . π . 10^2 = 78,539 mm^2

$$X = \frac{A\varnothing 10 \,.\, 1000}{As} = \frac{78{,}539.1000}{559{,}954} = 140{,}259 \text{ mm}$$

Maka dipakai ∅10 - 100

Kontrol kekuatan

$$As = \frac{A\varnothing 10.1000}{100} = \frac{78{,}539.1000}{100} = 785{,}39 \text{ mm}^2$$

$$a = \frac{As.Fy}{0{,}85.F'c.1000} = \frac{785{,}39.240}{0{,}85.20.1000} = 11{,}088 \text{ mm}$$

Mn = As . Fy . (d - a/2)

= 785,39 . 240 (90 - 11,088/2)

= 15,919 KN m > Mulx =10,885 KN m

Penulangan bagi dibagian tumpuan tx

As bagi = 20 % As tulangan pokok = 20 % . 559,954 = 111,991 mm^2

A ∅8 = ¼ . π . 8^2 = 50,265 mm^2

$$X = \frac{A\varnothing 8 \,.\, 1000}{As\ bagi} = \frac{50{,}265.1000}{111{,}991} = 448{,}831 \text{ mm}$$

Maka dipakai ∅8 - 200

b. Perhitungan penulangan arah ly dan ty (diambil b = 1000 mm = 1 m)

Muly = 5,754 KN m

Mu / Φ = 5,754 / 0,8 = 7,193 KN m

$$\rho b = \frac{0{,}85.F'c.\beta 1}{Fy}\left(\frac{600}{600+Fy}\right) = \frac{0{,}85.20.0{,}85}{240}\left(\frac{600}{600+240}\right) = 0{,}043$$

ρ mak = 0,75 . ρb = 0,75 . 0,043 = 0,03225

$$\rho \text{ min} = \frac{1,4}{Fy} = \frac{1,4}{240} = 0,00583$$

Misal $(d - a/2) = 0;9 \,.\, d = 0,9 \,.\, 90 = 81$ mm

$$As = \frac{Mu / \Phi}{Fy \,.\, (d - a/2)} = \frac{7,193.10^6}{240.81} = 369,969 \text{ mm}^2$$

As min $= \rho$ min $\,.\, 1000 \,.\, d = 0,00583 \,.\, 1000 \,.\, 90 = 524,7 \text{ mm}^2 > As$

Chek : $1,33 \,.\, As = 1,33 \,.\, 369,969 = 492,059 \text{ mm}^2 < As$ min

Dipakai $1,33.As = 492,059 \text{ mm}^2$; dengan $\varnothing 10 = \frac{1}{4} \,.\, \pi \,.\, 10^2 = 78,539 \text{ mm}^2$

$$X = \frac{A\varnothing 10 \,.\, 1000}{As \,.\, 1,33} = \frac{78,539.1000}{492,059} = 159,595 \text{ mm}$$

Maka dipakai $\varnothing 10 - 100$

Kontrol kekuatan

$$As = \frac{A\varnothing 10.1000}{100} = \frac{78,539.1000}{100} = 785,39 \text{ mm}^2$$

$$a = \frac{As.Fy}{0,85.F'c.1000} = \frac{785,39.240}{0,85.20.1000} = 11,088 \text{ mm}$$

$Mn = As \,.\, Fy \,.\, (d - a/2)$

$= 785,39 \,.\, 240 \;\; (90 - 11,088/2)$

$= 15,919$ KN m $>$ Muly $= 7,193$ KN m

Penulangan bagi dibagian tumpuan ty

As bagi $= 20\%$ As tulangan pokok $= 20\% \,.\, 492,059 = 98,412 \text{ mm}^2$

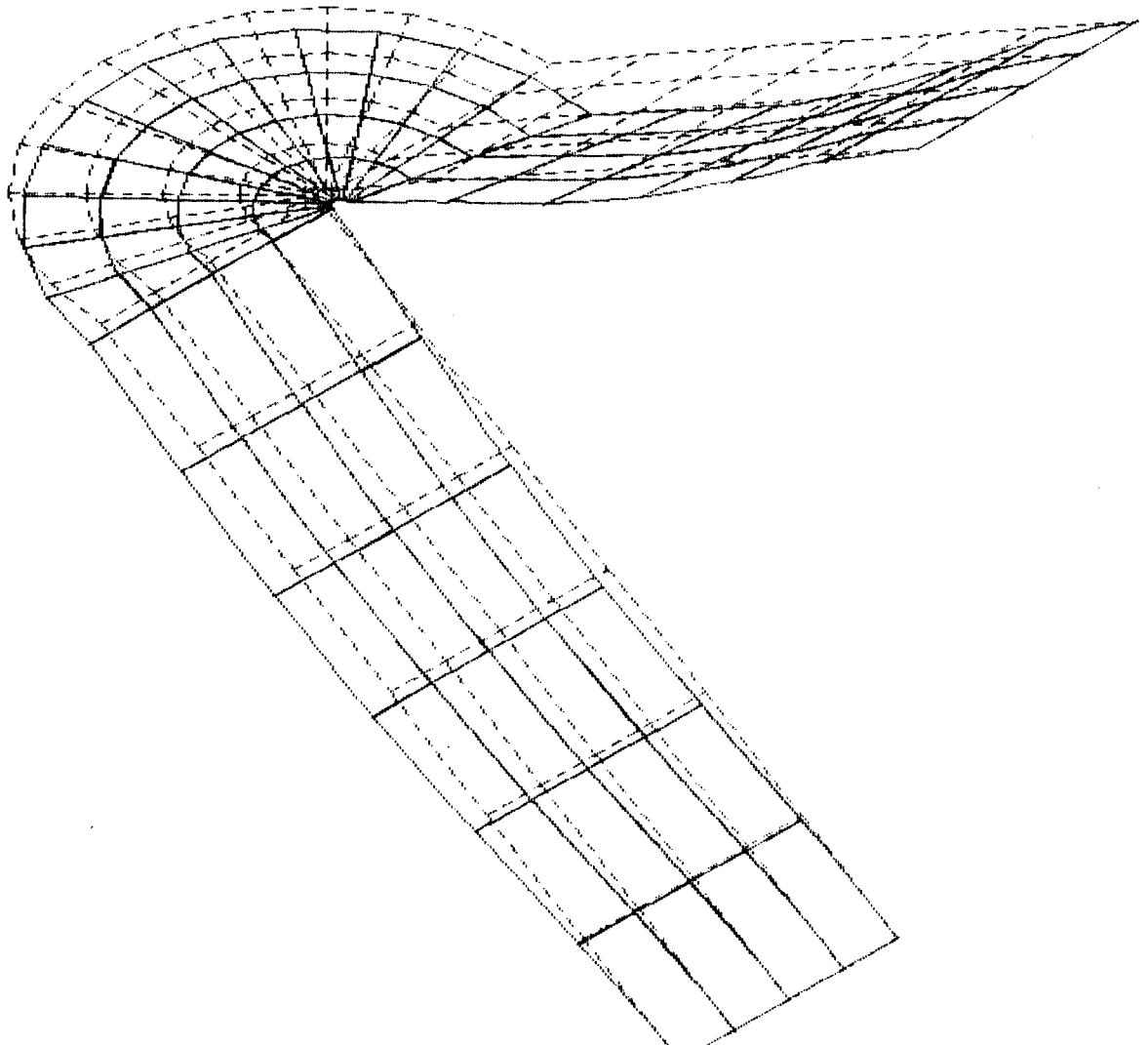
$A \varnothing 8 = \frac{1}{4} \,.\, \pi \,.\, 8^2 = 50,265 \text{ mm}^2$

$$X = \frac{A\varnothing 8 \,.\, 1000}{As \text{ bagi}} = \frac{50,265.1000}{98,412} = 510,76 \text{ mm}$$

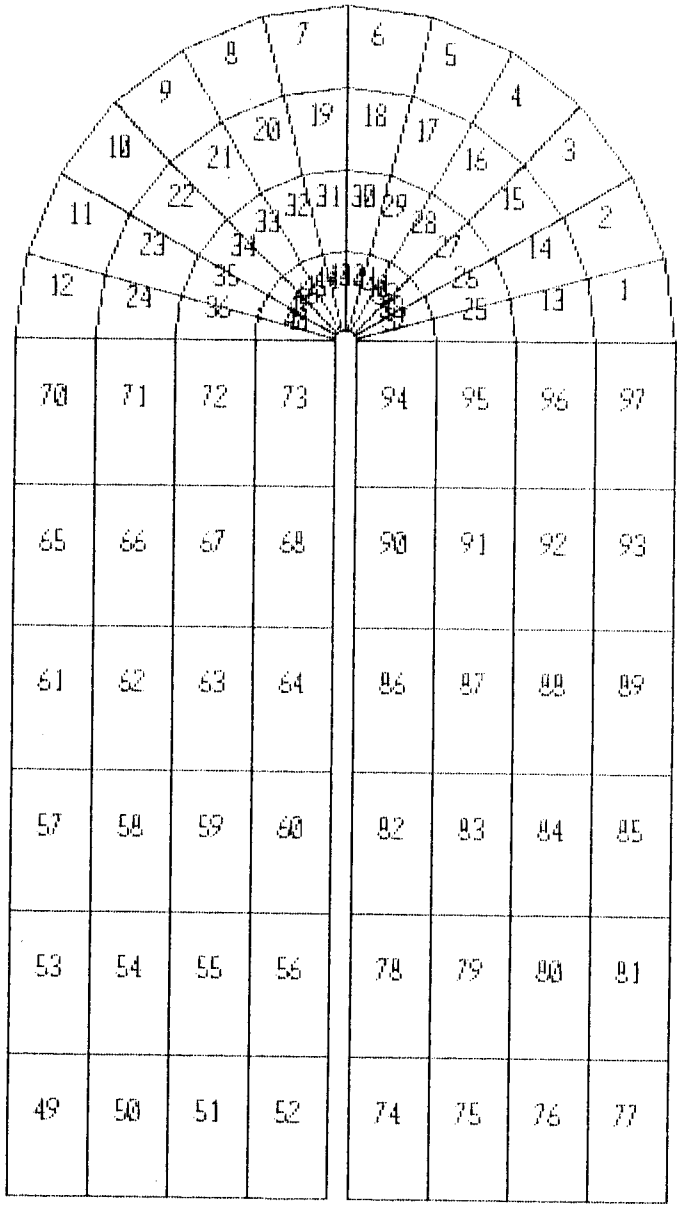
Maka dipakai $\varnothing 8 - 200$

3.2.3. HITUNGAN PELAT TANGGA 1

```
ANALISA PLAT TANGGA [KN-M]
SYSTEM
L=1
JOINTS
66   X=1.5    Y=3.9     Z=0
67   X=1.5              Z=2.29
1    X=3                          A=66.67,1,12,1,15
14   X=2.6375                     A=66,67,14,12,1,15
27   X=2.275                      A=66.67,27,12,1,15
40   X=1.9125                     A=66,67,40,12,1,15
53   X=1.55                       A=66,67,53,12,1,15
68   X=0        Y=0       Z=0
72   X=1.45
93   X=0        Y=3.25    Z=1.908
97   X=1.45                       Q=68,72,93,97,1,5
98   X=1.55     Y=0       Z=4.5
102  X=3
123  X=1.55     Y=3.25    Z=2.6717
127  X=3                          Q=98,102,123,127,1,5
:
RESTRAINTS
66  67   1    R=1,1,1,1,1,1
68  72   1    R=1,1,1,1,1,1
98 102   1    R=1,1,1,1,1,1
:
FRAME
C CONTROL DATA
NM=1  NSEC=5    Z=-1
C MATERIAL PROPERTIES BALOK
1       SH=R    T=0.4,0.25    W=0.4*0.25*23    E=2.1E7
C ELEMENT LOCATION DATA BALOK
9    1  14   M=1     G=3,1,13,13      LP=1,0
13  13  26   M=1     G=3,1,13,13      LP=1,0
:
SHELL
C MATERIAL PROPERTIES
NM=1  Z=-1
C INFORMATION DATA
1 E=2.1E7   U=0.2  W=12.528/0.2
C PEMBAGIAN ELEMEN TANGGA
1  JQ=1,2,14,15       M=1  ETYPE=0  TH=0.2  G=12,1
13 JQ=14,15,27,28     M=1  ETYPE=0  TH=0.2  G=12,1
25 JQ=27,28,40,41     M=1  ETYPE=0  TH=0.2  G=12,1
37 JQ=40,41,53,54     M=1  ETYPE=0  TH=0.2  G=12,1
49 JQ=68,69,73,74     M=1  ETYPE=0  TH=0.2  G=4,5
70 JQ=93,94,13,26     M=1  ETYPE=0  TH=0.2
71 JQ=94,95,26,39     M=1  ETYPE=0  TH=0.2
72 JQ=95,96,39,52     M=1  ETYPE=0  TH=0.2
73 JQ=96,97,52,65     M=1  ETYPE=0  TH=0.2
74 JQ=98,99,103,104   M=1  ETYPE=0  TH=0.2  G=4,5
94 JQ=123,124,53,40   M=1  ETYPE=0  TH=0.2
95 JQ=124,125,40,27   M=1  ETYPE=0  TH=0.2
96 JQ=125,126,27,14   M=1  ETYPE=0  TH=0.2
97 JQ=126,127,14,1    M=1  ETYPE=0  TH=0.2
```



Gambar 3.6. "Displecement" Pada Tangga 1



Gambar 3.7. Nomor Elemen Pelat Tangga 1

Tabel 3.5 Penulangan Pelat Lantai

Bentuk Pelat	Mu/ϕ (KN-m)	As (mm²)	As min (mm²)	1,33.As (mm²)	As Terpakai (mm²)	Tul. Pokok	Mn (KN-m)	As Bagi (mm²)	Tul Bagi
A 4,4 m 5,25 m	11.709 11.709 9.673 9.673	602.364 602.364 497.605 497.606	524.7 524.7 524.7 524.7	---- ---- 661.816 661.816	602.364 602.364 524.7 524.7	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 120.473 ---- 104,94	---- Ø8-200 ---- Ø8-200
B 3 m 4,6 m	6.627 6.627 4.379 4.379	340.9 340.9 225.238 225.238	524.7 524.7 524.7 524.7	453.397 453.397 299.566 299.566	453.397 453.397 299.566 299.566	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 90,879 ---- 59,913	---- Ø8-200 ---- Ø8-200
C 4 m 6 m	10.885 10.885 7.193 7.193	559.954 559.954 369.969 369.969	524.7 524.7 524.7 524.7	---- ---- 492.059 492.059	559.954 559.954 492.059 492.059	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 111,991 ---- 98,412	---- Ø8-200 ---- Ø8-200
D 2 m 3 m	2.721 2.721 1.798 1.798	179..985 179..985 118,919 118,919	408,1 408,1 408,1 408,1	239,380 239,380 158,162 158,162	239,380 239,380 158,162 158,162	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 47,876 ---- 31,832	---- Ø8-200 ---- Ø8-200
E 1 m 3 m	0.828 0.828 0.171 0.499	42.613 42.613 8.793 25.703	524.7 524.7 524.7 524.7	56.675 56.675 11.695 34.185	56.675 56.675 11.695 34.185	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 11,335 ---- 6,837	---- Ø8-200 ---- Ø8-200
F 4 m 6 m	13.574 13.574 8.968 8.968	698.226 698.226 461.328 461.328	524.7 524.7 524.7 524.7	---- ---- 613.566 613.566	698.226 698.226 524.7 524.7	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 139.645 ---- 104.94	---- Ø8-200 ---- Ø8-200
G 3 m 4 m	6.817 6.817 5.181 5.181	350.671 350.671 266.510 266.510	524.7 524.7 524.7 524.7	466.393 466.393 354.458 354.458	466.393 466.393 354.458 354.458	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 93,278 ---- 70,892	---- Ø8-200 ---- Ø8-200
H 4 m 6 m	11.782 11.782 7.784 7.784	606.044 606.044 400.422 400.422	524.7 524.7 524.7 524.7	---- ---- 532.562 532.562	606.044 606.044 524.7 524.7	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 121,208 ---- 104,94	---- Ø8-200 ---- Ø8-200
I 1,3 m 6 m	0,835 0,835 0,294 0,866	42,949 42,949 15,112 44,540	524.7 524.7 524.7 524.7	57,123 57,123 20,099 59,238	57,123 57,123 20,099 59,238	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 11,425 ---- 11,848	---- Ø8-200 ---- Ø8-200
J 3 m 3,5 m	6.272 6.272 5.181 5.181	322.618 322.618 266.510 266.510	524.7 524.7 524.7 524.7	429.081 429.081 354.459 354.459	429.081 429.081 354.459 354.459	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 85,816 ---- 70,892	---- Ø8-200 ---- Ø8-200
K 3 m 4 m	5.467 5.467 4.155 4.155	281.227 281.227 213.732 213.732	524.7 524.7 524.7 524.7	374.031 374.031 284.264 284.264	374.031 374.031 284.264 284.264	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	---- 74,808 ---- 56,853	---- Ø8-200 ---- Ø8-200

L 4 m 4,5 m	8.836 8.836 7.784 7.784	454.533 454.533 400.422 400.422	524.7 524.7 524.7 524.7	604.529 604.529 532.562 532.562	524.7 524.7 524.7 524.7	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	— 104,94 — 104,94	— Ø8-200 — Ø8-200
M 4 m 9 m	13.254 13.254 7.153 7.153	681.8 681.8 367.956 367.956	524.7 524.7 524.7 524.7	— — 489.381 489.381	681.8 681.8 489.381 489.381	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	— 136,36 — 97,876	— Ø8-200 — Ø8-200
N 3 m 3,9 m	6.817 6.817 5.181 5.181	350.671 350.671 266.510 266.510	524.7 524.7 524.7 524.7	466.393 466.393 354.459 345.459	466.393 466.393 354.459 345.459	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	— 93,279 — 70,891	— Ø8-200 — Ø8-200
Q 2 m 4,6 m	3.314 3.314 1.788 1.788	170.45 170.45 91.989 91.989	524.7 524.7 524.7 524.7	226.699 226.699 122.345 122.345	226.699 226.699 122.345 122.345	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	— 45,339 — 24,489	— Ø8-200 — Ø8-200
P 2 m 4 m	3.013 3.013 1.701 1.701	154.987 154.987 87.493 87.493	524.7 524.7 524.7 524.7	206.133 206.133 116.365 116.365	206.133 206.133 116.365 116.365	Ø10-100 Ø10-100 Ø10-100 Ø10-100	15,919 15,919 15,919 15,919	— 41,227 — 23,273	— Ø8-200 — Ø8-200

Tabel 3.6 Penulangan Pelat Tangga

Momen	Mu/ϕ (KN-m)	As (mm^2)	As min (mm^2)	1,33 As (mm^2)	As Terpakai (mm^2)	Tul. Pokok	Mn (KN-m)	As Bagi (mm^2)	Tul Bagi
Tangga 1									
Mmax	11.0775	234.157	524.7	311.428	311.428	Ø10-250	50.680	—	—
	12.4838	207.647	524.7	276.171	276.171	Ø10-250	—	55.234	Ø8-250
Mmin	0.435	7.2355	524.7	9.623	9.623	Ø10-250	50.680	—	—
	40.7438	677.707	524.7	—	677.707	Ø10-250	—	180.27	Ø8-250
Tangga 2									
Mmax	13.9363	231.8072	524.7	308.304	308.304	Ø10-250	50.680	—	—
	16.5788	275.761	524.7	366.762	366.762	Ø10-250	—	73.352	Ø8-250
Mmin	0.1575	2.6198	524.7	3.4843	3.4843	Ø10-250	50.680	—	—
	43.9025	730.2478	524.7	—	730.2478	Ø10-250	—	194.246	Ø8-250
Tangga 3									
	3.5235	58.6078	584.5	77.948	77.948	Ø16-250	50.680	—	—
	2.7836	46.3002	584.5	61.579	61.579	Ø16-250	50.680	—	—
	2.7836	46.3002	584.5	61.579	61.579	Ø16-250	—	41,227	Ø8-250
	2.4348	40.4993	584.5	53.8641	53.8641	Ø16-250	50.680	—	—
	2.4348	40.4993	584.5	53.8641	53.8641	Ø16-250	—	27.135	Ø8-250
	0.4235	7.0434	584.5	9.3677	9.3677	Ø16-250	50.680	—	—

3.3. Perbitungan Portal Akibat Beban Gempa

3.3.1. Luas Tiap Lantai

1. Luas lantai 2

   21x60 –(12.4)-(6 x 4.6) – (6x4)-(3X4) = 1148.6 m^2

   1.3 x24 x 2– (1.3 x 2 x 3) = 54.6 m^2

   1.3 x 4x7 = 36.4 m^2

   3 x 4 x 6 = 72 m^2

   2.75 x 12 = 33 m^2

   Total = 1344.4 – (2.7 x 3 x 2) = 1328.2 m^2

2. Luas lantai 3

   21x60-(4.6x6)-(3x4)-(2x12) = 1196.4 m^2

   3x4x6 = 72 m^2

   1.3x26.6x2 – (3x1.3x2) = 61.36 m^2

   1.3x4x16 = 83.2 m^2

   4.3 x 1.3x2 = 11.18 m^2

   2.75 x 12 = 33 m^2

   Total = 1457.14 – (2.7x3x2) = 1440.94 m^2

3. Lantai 3 = lantai 4 = 1440.94 m^2

4. Lantai 5

   26.6x62.6 – (4.6x6) – (3x4)-(1.3x3x2) = 1617.70 m^2

   1.45x12 = 17.4 m^2

   Total = 1635.16-(2.7x3x2) = 1618.96 m^2

5. Ring Balok (25/55)

   ((60x2)+(24x3)+(3x3)+(2x2)) x 0,25 = 51,25 m^2

   2x2x0,35 = 1,4 m^2

   Plat 3x4 = 12 m^2

   Total = 51,25 + 1,4 + 12 = 64,65 m^2

3.3.2. Pembebanan Tiap Lantai

A. Berat balok atap dan rangka baja

1. Beban mati

Balok atap (25/55)

(0.25x0.55)x(60+60+24+24+24+3+3+2+2)x23 = 638,825 KN

(0,35x0,60)x(2+2)x23 = 19,32 KN

Plat

3x4x4,766 = 57,192 m^2

kolom

60/70 = (0.6x0.7x1/2x4.5x30x23) = 652.05 KN

40/70 (0.4x0.7x1/2x4.5x6x23) = 173.88 KN

Kaca ⇒ ((27x4x4.5)+(6x6x4.5)x0.1x1/2 = 32.4 KN

Dinding ½ batu ⇒ (69.35x4.5x2.5)x1/2 = 390.094 KN

Beban rangka atap = 215,114 KN

Total wmati = 2151,875 KN

2. Beban hidup

qh = 1 KN/m^2 koef.red = 1

wh = 1x1x58,65 = 64,65 KN

w atap =wmati + whidup = 2216,525 KN

B. Lantai 5

1. Beban mati

Pelat = 1618.96x4.766 = 7715.9634 KN

Balok lantai :

25/55 = 0.25x0.55x27x4x23 = 341.55 KN

25/45 = 0.25x0.45x39x4x23	= 403.65 KN
30/65 = 0.3x0.65x4x6x23	= 107.64 KN
30/95 = 0.3x0.95x24x6x23	= 943.92 KN
30/70 = 0.3x0.7x20x23	= 96.6 KN
30x55 = 0.3x0.55x12x3x23	= 124.2 KN
30x75 = 0.3x0.75x45x23	= 232.875 KN
30/80 = 0.3x0.8x12x23	= 66.24 KN
20/25 = 0.2x0.25x19.2x23	= 22.08 KN
20/40 = 0.2x0.4x4x23	= 7.36 KN
30x90 = 0.3x0.9x20x23	= 124.2 KN
25/85 = 0.25x0.85x12x23	= 58.65 KN
0.25x0.6x12x23	= 41.4 KN
0.4x1x9x23	= 82.8 KN
0.2x0.6x6x23	= 16.56 KN
0.25x0.8x24x23	= 110.4 KN
0.3x0.5x9x23	= 31.05 KN
0.3x0.5x14x23	= 48.3 KN
0.3x0.45x3.5x23	= 10.867 KN
1.3x42x0.1x0.7x23	= 87.906 KN
6x0.5x0.2x23	= 13.8 KN
Kolom	
60/70 ⇒ 0.6x0.7x30x4.5x23	= 1304.1 KN
10/70 ⇒ 0.1x0.7x8x1.5x23	= 231.84 KN
40/40 ⇒ 0.4x0.4x5x4.5x23	= 82.8 KN
40/70 ⇒ 0.4x0.7x7x1/2x4.5x23	= 101.43 KN
60/70 ⇒ 0.6x0.7x18x4.5x23x1/2	= 391.23 KN
Kaca ⇒ ((27x4x4.5)+(6x6x4.5)x0.1	= 64.8 KN
Dinding ½ batu ⇒ (69.35x4.5x2.5)	= 780.188 KN
Total beban mati	= 13713.3994 KN

2. Beban hidup

Qh = 3 KN/m^2 koef. Red. = 1

Wh = 1x3x1618.96 = 4856.88

W lantai 5 = 4856.88 + 13713.3994 = 18570.2794 KN

C. Lantai 4

1. Beban mati

Material

26	1.3x0.1x0.7x23x38 = 79.543 KN
6.	=945.92 KN
7.	= 403.65 KN
9.	= 27x0.25x0.6x23 = 93.15 KN
16.	= 110.4 KN
8.	= 124.2 KN
17.	= 58.56 KN
5.	= 107.64 KN
18.	= 22.08 KN
11.	= 232.875 KN
12.	= 66.24 KN
13.	= 7.36 KN
25.	= 10.867 KN
14.	= 124.2 KN
10.	= 96.6 KN
19.	= 41.4 KN
20.	= 13.8 KN
21.	= 16.56 KN

Kolom

60/70	⊃ 0.6x0.7x48x4.5x23	= 2086.56 KN
40/70	⊃ 0.4x0.7x15x4.5x23	= 434.7 KN

40/40 ⇒ 0.4x0.4x5x4.5x23 = 82.8 KN

Kaca = (27x4x4.5x0.1)+(8x4x4.5x0.1) = 70.2 KN

Dinding = 780.188 KN

Total = 12875.094 KN

2. Beban Hidup

qh = 3 KN/M^2 koef.red = 1

wh = 1 x 3 x 1440.94 = 3890.538

w lantai 4 = 3890.538 + 12875.094 = 16765.632 KN

D. Lantai 3

1. Beban mati

Pelat = 6867.52 KN

Material

15 = 26x0.3x0.45x23 = 80.73 KN

14 = 0.3x0.55x8x3x23 = 91.08 KN

26 =1.3x0.1x0.7x23x38 = 79.543 KN

6. =945.92 KN

7. = 403.65 KN

9. = 27x0.25x0.6x23 = 93.15 KN

16. = 110.4 KN

8. = 124.2 KN

17. = 58.56 KN

5. = 107.64 KN

18. = 22.08 KN

11. = 232.875 KN

12. = 66.24 KN

13. = 7.36 KN

25. = 10.867 KN

14. = 124.2 KN

10. = 96.6 KN

19. = 41.4 KN

20. = 13.8 KN

21. = 16.56 KN

22 = 0.3x0.4x4.5x2x23 = 24.84 KN

Kolom

60/70 ⇒ 0.6x0.7x48x4.5x23 = 2086.56 KN

40/70 ⇒ 0.4x0.7x15x4.5x23 = 434.7 KN

40/40 ⇒ 0.4x0.4x5x4.5x23 = 82.8 KN

Kaca = (27x4x4.5x0.1)+(8x4x4.5x0.1) = 70.2 KN

Dinding = 780.188 KN

Total beban mati = 12875.094 KN

2. Beban Hidup

Qh = 3 KN/ m^2 koef.red = 1

Wh = 1x3x1440.94 = 3458.256 KN

Wlantai 3 = 3458.256 + 12875.094 = 16333.35 KN

E. Lantai 2

1. Beban mati

Pelat = 1328.2 x 4.766 = 6330.2 KN

Balok

26 1.3x0.1x0.7x23x22 = 46.046 KN

6. =945.92 KN

7. = 403.65 KN

9. = 341.55 KN

16. = 110.4 KN

8. = 124.2 KN

17. = 58.56 KN

5. = 107.64 KN

18. = 22.08 KN

11. = 0.3 x 0.75 x 6 x 6 x 23 = 186.3 KN

12. = 66.24 KN

13. = 7.36 KN

25. = 10.867 KN

14. = 124.2 KN

10. = 96.6 KN

19. = 41.4 KN

20. = 13.8 KN

21. = 16.56 KN

Kolom

60/70 $\Rightarrow$ 0.6x0.7x48x5.875x23 = 2724.12 KN

40/70 $\Rightarrow$ 0.4x0.7x15x5.875x23 = 567.525 KN

40/40 $\Rightarrow$ 0.4x0.4x5x5.875x23 = 108.1 KN

Kaca = (27x4x5.875x0.1)+(8x4x5.875x0.1) = 82.25 KN

Dinding ½ batu $\Rightarrow$ (69.35x5.875x2.5) = 1018.578 KN

Total beban mati = 13903.836 KN

2. Beban hidup

Qh = 3 KN/m^2 koef.red = 1

Wh = 1 x 3 x 1328.2 = 2789.22 KN

Wlantai 2 = 2789.22 + 13903.836 = 16693.056 KN

Jumlah total semua lantai (Wt)

= 2216.525 KN + 18570.2794 KN +16765.632 KN + 16333.35 KN + 16693.056 KN = 70934.0414 KN

3.3.3. Perhitungan gaya horizontal pada tiap lantai

a. $T = 0.06\ H^{3/4}$

Dimana H = Tinggi bangunan gedung diukur dari penjepitan

$H = 7.25 + (4x4.5) = 25.25$ m

$Tx = Ty = 0{,}06\ (\ 25.25\ )^{3/4} = 0.6758$ dt

b. Koefisian gempa geser (c)

Daerah yogyakarta termasuk wilayah III, tanah keras Tx=Ty = 0.6758 dt

(dari gambar 2-5, buku Gideon), koefisien gempa dasar diproleh Cx = Cy = 0.04

c. Faktor kekakuan dari tabel 1 PPTGIUG 1983 didapat I = 1.5

d. Faktor jenis kontruksi (K) untuk bangunan gedung bertulang K=1

e. Gaya geser dasar horisontal total akibat gempa (V)

Vx = Vy = C.I.K.Wt

= 0.04x1.5x1x70934.0414 KN

= 4256.042 KN

f. Pembagian gaya geser dasar horisontal total akibat gempa ke sepanjang tinggi gedung

Arah x H/A= 25.25/60 = 0.421 < 3

Arah y H/B = 25.25/24 = 1.052 < 3

H/A & H/B < 3, maka dipakai rumus :

$$Fi = \frac{Wi.hi}{\sum Wi.hi} V$$

Dimana :

Fi = beban horisontal terpusat pada lantai i

Wi = berat lantai i

Hi = tinggi lantai i

V = gaya geser dasar horisontal akibat gempa

Lantai	Hi (m)	Wi (KN)	Wi.Hi (KN)	Fi (KN)
Atap	25.25	2216.525	64936.031	266.856
5	20.75	18570.2794	385333.298	1583.538
4	16.25	16765.632	272441.52	1119.606
3	11.75	16333.35	191916.863	788.688
2	7.25	16693.056	121024.656	497.354
		Σ Wi.Hi = 1035652.368		

3.3.4. Beban Gempa Pada Tiap Lantai

Beban Gempa Pada balok atap

Gempa arah – x

Joint 693 = (4.5/24)x266.856 = 50.036 KN

Joint 730 = ((1.5+4.5)/24)x266.856 = 66.714 KN

Joint 729 = ((1.5+3)/24)x266.856 = 50.036 KN

Joint 728 = (6/24)x266.856 = 66.714 KN

Joint 727 = (3/24)x266.856 = 33.357 KN

Gempa arah – y

Joint 693=708 = (2/60)x266.856 = 8.895 KN

Joint 694 →707 = (4/60)266.856 = 17.790 KN

Beban gempa pada lanta 5

Gempa arah – x

Joint 100 = (4.5/24)x1583.538 = 296.913 KN

Joint 285 = ((1.5+4.5)/24)X1583.538 KN = 395.885 KN

Joint 327 =((1.5+3)/24)x1583.538 = 296.913 KN

Joint 469 = (6/24)x1583.538 = 395.885 KN

Joint 582 = (3/24)x1583.538 = 197.942 KN

Arah – y

Joint 100=115 =(2/60)x1583.538 = 52.785 KN

Joint 101 → 114 = (4/60)x1583.538 = 105.569 KN

Beban gempa lantai 4

Arah – x

Joint 68 = (4.5/24)x1119.606 = 209.926 KN

Joint 267 = ((1.5+4.5)/24)x1119.606 = 279.902 KN

Joint 354 = ((1.5+3)/24)x1119.606 = 209.926 KN

Joint 453 = (6/24)x1119.606 = 279.902 KN

Joint 563 = (3/24)x1119.606 = 139.951 KN

Arah – y

Joint 68 = 81 = (2/60)x1119.606 = 37.32KN

Joint 69 →71 = 73→74 = 82=222=223=183=75=76=78→80 = (4/60)x119.606 = 74.64 KN

Beban gempa lantai 3

Arah – x

Joint 40 = (4.5/24)x788.688 = 147.879 KN

Joint 250 = ((1.5+4.5)/24)x788.688 = 197.172 KN

Joint 336 = ((1.5+3)/24)x788.688=147.879KN

Jonit 437 = (6/24)x788.688 = 197.172 KN

Joint 544 = (3/24)x788.688 = 98.586 KN

Arah – y

Joint 40=57=(2/60)x788.688 = 26.290 KN

Joint 41=43=45→52=54→56 = (4/60)x788.688KN

Beban gempa lantai 2

Arah – x

Joint 18 = (4.5/24)x497.354 = 93.254 KN

Joint 232 = ((1.5+4.5)/24)x497.354 = 124.339 KN

Joint 318 = ((1.5+3)/24)x497.354 = 93.254 KN

Joint 421 = ((3+3)/24)x497.354 = 124.339 KN

Joint 525 = (3/24)x497.354=62.169 KN

Arah – y

Joint 18=29=(2/60)x497.354 = 16.579 KN

Joint 19→21=138→139=22→25=144→145=26→28 = (4/60)x497.354

= 33.157 KN

3.3.5. HITUNGAN STRUKTUR TIGA DIMENSI

```
HITUNGAN STRUKTUR TIGA DIMENSI - UNITS: KN - M
SYSTEM
L=6
JOINTS
1   X=0      Y=0      Z=0                          : PORTAL 1
16  X=60     Y=0      Z=0       G=1,16,1
17  X=-1.3   Y=0      Z=7.25
18  X=0      Y=0      Z=7.25
21  X=12     Y=0      Z=7.25    G=18,21,1
22  X=24     Y=0      Z=7.25
25  X=36     Y=0      Z=7.25    G=22,25,1
26  X=48     Y=0      Z=7.25
29  X=60     Y=0      Z=7.25    G=26,29,1
30  X=61.3   Y=0      Z=7.25
31  X=0      Y=-1.3   Z=11.75
34  X=12     Y=-1.3   Z=11.75    G=31,34,1
35  X=48     Y=-1.3   Z=11.75
38  X=60     Y=-1.3   Z=11.75    G=35,38,1
39  X=-1.3   Y=0      Z=11.75
40  X=0      Y=0      Z=11.75
43  X=12     Y=0      Z=11.75    G=40,43,1
44  X=13.3   Y=0      Z=11.75
45  X=16     Y=0      Z=11.75
52  X=44     Y=0      Z=11.75    G=45,52,1
53  X=46.7   Y=0      Z=11.75
54  X=48     Y=0      Z=11.75
57  X=60     Y=0      Z=11.75    G=54,57,1
58  X=61.3   Y=0      Z=11.75
59  X=0      Y=-1.3   Z=16.25
62  X=12     Y=-1.3   Z=16.25    G=59,62,1
63  X=48     Y=-1.3   Z=16.25
66  X=60     Y=-1.3   Z=16.25    G=63,66,1
67  X=-1.3   Y=0      Z=16.25
68  X=0      Y=0      Z=16.25
71  X=12     Y=0      Z=16.25    G=68,71,1
72  X=13.5   Y=0      Z=16.25
73  X=16     Y=0      Z=16.25
74  X=20     Y=0      Z=16.25
75  X=40     Y=0      Z=16.25
76  X=44     Y=0      Z=16.25
77  X=46.7   Y=0      Z=16.25
78  X=48     Y=0      Z=16.25
81  X=60     Y=0      Z=16.25    G=78,81,1
82  X=61.3   Y=0      Z=16.25
83  X=0      Y=-2     Z=20.75
98  X=60     Y=-2     Z=20.75    G=83,98,1
99  X=-2     Y=0      Z=20.75
100 X=0      Y=0      Z=20.75
115 X=60     Y=0      Z=20.75    G=100,115,1
116 X=62     Y=0      Z=20.75
117 X=12     Y=3      Z=0                          : PORTAL 2
120 X=24     Y=3      Z=0       G=117,120,1
121 X=36     Y=3      Z=0
124 X=48     Y=3      Z=0       G=121,124,1
125 X=16     Y=1.7    Z=7.25
```

```
126 X=20                                    G=125,126,1
131 X=40
132 X=44      Y=1.7      Z=7.25     G=131,132,1
133 X=-1.3    Y=3        Z=7.25
134 X=0       Y=3        Z=7.25
149 X=60      Y=3        Z=7.25     G=134,149,1
150 X=61.3    Y=3        Z=7.25
155 X=-1.3    Y=3        Z=11.75
156 X=0       Y=3        Z=11.75
162 X=24      Y=3        Z=11.75    G=156,162,1
163 X=36      Y=3        Z=11.75
169 X=60      Y=3        Z=11.75    G=163,169,1
170 X=61.3    Y=3        Z=11.75
175 X=-1.3    Y=3        Z=16.25
176 X=0       Y=3        Z=16.25
182 X=24      Y=3        Z=16.25    G=176,182,1
183 X=36      Y=3        Z=16.25
189 X=60      Y=3        Z=16.25    G=183,189,1
190 X=61.3    Y=3        Z=16.25
193 X=-2      Y=3        Z=20.75
194 X=0       Y=3        Z=20.75
200 X=24      Y=3        Z=20.75    G=194,200,1
203 X=36      Y=3        Z=20.75
209 X=60      Y=3        Z=20.75    G=203,209,1
210 X=62      Y=3        Z=20.75
211 X=28      Y=5        Z=0                          : PORTAL 3
212 X=32      Y=5        Z=0
213 X=24      Y=5        Z=7.25
216 X=36      Y=5        Z=7.25     G=213,216,1
217 X=24      Y=5        Z=11.75
220 X=36      Y=5        Z=11.75    G=217,220,1
221 X=24      Y=5        Z=16.25
224 X=36      Y=5        Z=16.25    G=221,224,1
225 X=24      Y=5        Z=20.75
228 X=36      Y=5        Z=20.75    G=225,228,1
229 X=0       Y=9        Z=0
230 X=60      Y=9        Z=0
231 X=-1.3    Y=9        Z=7.25
232 X=0       Y=9        Z=7.25
645 X=2.7     Y=9        Z=7.25
233 X=4       Y=9        Z=7.25
238 X=24      Y=9        Z=7.25     G=233,238,1
239 X=28.6
240 X=33
241 X=36      Y=9        Z=7.25
246 X=56      Y=9        Z=7.25     G=241,246,1
646 X=57.3    Y=9        Z=7.25
247 X=60      Y=9        Z=7.25
248 X=61.3    Y=9        Z=7.25
249 X=-1.3    Y=9        Z=11.75
250 X=0       Y=9        Z=11.75
648 X=2.7     Y=9        Z=11.75
251 X=4       Y=9        Z=11.75
257 X=28      Y=9        Z=11.75 G=251,257,1
618 X=28.6
619 X=32      Y=9        Z=11.75
258 X=33
```

```
259 X=36     Y=9        Z=11.75
264 X=56     Y=9        Z=11.75   G=259,264,1
650 X=57.3   Y=9        Z=11.75
265 X=60
660 X=61.3
266 X=-1.3              Z=16.25
267 X=0
652 X=2.7
268 X=4
274 X=28                          G=268,274,1
620 X=28.6
621 X=32
275 X=33
276 X=36
281 X=56                          G=276,281,1
654 X=57.3
282 X=60
283 X=61.3
284 X=-2       Z=20.75
285 X=0
656 X=2.7
286 X=4
292 X=28                          G=286,292,1
622 X=28.6
623 X=32
293 X=33
294 X=36
299 X=56                          G=294,299,1        : PORTAL 4
658 X=57.3
300 X=60
301 X=62
302 X=0        Y=12     Z=0                    : PORTAL 5
308 X=24                          G=302,308,1
309 X=33
310 x=36
316 X=60                          G=310,316,1
317 X=-1.3              Z=7.25
318 X=0
644 X=2.7
319 X=4
324 X=24                          G=319,324,1
325 X=28.6
326 X=33
327 X=36
332 X=56                          G=327,332,1
647 X=57.3
333 X=60
334 X=61.3
335 X=-1.3              Z=11.75
336 X=0
649 X=2.7
337 X=4
342 X=24                          G=337,342,1
343 X=28.6
344 X=33
345 X=36
350 X=56                          G=345,350,1
```

```
651 X=57.3
351 X=60
352 X=61.3
353 X=-1.3              Z=16.25
354 X=0
653 X=2.7
355 X=4
360 X=24                          G=355.360,1
361 X=28.6
362 X=33
363 X=36
368 X=56                          G=363.368,1
655 X=57.3
369 X=60
370 X=61.3
371 X=-2                Z=20.75
372 X=0
657 X=2.7
373 X=4
378 X=24                          G=373.378,1
379 X=28.6
380 X=33
381 X=36
386 X=56                          G=381.386,1
659 X=57.3
387 X=60
388 X=62
389 X=24      Y=14      Z=0                     : PORTAL 6
390 X=33
391 X=36
392 X=24                Z=7.25
393 X=28.6
394 X=33
395 X=36
396 X=24                Z=11.75
397 X=28.6
398 X=33
399 X=36
400 X=24                Z=16.25
401 X=28.6
402 X=33
403 X=36
404 X=24                Z=20.75
405 X=28.6
406 X=33
407 X=36
408 X=33      Y=16      Z=0               : PORTAL 7
409 X=36
410 X=33                Z=7.25
411 X=36
412 X=33                Z=11.75
413 X=36
414 X=33                Z=16.25
415 X=36
416 X=33                Z=20.75
417 X=36
747 X=24      Y=16      Z=0
```

```
748                     Z=7.25
749                     Z=11.75
750                     Z=16.25
751                     Z=20.75
418 X=0       Y=18      Z=0                 : PORTAL 8
419 X=60
420 X=-1.3              Z=7.25
421 X=0
427 X=24                          G=421,427,1
428 X=36
434 X=60                          G=428,434,1
435 X=61.3
436 X=-1.3              Z=11.75
437 X=0
443 X=24                          G=437,443,1
444 X=36
450 X=60                          G=444,450,1
451 X=61.3
452 X=-1.3              Z=16.25
453 X=0
459 X=24                          G=453,459,1
460 X=36
466 X=60                          G=460,466,1
467 X=61.3
468 X=-2                Z=20.75
469 X=0
475 X=24                          G=469,475,1
476 X=36
482 X=60                          G=476,482,1
483 X=62
484 X=24      Y=20      Z=0                       : PORTAL 9
485 X=36
486 X=24                Z=7.25
487 X=27
488 X=28.6
489 X=30
490 X=33
491 X=36
492 X=24                Z=11.75
493 X=27
494 X=28.6
495 X=30
496 X=33
497 X=36
498 X=24                 Z=16.25
499 X=27
500 X=28.6
501 X=30
502 X=33
503 X=36
504 X=24                Z=20.75
505 X=27
506 X=28.6
507 X=30
508 X=33
509 X=36
510 X=0       Y=24       Z=0                       : PORTAL 10
```

```
516 X=24                                G=510,516,1
517 X=36
523 X=60                                G=517,523,1
524 X=-1.3                  Z=7.25
525 X=0
531 X=24                                G=525,531,1
532 X=27
535 X=36                                G=532,535,1
536 X=40
541 X=60                                G=536,541,1
542 X=61.3
191 X=16      Y=25.3
192 X=20
201 X=40
202 X=44
543 X=-1.3    Y=24      Z=11.75
544 X=0
550 X=24                                G=544,550,1
551 X=27
554 X=36                                G=551,554,1
555 X=40
560 X=60                                G=555,560,1
561 X=61.3
151 X=0       Y=25.3
154 X=12                                G=151,154,1
171 X=16
172 X=20
600 X=40
605 X=60                                G=600,605,1
562 X=-1.3    Y=24        Z=16.25
563 X=0
569 X=24                                G=563,569,1
570 X=27
573 X=36                                G=570,573,1
574 X=40
579 X=60                                G=574,579,1
580 X=61.3
606 X=0        Y=25.3
611 X=20                                G=606,611,1
612 X=40
617 X=60                                G=612,617,1
581 X=-2       Y=24        Z=20.75
582 X=0
588 X=24                                G=582,588,1
589 X=27
592 X=36                                G=589,592,1
593 X=40
598 X=60                                G=593,598,1
599 X=62
173 X=0       Y=26
174 X=4
683 X=8
686 X=20                                G=683,686,1
687 X=40
692 X=60                                G=687,692,1
661 X=24      Y=25.75     Z=0                          : PORTAL 11
662 X=36
```

```
663 X=24                    Z=7.25
667 X=36                                G=663,667,1
668 X=24                    Z=11.75
672 X=36                                G=668,672,1
673 X=24                    Z=16.25
677 X=36                                G=673,677,1
678 X=24                    Z=20.75
682 X=36                                G=678,682,1
624 X=24        Y=21.6      Z=7.25                      : PORTAL 12
628 X=36                                G=624,628,1
629 X=24                    Z=11.75
633 X=36                                G=629,633,1
634 X=24                    Z=16.25
638 X=36                                G=634,638,1
639 X=24                    Z=20.75
643 X=36                                G=639,643,1
693 X=0         Y=0         Z=25.25                     : RING BALOK ATAP
708 X=60                                G=693,708,1
709             Y=9
710             Y=12
711             Y=18
712             Y=24
727 X=0                                 G=712,727,1
728             Y=18
729             Y=12
730             Y=9
731 X=24        Y=26.75     Z=7.25
732 X=36
733 X=24                    Z=11.75
734 X=36
735 X=24                    Z=16.25
736 X=36
737 X=24                    Z=20.75
738 X=36
739 X=60         Y=4        Z=25.25
740              Y=8
741              Y=16
742              Y=20
743 X=0          Y=20
744              Y=16
745              Y=8
746              Y=4
C JOINT PADA LIFT
851  X=33        Y=12       Z=25.25
853  X=36                                G=851,853,1
854  X=33        Y=14       Z=25.25
856  X=36                                G=854,856,1
857  X=33        Y=16       Z=25.25
859  X=36                                G=857,859,1
C JOINT BALOK BORDES
835 X=0       Y=9           Z=5
836           Y=12
837           Y=9           Z=9.5
838           Y=12
839           Y=9           Z=14
840           Y=12
841           Y=9           Z=18.5
```

```
842          Y=12
843 X=60     Y=9          Z=5
844          Y=12
845          Y=9          Z=9.5
846          Y=12
847          Y=9          Z=14
848          Y=12
849          Y=9          Z=18.5
850          Y=12
752 X=0      Y=0          Z=2.67          : JOINT BALOK SLOOF
767 X=60     Y=0          Z=2.67  G=752,767,1
768 X=12     Y=3
777 X=48                          G=768,777,1
778 X=28     Y=5
779 X=32
780 X=0      Y=9
781 X=60
782 X=0      Y=12
783 X=4
788 X=24                          G=783,788,1
789 X=33
790 X=36
795 X=56                          G=790,795,1
796 X=60
797 X=24      Y=14
798 X=33
799 X=36
800 X=24      Y=16
801 X=33
802 X=36
803 X=0       Y=18
804 X=60
805 X=24      Y=20
806 X=36
807 X=0       Y=24
813 X=24                    G=807,813,1
814 X=36
820 X=60                    G=814,820,1
821 X=24      Y=25.75
822 X=36
823 X=2.7     Y=9        Z=0      : BALOK SLOOF TANGGA
824 X=12
825 X=16
826 X=57.3
827 X=2.7                Z=2.67
828 X=12
829 X=16
830 X=57.3
831 X=2.7    Y=12        Z=0
832 X=2.7                Z=2.67
833 X=57.3    Y=12       Z=0
834 X=57.3               Z=2.67
:
RESTRAINTS
1       16      1       R=1,1,1,0,0,1
117     120     1       R=1,1,1,0,0,1
121     124     1       R=1,1,1,0,0,1
```

```
211     212     1       R=1,1,1,0,0,1
229     230     1       R=1,1,1,0,0,1
302     308     1       R=1,1,1,0,0,1
309     316     1       R=1,1,1,0,0,1
389                     R=1,1,1,0,0,1
390     391     1       R=1,1,1,0,0,1
408     409     1       R=1,1,1,0,0,1
418     419     1       R=1,1,1,0,0,1
510     516     1       R=1,1,1,0,0,1
517     523     1       R=1,1,1,0,0,1
484     485     1       R=1,1,1,0,0,1
661     662     1       R=1,1,1,0,0,1
747                     R=1,1,1,0,0,1
823     826     1       R=1,1,1,0,0,1
831                     R=1,1,1,0,0,1
833                     R=1,1,1,0,0,1
:
FRAME
C CONTROL DATA
NM=29   NSEC=5      NL=108      Z=-1
C MATERIAL PROPERTIES
1     SH=R    T=0.7,0.6       E=2.1E7  W=0.7*0.6*23        :KOLOM
2     SH=R    T=0.7,0.5       E=2.1E7  W=0.7*0.5*23        :KOLOM
3     SH=R    T=0.5,0.5       E=2.1E7  W=0.5*0.5*23        :KOLOM
4     SH=R    T=1.0,0.4       E=2.1E7  W=1.0*0.4*23         :BALOK
5     SH=R    T=0.65,0.3      E=2.1E7  W=0.65*0.3*23        :BALOK
6     SH=R    T=0.95,0.3      E=2.1E7  W=0.95*0.3*23        :BALOK
7     SH=R    T=0.50,0.30     E=2.1E7  W=0.45*0.25*23       :BALOK
8     SH=R    T=0.9,0.3       E=2.1E7  W=0.9*0.3*23         :BALOK
9     SH=R    T=0.6,0.3       E=2.1E7  W=0.6*0.3*23         :BALOK
10    SH=R    T=0.7,0.3       E=2.1E7  W=0.7*0.3*23         :BALOK
11    SH=R    T=0.75,0.3      E=2.1E7  W=0.75*0.3*23        :BALOK
12    SH=R    T=0.8,0.3       E=2.1E7  W=0.8*0.3*23         :BALOK
13    SH=R    T=0.4,0.2       E=2.1E7  W=0.4*0.2*23         :BALOK
14    SH=R    T=0.55,0.3      E=2.1E7  W=0.55*0.3*23        :BALOK
15    SH=R    T=0.5,0.3       E=2.1E7  W=0.5*0.3*23         :BALOK
16    SH=R    T=0.8,0.25      E=2.1E7  W=0.8*0.25*23        :BALOK
17    SH=R    T=0.85,0.25     E=2.1E7  W=0.85*0.25*23       :BALOK
18    SH=R    T=0.3,0.25      E=2.1E7  W=0.25*0.2*23        :BALOK
19    SH=R    T=0.6,0.25      E=2.1E7  W=0.6*0.25*23        :BALOK
20    SH=R    T=0.5,0.2       E=2.1E7  W=0.5*0.2*23         :BALOK
21    SH=R    T=0.6,0.2       E=2.1E7  W=0.6*0.2*23         :BALOK
22    SH=R    T=0.5,0.3       E=2.1E7  W=0.5*0.3*23         :BALOK
23    SH=R    T=0.4,0.2       E=2.1E7  W=0.4*0.2*23         :BALOK
24    SH=R    T=0.4,0.3       E=2.1E7  W=0.4*0.3*23         :BALOK
25    SH=R    T=0.45,0.3      E=2.1E7  W=0.45*0.3*23        :BALOK
26    SH=R    T=0.7,0.1       E=2.1E7  W=0.7*0.1*23         :BALOK
27    SH=R    T=0.45,0.45     E=2.1E7  W=0.4*0.4*23         :BALOK
28    SH=R    T=0.5,0.35      E=2.1E7  W=0.5*0.35*23        :BALOK
29    SH=R    T=0.6,0.35      E=2.1E7  W=0.6*0.35*23        :BALOK
C SPAN LOADING DATA
1     TRAP=0,0,0,2.199,-4.766,0,3.799,-4.766,0,5.99,0,0      :A
2     TRAP=0,0,0,2.199,-4.766,0,4.399,0,0
3     TRAP=0,0,0,2.199,-3,0,3.799,-3,0,5.99,0,0
4     TRAP=0,0,0,2.199,-3,0,4.399,0,0
5     TRAP=0,0,0,1.499,-4.766,0,3.099,-4.766,0,4.599,0,0     :B
6     TRAP=0,0,0,1.499,-4.766,0,2.99,0,0
```

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7     TRAP=0,0,0,1.499,-3,0,3.099,-3,0,4.599,0,0
8     TRAP=0,0,0,1.499,-3,0,2.99,0,0
9     TRAP=0,0,0,1.99,-4.766,0,3.99,-4.766,0,5.99,0,0          :C
10    TRAP=0,0,0,1.99,-4.766,0,3.99,0,0
11    TRAP=0,0,0,1.99,-2.5,0,3.99,-2.5,0,5.99,0,0
12    TRAP=0,0,0,1.99,-2.5,0,3.99,0,0
13    TRAP=0,0,0,1.199,-4.766,0,1.799,-4.766,0,2.99,0,0        :D
14    TRAP=0,0,0,1.199,-4.766,0,2.399,0,0
15    TRAP=0,0,0,1.199,-2.5,0,1.799,-2.5,0,2.99,0,0
16    TRAP=0,0,0,1.199,-2.5,0,2.399,0,0
17    TRAP=0,0,0,0.799,-4.766,0,2.199,-4.766,0,2.99,0,0        :E
18    TRAP=0,0,0,0.799,-4.766,0,1.599,0,0
19    TRAP=0,0,0,0.799,-3,0,2.199,-3,0,2.99,0,0
20    TRAP=0,0,0,0.799,-3,0,1.599,0,0
21    TRAP=0,0,0,1.99,-4.766,0,3.99,-4.766,0,5.99,0,0          :F
22    TRAP=0,0,0,1.99,-4.766,0,3.99,0,0
23    TRAP=0,0,0,1.99,-4,0,3.99,-4,0,5.99,0,0
24    TRAP=0,0,0,1.99,-4,0,3.99,0,0
25    TRAP=0,0,0,1.499,-4.766,0,2.499,-4.766,0,3.99,0,0        :G
26    TRAP=0,0,0,1.499,-4.766,0,2.99,0,0
27    TRAP=0,0,0,1.499,-4,0,2.499,-4,0,3.99,0,0
28    TRAP=0,0,0,1.499,-4,0,2.99,0,0
29    TRAP=0,0,0,1.99,-4.766,0,3.99,-4.766,0,5.99,0,0          :H
30    TRAP=0,0,0,1.99,-4.766,0,3.99,0,0
31    TRAP=0,0,0,1.99,-3,0,3.99,-3,0,5.99,0,0
32    TRAP=0,0,0,1.99,-3,0,3.99,0,0
33    TRAP=0,0,0,1.299,-4.766,0,4.699,-4.766,0,5.99,0,0        :I
34    TRAP=0,0,0,1.299,-4.776,0
35    TRAP=0,0,0,1.299,-1,0,4.699,-1,0,5.99,0,0
36    TRAP=0,0,0,1.299,-1,0
37    TRAP=0,0,0,1.499,-4.766,0,1.99,-4.766,0,3.499,0,0        :J
38    TRAP=0,0,0,1.499,-4.766,0,2.99,0,0
39    TRAP=0,0,0,1.499,-4,0,1.99,-4,0,3.499,0,0
40    TRAP=0,0,0,1.499,-4,0,2.99,0,0
41    TRAP=0,0,0,1.499,-4.766,0,2.499,-4.766,0,3.99,0,0        :K
42    TRAP=0,0,0,1.499,-4.766,0,2.99,0,0
43    TRAP=0,0,0,1.499,-2.5,0,2.499,-2.5,0,3.99,0,0
44    TRAP=0,0,0,1.499,-2.5,0,2.99,0,0
45    TRAP=0,0,0,1.99,-4.766,0,3.99,0,0,0                      :L
46    TRAP=0,0,0,1.99,-4.766,0,2.99,-4.766,0,4.99,0,0
47    TRAP=0,0,0,1.99,-3,0,3.99,0,0
48    TRAP=0,0,0,1.99,-3,0,2.99,-3,0,4.99,0,0
49    TRAP=0,0,0,1.99,-4.766,0,6.99,-4.766,0,8.99,0,0          :M
50    TRAP=0,0,0,1.99,-4.766,0,3.99,0,0
51    TRAP=0,0,0,1.99,-3,0,6.99,-3,0,8.99,0,0
52    TRAP=0,0,0,1.99,-3,0,3.99,0,0
53    TRAP=0,0,0,1.499,-4.766,0,2.399,-4.766,0,3.9,0,0         :N
54    TRAP=0,0,0,1.499,-4.766,0,2.99,0,0
55    TRAP=0,0,0,1.499,-4,0,2.399,-4,0,3.899,0,0
56    TRAP=0,0,0,1.499,-4,0,2.99,0,0
57    TRAP=0,0,0,0.99,-4.766,0,3.599,-4.766,0,4.599,0,0        :O
58    TRAP=0,0,0,0.99,-4.766,0,1.99,0,0
59    TRAP=0,0,0,0.99,-3,0,3.599,-3,0,4.599,0,0
60    TRAP=0,0,0,1,-3,0,1.99,0,0
61    TRAP=0,0,0,0.99,-4.766,0,2.99,-4.766,0,3.99,0,0          :P
62    TRAP=0,0,0,1,-4.766,0,2,0,0
63    TRAP=0,0,0,0.99,-2.5,0,2.99,-2.5,0,3.999,0,0
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64    TRAP=0.0,0,1,-2.5,0,2,0,0
65    TRAP=0,0,0,1.3,-4.766,0,1.7,-4.766,0,2.99,0,0          :Q =I
66    TRAP=0,-4.766,0,1.2999,0,0
67    TRAP=0,0,0,1.3,-1,0,1.7,-1,0,2.99,0,0
68    TRAP=0,-1,0,1.2999,0,0
69    WG=0,0,0
70    WG=0,0,-6.355        : RATA C MATI
71    WG=0,0,-3.333        : RATA C HIDUP
72    WG=0,0,-4            : RATA H HIDUP
73    TRAP=0,0,0,1.5,-3,0,2.5,-3,0,4,0,0                     :B´= K
74    TRAP=0,0,0,0.99,-4.766,0,3.399,-4.766,0,4.399,0,0      :O´
75    TRAP=0,0,0,0.99,-3,0,3.399,-3,0,4.399,0,0
76    WG=0,0,-6.999              : A MT
77    WG=0,0,-4.4                : A HD
78    WG=0,0,-2.54               : E BALOK BK
79    WG=0,0,-1.6                : E
80    WG=0,0,-4.766              : J=B RATA MATI
81    WG=0,0,-4                  : J
82    WG=0,0,-3                  : B RATA HD
83  TRAP=0,0,0,0.65,-4.766,0,2.35,-4.766,0,3,0,0 :PLAT DKT TANGGA
84    TRAP=0,0,0,0.6499,-4.766,0,1.299,0,0
85    TRAP=0,0,0,0.65,-3,0,2.35,-3,0,3,0,0
86    TRAP=0,0,0,0.6499,-3,0,1.299,0,0
87    WG=0,0,-3.177              : PLAT UJUNG 1M
88    WG=0,0,-0.667              : PLAT UJUNG 1M
89    WG=0,0,-5.33               : RATA HIDUP F
90    TRAP=0,0,0,0.87499,-4.766,0,2.12499,-4.766,0,2.999,0,0   :D
91    TRAP=0,0,0,0.87499,-4.766,0,1.7499,0,0
92    TRAP=0,0,0,0.87499,-2.5,0,2.12499,-2.5,0,2.99,0,0
93    TRAP=0,0,0,0.87499,-2.5,0,1.7499,0,0
94    TRAP=0,0,0,1.299,-4.766,0,2.699,-4.766,0,3.99,0,0      :Q = I
95    TRAP=0,0,0,1.299,-1,0,2.699,-1,0,3.999,0,0
96    WG=0,0,-4.29
97    WG=0,0,-2
98    WG=0,0,-8.372
99    WG=0,0,-3.9
100   TRAP=0,-4.766,0,1.999,0,0
101   TRAP=0,-1,0,1.999,0,0
102   TRAP=0,0,0,2,-4.766,0,3.999,0,0
103   TRAP=0,0,0,2,-1,0,3.999,0,0
104   TRAP=0,0,0,2,-4.766,0,4,-4.766,0,6,0,0
105   TRAP=0,0,0,2,-1,0,4,-1,0,6,0,0
106   TRAP=0,0,0,1.5,-4.766,0,3,0,0
107   TRAP=0,0,0,1.5,-1,0,3,0,0
108   WG=0,0,-2.383   PLD=1,-6.8,0
C     ELEMEN LOCATION DATA
C     KOLOM
1418    1    752    M=1     G=15,1,1,1   LP=3,0      : PORTAL 1
1       752     18    M=1     G=3,1,1,1    LP=3,0
5       756     45    M=1     G=1,1,1,1    LP=3,0
7       758     22    M=1     G=3,1,1,1    LP=3,0
11      762     51    M=1     G=1,1,1,1    LP=3,0
13      764     26    M=1     G=3,1,1,1    LP=3,0
17      18      40    M=1     G=3,1,1,1    LP=3,0
23      22      47    M=1     G=3,1,1,1    LP=3,0
29      26      54    M=1     G=3,1,1,1    LP=3,0
33      40      68    M=1     G=3,1,1,1    LP=3,0
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37      45     73    M=1     G=1,1,1,1    LP=3,0
39      47    106    M=1     G=3,1,1,1    LP=3,0
43      51     75    M=1     G=1,1,1,1    LP=3,0
45      54     78    M=1     G=3,1,1,1    LP=3,0
49      68    100    M=1     G=3,1,1,1    LP=3,0
53      73    104    M=1     G=1,1,1,1    LP=3,0
59      75    110    M=1     G=1,1,1,1    LP=3,0
61      78    112    M=1     G=3,1,1,1    LP=3,0
1434   117    768    M=1      G=3,1,1,1    LP=3,0      : PORTAL 2
1438   121    774    M=1      G=3,1,1,1    LP=3,0
145    768    137    M=1      G=3,1,1,1    LP=3,0
149    774    143    M=1      G=3,1,1,1    LP=3,0
153    137    159    M=1      G=3,1,1,1    LP=3,0
157    143    163    M=1      G=3,1,1,1    LP=3,0
161    159    179    M=1      G=3,1,1,1    LP=3,0
165    163    183    M=1      G=3,1,1,1    LP=3,0
1293   179    197    M=1      G=3,1,1,1    LP=3,0
1297   183    203    M=1      G=3,1,1,1    LP=3,0
1442   211    778    M=2      G=1,1,1,1    LP=3,0     : PORTAL 3
249    778    214    M=2      G=1,1,1,1    LP=3,0
251    214    218    M=2      G=1,1,1,1    LP=3,0
253    218    222    M=2      G=1,1,1,1    LP=3,0
1301   222    226    M=2      G=1,1,1,1    LP=3,0
1487   823    827    M=3                   LP=3,0     : PORTAL 4
1488   824    828    M=3                   LP=3,0
1489   825    829    M=3                   LP=3,0
1490   826    830    M=3                   LP=3,0
1444   229    780    M=2      G=1,1,1,1    LP=3,0
267    780    232    M=2                   LP=3,0
1507   229    835    M=2                   LP=3,0
268    230    247    M=2                   LP=3,0
1569   230    843    M=2                   LP=3,0
269    232    250    M=2                   LP=3,0
1509   232    837    M=2                   LP=3,0
270    247    265    M=2                   LP=3,0
1571   247    845    M=2                   LP=3,0
271    250    267    M=2                   LP=3,0
1561   250    839    M=2                   LP=3,0
272    265    282    M=2                   LP=3,0
1573   265    847    M=2                   LP=3,0
273    267    285    M=2                   LP=3,0
1563   267    841    M=2                   LP=3,0
274    282    300    M=2                   LP=3,0
1575   282    849    M=2                   LP=3,0
1446   302    782    M=2                   LP=3,0
1491   831    832    M=3                   LP=3,0   : PORTAL 5
1492   833    834    M=3                   LP=3,0
1447   303    783    M=1      G=4,1,1,1    LP=3,0
1452   308    788    M=2                   LP=3,0
1453   309    789    M=3                   LP=3,0
1454   310    790    M=2                   LP=3,0
1455   311    791    M=1      G=4,1,1,1    LP=3,0
1460   316    796    M=2                   LP=3,0
343    782    318    M=2                   LP=3,0   : PORTAL 5
1508   302    836    M=2                   LP=3,0
344    783    319    M=1       G=4,1,1,1   LP=3,0
349    788    324    M=2                   LP=3,0
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350     789     326     M=3                     LP=3,0
351     790     327     M=2                     LP=3,0
352     791     328     M=2     G=4,1,1,1       LP=3,0
357     796     333     M=2                     LP=3,0
1570    316     844     M=2                     LP=3,0
358     318     336     M=2                     LP=3,0
1560    318     838     M=2                     LP=3,0
359     319     337     M=1     G=4,1,1,1       LP=3,0
364     324     342     M=2                     LP=3,0
365     326     344     M=3                     LP=3,0
366     327     345     M=2                     LP=3,0
367     328     346     M=1     G=4,1,1,1       LP=3,0
372     846     351     M=2                     LP=3,0
1572    333     846     M=2                     LP=3,0
373     840     354     M=2                     LP=3,0
1562    336     840     M=2                     LP=3,0
374     337     355     M=1     G=4,1,1,1       LP=3,0
379     342     360     M=2                     LP=3,0
380     344     362     M=3                     LP=3,0
381     345     363     M=2                     LP=3,0
382     346     364     M=1     G=4,1,1,1       LP=3,0
387     848     369     M=2                     LP=3,0
1574    351     848     M=2                     LP=3,0
388     842     372     M=2                     LP=3,0
1564    354     842     M=2                     LP=3,0
389     360     378     M=2                     LP=3,0
390     362     380     M=3                     LP=3,0
391     363     381     M=2                     LP=3,0
392     850     387     M=2                     LP=3,0
1576    369     850     M=2                     LP=3,0
1303    355     373     M=1     G=4,1,1,1       LP=3,0
1308    364     382     M=1     G=4,1,1,1       LP=3,0
1461    389     797     M=2                     LP=3,0  : PORTAL 6
1462    390     798     M=3     G=1,1,1,1       LP=3,0
463     797     392     M=2                     LP=3,0  : PORTAL 6
464     798     394     M=3     G=1,1,1,1       LP=3,0
466     392     396     M=2                     LP=3,0
467     394     398     M=3     G=1,1,1,1       LP=3,0
469     396     400     M=2                     LP=3,0
470     398     402     M=3     G=1,1,1,1       LP=3,0
472     400     404     M=2                     LP=3,0
1464    747     800     M=2                     LP=3,0  : PORTAL 7
1465    408     801     M=3     G=1,1,1,1       LP=3,0
473     402     406     M=3     G=1,1,1,1       LP=3,0  : PORTAL 7
487     801     410     M=3     G=1,1,1,1       LP=3,0
489     410     412     M=3     G=1,1,1,1       LP=3,0
491     412     414     M=3     G=1,1,1,1       LP=3,0
493     414     416     M=3     G=1,1,1,1       LP=3,0
1313    747     748     M=3                     LP=3,0
1314    748     749     M=3     G=2,1,1,1       LP=3,0
1467    418     803     M=2     G=1,1,1,1       LP=3,0  : PORTAL 8
499     803     421     M=2                     LP=3,0  : PORTAL 8
500     419     434     M=2                     LP=3,0
501     421     437     M=2                     LP=3,0
502     434     450     M=2                     LP=3,0
503     437     453     M=2                     LP=3,0
504     450     466     M=2                     LP=3,0
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505     453     469     M=2                     LP=3,0
506     466     482     M=2                     LP=3,0
1469    484     805     M=2     G=1,1,1,1       LP=3,0  : PORTAL 9
563     805     486     M=2                     LP=3,0  : PORTAL 9
564     485     491     M=2                     LP=3,0
565     486     492     M=2                     LP=3,0
566     491     497     M=2                     LP=3,0
567     492     498     M=2                     LP=3,0
568     497     503     M=2                     LP=3,0
569     498     504     M=2                     LP=3,0
570     503     509     M=2                     LP=3,0
1471    510     807     M=1     G=6,1,1,1       LP=3,0  : PORTAL 10
1478    517     814     M=1     G=6,1,1,1       LP=3,0
591     807     525     M=1     G=6,1,1,1       LP=3,0  : PORTAL 10
598     814     535     M=1     G=6,1,1,1       LP=3,0
605     525     544     M=1     G=6,1,1,1       LP=3,0
612     535     554     M=1     G=6,1,1,1       LP=3,0
619     544     563     M=1     G=6,1,1,1       LP=3,0
626     554     573     M=1     G=6,1,1,1       LP=3,0
633     563     582     M=1     G=6,1,1,1       LP=3,0
640     573     592     M=1     G=6,1,1,1       LP=3,0
1485    661     821     M=2                     LP=3,0  : PORTAL 11
1486    662     822     M=2                     LP=3,0
731     821     663     M=2                     LP=3,0  : PORTAL 11
732     822     667     M=2                     LP=3,0
733     663     668     M=2                     LP=3,0
734     667     672     M=2                     LP=3,0
735     668     673     M=2                     LP=3,0
736     672     677     M=2                     LP=3,0
737     673     678     M=2                     LP=3,0
738     677     682     M=2                     LP=3,0
1249    100     693     M=1     G=15,1,1,1      LP=3,0
1265    300     709     M=2                     LP=3,0
1266    387     710     M=2                     LP=3,0
1267    482     711     M=2                     LP=3,0
1268    598     712     M=1     G=6,1,-1,1      LP=3,0
1275    588     721     M=1     G=6,1,-1,1      LP=3,0
1282    469     728     M=2                     LP=3,0
1283    372     729     M=2                     LP=3,0
1284    285     730     M=2                     LP=3,0
C ELEMEN KOLOM LT-5 & RING BALOK
1591    380     851     M=3                     LP=3,0
1592    381     853     M=3                     LP=3,0
1593    406     854     M=3                     LP=3,0
1594    407     856     M=3                     LP=3,0
1595    416     857     M=3                     LP=3,0
1596    417     859     M=3                     LP=3,0
C ELEMEN BALOK SLOOF SEARAH SUMBU - X
1321    752     753     M=27    G=14,1,1,1      LP=2,0
1346    768     769     M=27    G=8,1,1,1       LP=2,0
1355    778     779     M=27                    LP=2,0
1356    782     783     M=27                    LP=2,0
1357    783     784     M=27    G=4,1,1,1       LP=2,0
1362    788     789     M=27                    LP=2,0
1363    789     790     M=27                    LP=2,0
1364    790     791     M=27    G=4,1,1,1       LP=2,0
1369    795     796     M=27                    LP=2,0
```

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1370    798    799    M=27                          LP=2,0
1371    801    802    M=27                          LP=2,0
1372    807    808    M=27    G=5,1,1,1             LP=2,0
1378    813    814    M=27                          LP=2,0
1379    814    815    M=27    G=5,1,1,1             LP=2,0
1597    821    822    M=27                          LP=2,0
C ELEMEN BALOK SLOOF SEARAH SUMBU - Y
1385    755    768    M=27    G=9,1,1,1             LP=3,0
1395    772    778    M=27    G=1,1,1,1             LP=3,0
1397    788    797    M=27                          LP=3,0
1398    797    800    M=27                          LP=3,0
1399    800    805    M=27                          LP=3,0
1400    805    813    M=27                          LP=3,0
1401    789    798    M=27                          LP=3,0
1402    798    801    M=27                          LP=3,0
1403    790    799    M=27                          LP=3,0
1404    799    802    M=27                          LP=3,0
1405    802    806    M=27                          LP=3,0
1406    806    814    M=27                          LP=3,0
1407    752    780    M=27                          LP=3,0
1408    780    782    M=27                          LP=3,0
1409    782    803    M=27                          LP=3,0
1410    803    807    M=27                          LP=3,0
1411    767    781    M=27                          LP=3,0
1412    781    796    M=27                          LP=3,0
1413    796    804    M=27                          LP=3,0
1414    804    820    M=27                          LP=3,0
1416    813    821    M=9                           LP=3,0
1417    814    822    M=10                          LP=3,0
1495    826    830    M=27                          LP=3,0
1497    827    832    M=27                          LP=3,0
1498    830    834    M=27                          LP=3,0
1499    780    827    M=27                          LP=2,0
1500    830    781    M=27                          LP=2,0
1501    828    785    M=27                          LP=3,0
1502    829    786    M=27                          LP=3,0
1493    828    829    M=27    NSL=25,69,24,69       LP=2,0
1496    797    798    M=27                          LP=2,0
C ELEMEN BALOK   SEJAJAR SUMBU - X
65      17     18     M=26    NSL=66,66,68,68           LP=-2,0  : PORTAL 1
66      18     19     M=9     NSL=25,94,27,95    G=2,1,1,1  LP=-2,0
69      22     23     M=9     NSL=78,78,79,79    G=2,1,1,1  LP=-2,0
72      26     27     M=9     NSL=41,94,43,95    G=2,1,1,1  LP=-2,0
75      30     29     M=26    NSL=66,66,68,68               LP=2,0
76      31     40     M=26    NSL=66,66,68,68    G=3,1,1,1  LP=3,0
80      35     54     M=26    NSL=66,66,68,68    G=3,1,1,1  LP=3,0
84      39     40     M=26    NSL=66,66,68,68               LP=-2,0
85      40     41     M=9     NSL=25,94,27,95    G=2,1,1,1  LP=-2,0
88      44     43     M=26    NSL=66,66,68,68               LP=2,0
89      53     54     M=26    NSL=66,66,68,68               LP=-2,0
90      54     55     M=9     NSL=41,94,43,95    G=2,1,1,1  LP=-2,0
93      58     57     M=26    NSL=66,66,68,68               LP=2,0
94      59     68     M=26    NSL=66,66,68,68    G=3,1,1,1  LP=3,0
98      63     78     M=26    NSL=66,66,68,68    G=3,1,1,1  LP=3,0
102     67     68     M=26    NSL=66,66,68,68               LP=-2,0
103     68     69     M=9     NSL=41,94,43,95    G=2,1,1,1  LP=-2,0
106     72     71     M=26    NSL=66,66,68,68               LP=2,0
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107    77    78    M=26    NSL=66,66,68,68                    LP=-2,0
108    78    79    M=9     NSL=41,94,43,95    G=2,1,1,1       LP=-2,0
111    82    81    M=26    NSL=66,66,68,68                    LP=2,0
112    83   100    M=26    NSL=100,100,101,101   G=15,1,1,1 LP=3,0
128    99   100    M=26    NSL=100,100,101,101                LP=-2,0
129   100   101    M=9     NSL=41,102,43,103   G=5,1,1,1      LP=-2,0
135   106   107    M=9     NSL=45,102,47,103   G=2,1,1,1      LP=-2,0
138   109   110    M=9     NSL=25,102,27,103   G=5,1,1,1      LP=-2,0
144   116   115    M=26    NSL=100,100,101,101                LP=2,0
169   138   125    M=26    NSL=34,69,36,69   G=1,1,1,1        LP=-3,0
171   140    22    M=15    NSL=34,69,36,69      LP=-3,0 : A PORTAL 2
172   141    23    M=9     NSL=34,34,36,36   G=1,1,1,1        LP=-3,0
174   143    25    M=9     NSL=34,69,36,69                    LP=-3,0
175   144   131    M=26    NSL=34,69,36,69   G=1,1,1,1        LP=-3,0
177   133   134    M=26    NSL=66,66,68,68                    LP=-2,0
178   134   135    M=22    NSL=22,25,24,28   G=2,1,1,1        LP=-2,0
181   137   138    M=9     NSL=69,69,69,69                    LP=-2,0
182   138   139    M=9     NSL=22,94,24,95                    LP=-2,0
183   139   140    M=9     NSL=22,69,24,69                    LP=-2,0
184   140   141    M=9     NSL=94,61,95,63   G=2,1,1,1        LP=-2,0
187   143   144    M=9     NSL=10,69,12,69                    LP=-2,0
188   144   145    M=9     NSL=10,94,12,95                    LP=-2,0
189   145   146    M=9     NSL=10,69,12,69                    LP=-2,0
190   146   147    M=22    NSL=41,10,43,12   G=2,1,1,1        LP=-2,0
193   150   149    M=26    NSL=66,66,68,68                    LP=2,0
198   155   156    M=26    NSL=66,66,68,68                    LP=-2,0
199   156   157    M=22    NSL=22,25,24,28   G=2,1,1,1        LP=-2,0
202   159   160    M=9     NSL=10,34,12,36                    LP=-2,0
203   160   161    M=9     NSL=10,94,12,95                    LP=-2,0
204   161   162    M=9     NSL=10,69,12,69                    LP=-2,0
205   163   164    M=9     NSL=10,69,12,69                    LP=-2,0
206   164   165    M=9     NSL=10,94,12,95                    LP=-2,0
207   165   166    M=9     NSL=10,34,12,36                    LP=-2,0
1223  166   167    M=13    NSL=10,41,12,43                    LP=-2,0
1224  167   168    M=13    NSL=10,41,12,43                    LP=-2,0
210   168   169    M=13    NSL=10,41,12,43                    LP=-2,0
211   170   169    M=26    NSL=66,66,68,68                    LP=2,0
216   175   176    M=26    NSL=66,66,68,68                    LP=-2,0
217   177   178    M=13    NSL=10,41,12,43   G=2,1,1,1        LP=-2,0
220   179   180    M=9     NSL=10,34,12,36                    LP=-2,0
221   180   181    M=9     NSL=10,94,12,95                    LP=-2,0
222   181   182    M=9     NSL=10,69,12,69                    LP=-2,0
223   183   184    M=9     NSL=10,69,12,69                    LP=-2,0
224   184   185    M=9     NSL=10,94,12,95                    LP=-2,0
225   186   185    M=9     NSL=10,34,12,36                    LP=2,0
226   186   187    M=13    NSL=10,41,12,43   G=2,1,1,1        LP=-2,0
229   190   189    M=26    NSL=66,66,68,68                    LP=2,0
232   193   194    M=26    NSL=100,100,101,101                LP=-2,0
233   194   195    M=13    NSL=10,41,12,43   G=2,1,1,1        LP=-2,0
236   197   198    M=9     NSL=10,41,12,43   G=2,1,1,1        LP=-2,0
242   203   204    M=9     NSL=10,41,12,43   G=2,1,1,1        LP=-2,0
245   206   207    M=13    NSL=22,25,24,27   G=2,1,1,1        LP=-2,0
248   210   209    M=26    NSL=100,100,101,101                LP=2,0
C PORTAL 3
255   213   214    M=9     NSL=61,69,63,69   G=2,1,1,1        LP=-2,0
258   217   218    M=9     NSL=45,69,47,69   G=2,1,1,1        LP=-2,0
261   221   222    M=9     NSL=45,69,47,69   G=2,1,1,1        LP=-2,0
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264   225   226    M=9     NSL=45,45,47,47    G=2,1,1,1   LP=-2,0
C PORTAL 4
275   231   232    M=26    NSL=66,69,68,69                LP=-2,0
276   232   645    M=9     NSL=70,69,89,69                LP=-2,0
1181  645   233    M=7     NSL=70,84,89,86                LP=-2,0
277   233   234    M=7     NSL=22,41,24,73    G=1,1,1,1   LP=-2,0
279   235   236    M=7     NSL=41,96,73,97                LP=-2,0
280   236   237    M=7     NSL=22,41,24,73    G=1,1,1,1   LP=-2,0
282   238   239    M=7     NSL=5,69,7,69                  LP=-2,0
283   239   240    M=7     NSL=80,69,82,69                LP=-2,0
284   240   241    M=7     NSL=6,69,8,69                  LP=-2,0
285   241   242    M=7     NSL=10,41,12,42    G=4,1,1,1   LP=-2,0
1182  246   646    M=7     NSL=70,84,86,71                LP=-2,0
290   646   247    M=9     NSL=70,69,71,69                LP=-2,0
291   248   247    M=26    NSL=66,69,68,69                LP=2,0
292   249   250    M=26    NSL=66,69,68,69                LP=-2,0
293   250   648    M=9     NSL=70,69,89,69                LP=-2,0
1183  648   251    M=7     NSL=70,84,89,86                LP=-2,0
294   251   252    M=7     NSL=22,41,24,73    G=4,1,1,1   LP=-2,0
299   256   257    M=7     NSL=80,45,82,47                LP=-2,0
230   257   618    M=7     NSL=80,70,82,72                LP=-2,0
300   618   619    M=7     NSL=80,70,82,72                LP=-2,0
231   619   258    M=7     NSL=80,70,82,72                LP=-2,0
301   258   259    M=7     NSL=80,70,82,72                LP=-2,0
302   259   260    M=7     NSL=10,41,12,73    G=4,1,1,1   LP=-2,0
1184  264   650    M=7     NSL=84,70,86,71                LP=-2,0
307   650   265    M=7     NSL=70,69,71,69                LP=-2,0
308   660   265    M=7     NSL=66,69,68,69                LP=2,0
309   266   267    M=7     NSL=66,69,68,69                LP=-2,0
310   267   652    M=7     NSL=70,69,71,69                LP=-2,0
1185  652   268    M=7     NSL=70,84,71,86                LP=-2,0
311   268   269    M=7     NSL=10,41,12,73   G=4,1,1,1    LP=-2,0
316   273   274    M=7     NSL=80,45,82,47                LP=-2,0
239   274   620    M=7     NSL=80,70,82,72                LP=-2,0
317   620   621    M=7     NSL=80,70,82,72                LP=-2,0
240   621   275    M=7     NSL=80,70,82,72                LP=-2,0
318   275   276    M=7     NSL=80,70,82,72                LP=-2,0
319   276   277    M=7     NSL=10,41,12,73    G=4,1,1,1   LP=-2,0
1186  281   654    M=7     NSL=84,70,86,71                LP=-2,0
324   654   282    M=7     NSL=70,69,71,69                LP=-2,0
325   283   282    M=26    NSL=66,69,68,69                LP=2,0
326   284   285    M=26    NSL=100,69,101,69              LP=-2,0
327   285   656    M=9     NSL=70,69,71,69                LP=-2,0
1187  656   286    M=7     NSL=70,84,71,86                LP=-2,0
328   286   287    M=7     NSL=10,41,12,73   G=4,1,1,1    LP=-2,0
333   291   292    M=7     NSL=80,45,82,47                LP=-2,0
241   292   622    M=7     NSL=80,70,82,72                LP=-2,0
334   622   623    M=7     NSL=80,70,82,72                LP=-2,0
755   623   293    M=7     NSL=80,70,82,72                LP=-2,0
335   293   294    M=7     NSL=80,70,82,72                LP=-2,0
336   294   295    M=7     NSL=22,53,24,55    G=4,1,1,1   LP=-2,0
1188  299   658    M=7     NSL=84,70,86,89                LP=-2,0
341   658   300    M=7     NSL=70,69,89,69                LP=-2,0
342   301   300    M=26    NSL=100,69,101,69              LP=2,0
C PORTAL 5
393   317   318    M=7     NSL=66,69,68,69                LP=-2,0
394   318   644    M=9     NSL=70,69,71,69                LP=-2,0
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1189  644   319    M=11    NSL=84,70,86,71                        LP=-2,0
395   319   320    M=10    NSL=10,41,12,73    G=4,1,1,1           LP=-2,0
400   324   325    M=19    NSL=57,5,59,7                          LP=-2,0
401   325   326    M=19    NSL=80,74,82,75                        LP=-2,0
402   326   327    M=19    NSL=6,69,8,69                          LP=-2,0
403   327   328    M=7     NSL=41,30,73,32    G=4,1,1,1           LP=-2,0
1190  332   647    M=11    NSL=84,70,86,72                        LP=-2,0
408   647   333    M=14    NSL=70,69,72,68                        LP=-2,0
409   334   333    M=26    NSL=66,69,68,69                        LP=2,0
410   335   336    M=26    NSL=66,69,68,69                        LP=-2,0
411   336   649    M=7     NSL=70,69,89,69                        LP=-2,0
1191  649   337    M=11    NSL=70,84,89,86                        LP=-2,0
412   337   338    M=7     NSL=22,41,24,73    G=4,1,1,1           LP=-2,0
418   342   343    M=19    NSL=57,5,59,7                          LP=-2,0
419   343   344    M=19    NSL=80,74,82,75                        LP=-2,0
420   344   345    M=19    NSL=6,69,8,69                          LP=-2,0
421   345   346    M=7     NSL=41,30,73,32    G=4,1,1,1           LP=-2,0
1192  350   651    M=11    NSL=84,70,86,72                        LP=-2,0
426   651   351    M=7     NSL=70,69,72,69                        LP=-2,0
427   352   351    M=26    NSL=66,69,68,69                        LP=2,0
428   353   354    M=26    NSL=66,69,68,69                        LP=-2,0
429   354   653    M=7     NSL=70,69,72,69                        LP=-2,0
1193  653   355    M=11    NSL=70,84,72,86                        LP=-2,0
430   355   356    M=7     NSL=30,41,32,73    G=4,1,1,1           LP=-2,0
435   360   361    M=19    NSL=57,5,59,7                          LP=-2,0
436   361   362    M=19    NSL=80,74,82,75                        LP=-2,0
437   362   363    M=19    NSL=6,69,8,69                          LP=-2,0
438   363   364    M=7     NSL=30,41,32,73    G=4,1,1,1           LP=-2,0
1194  368   655    M=7     NSL=70,84,72,86                        LP=-2,0
443   655   369    M=7     NSL=70,69,72,69                        LP=-2,0
444   370   369    M=26    NSL=66,69,68,69                        LP=2,0
445   371   372    M=26    NSL=100,69,101,69                      LP=-2,0
446   372   657    M=9     NSL=70,69,71,69                        LP=-2,0
1195  657   373    M=7     NSL=70,84,71,86                        LP=-2,0
447   373   374    M=7     NSL=10,41,12,73    G=4,1,1,1           LP=-2,0
452   378   379    M=19    NSL=57,5,59,7                          LP=-2,0
453   379   380    M=19    NSL=80,74,82,75                        LP=-2,0
454   380   381    M=19    NSL=6,69,8,69                          LP=-2,0
456   381   382    M=19    NSL=22,53,24,73    G=4,1,1,1           LP=-2,0
1196  386   659    M=7     NSL=70,84,89,86                        LP=-2,0
461   659   387    M=7     NSL=70,69,89,69                        LP=-2,0
462   388   387    M=26    NSL=100,69,101,69                      LP=2,0
C PORTAL 6
475   392   393    M=4     NSL=57,96,59,97                        LP=-2,0
476   393   394    M=4     NSL=2,74,4,75                          LP=-2,0
477   394   395    M=21    NSL=69,69,69,69                        LP=-2,0
478   396   397    M=4     NSL=57,96,59,97                        LP=-2,0
479   397   398    M=4     NSL=2,74,4,75                          LP=-2,0
480   398   399    M=21    NSL=69,69,69,69                        LP=-2,0
481   400   401    M=4     NSL=57,96,59,97                        LP=-2,0
482   401   402    M=4     NSL=2,74,4,75                          LP=-2,0
483   402   403    M=21    NSL=69,69,69,69                        LP=-2,0
484   404   405    M=4     NSL=57,96,59,97                        LP=-2,0
485   405   406    M=4     NSL=2,74,4,75                          LP=-2,0
486   406   407    M=21    NSL=69,69,69,69                        LP=-2,0
C PORTAL 7
495   410   411    M=21    NSL=38,69,40,69                        LP=-2,0
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496   412   413    M=21    NSL=38,69,40,69                LP=-2,0
497   414   415    M=21    NSL=38,69,40,69                LP=-2,0
498   416   417    M=21    NSL=38,69,40,69                LP=-2,0
C PORTAL 8
507   420   421    M=26    NSL=66,66,68,68                LP=-2,0
508   421   422    M=7     NSL=10,10,12,12   G=5,1,1,1    LP=-2,0
514   428   429    M=7     NSL=30,30,32,32   G=5,1,1,1    LP=-2,0
520   435   434    M=26    NSL=66,66,68,68                LP=2,0
521   436   437    M=26    NSL=66,66,68,68                LP=-2,0
522   437   438    M=7     NSL=22,22,24,24   G=5,1,1,1    LP=-2,0
528   444   445    M=7     NSL=30,30,32,32   G=5,1,1,1    LP=-2,0
534   451   450    M=26    NSL=66,66,68,68                LP=2,0
535   452   453    M=26    NSL=66,66,68,68                LP=-2,0
536   453   454    M=7     NSL=10,10,12,12   G=5,1,1,1    LP=-2,0
542   460   461    M=7     NSL=22,22,24,24   G=5,1,1,1    LP=-2,0
548   467   466    M=26    NSL=66,66,68,68                LP=2,0
549   468   469    M=26    NSL=100,100,101,101            LP=-2,0
550   469   470    M=7     NSL=30,30,32,32   G=5,1,1,1    LP=-2,0
556   476   477    M=7     NSL=30,30,32,32   G=5,1,1,1    LP=-2,0
562   483   482    M=26    NSL=100,100,101,101            LP=2,0
C PORTAL 9
571   486   487    M=17    NSL=17,69,19,69                LP=-2,0
572   487   488    M=17    NSL=78,69,79,69                LP=-2,0
573   488   489    M=8     NSL=78,76,79,77                LP=-2,0
574   489   490    M=17    NSL=17,76,19,77                LP=-2,0
575   490   491    M=17    NSL=17,38,19,40                LP=-2,0
576   492   493    M=17    NSL=17,69,19,69                LP=-2,0
577   493   494    M=17    NSL=78,69,79,69                LP=-2,0
578   494   495    M=17    NSL=78,76,79,77                LP=-2,0
579   495   496    M=17    NSL=17,76,19,77                LP=-2,0
580   496   497    M=17    NSL=17,38,19,40                LP=-2,0
581   498   499    M=17    NSL=17,69,19,69                LP=-2,0
582   499   500    M=17    NSL=78,69,79,69                LP=-2,0
583   500   501    M=17    NSL=78,76,79,77                LP=-2,0
584   501   502    M=17    NSL=17,76,19,77                LP=-2,0
585   502   503    M=17    NSL=17,38,19,40                LP=-2,0
586   504   505    M=17    NSL=17,69,19,69                LP=-2,0
587   505   506    M=17    NSL=78,69,79,69                LP=-2,0
588   506   507    M=8     NSL=78,76,79,77                LP=-2,0
589   507   508    M=17    NSL=17,76,19,77                LP=-2,0
590   508   509    M=17    NSL=17,38,19,40                LP=-2,0
C PORTAL 10
647   524   525    M=26    NSL=66,66,68,68                LP=-2,0
648   525   526    M=9     NSL=10,94,12,95   G=2,1,1,1    LP=-2,0
651   528   529    M=9     NSL=10,69,12,69                LP=-2,0
652   529   530    M=9     NSL=10,94,12,95                LP=-2,0
653   530   531    M=9     NSL=10,69,12,69                LP=-2,0
654   531   532    M=16    NSL=90,13,92,15   G=3,1,1,1    LP=-2,0
658   535   536    M=9     NSL=30,69,32,69                LP=-2,0
659   536   537    M=9     NSL=30,94,32,95                LP=-2,0
660   537   538    M=9     NSL=30,69,32,69                LP=-2,0
661   538   539    M=9     NSL=30,94,32,95   G=2,1,1,1    LP=-2,0
664   542   541    M=26    NSL=66,66,68,68                LP=2,0
756   191   529    M=26    NSL=66,69,68,69                LP=-3,0
757   192   530    M=26    NSL=66,69,68,69                LP=-3,0
758   201   536    M=26    NSL=66,69,68,69                LP=-3,0
759   202   537    M=26    NSL=66,69,68,69                LP=-3,0
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665   543   544    M=26    NSL=66,66,68,68                          LP=-2,0
666   544   545    M=9     NSL=22,94,24,95   G=2,1,1,1              LP=-2,0
669   547   548    M=9     NSL=22,69,24,69                          LP=-2,0
670   548   549    M=9     NSL=22,94,24,95                          LP=-2,0
671   549   550    M=9     NSL=22,69,24,69                          LP=-2,0
672   550   551    M=16    NSL=90,13,92,15   G=3,1,1,1              LP=-2,0
676   554   555    M=9     NSL=30,69,32,69                          LP=-2,0
677   555   556    M=9     NSL=30,94,32,95                          LP=-2,0
678   556   557    M=9     NSL=30,69,32,69                          LP=-2,0
679   557   558    M=9     NSL=30,94,32,95   G=2,1,1,1              LP=-2,0
682   561   560    M=26    NSL=66,66,68,68                          LP=2,0
760   151   544    M=26    NSL=66,66,68,68   G=2,1,1,1              LP=-3,0
763   154   547    M=26    NSL=66,69,68,69                          LP=-3,0
764   171   548    M=26    NSL=66,69,68,69   G=1,1,1,1              LP=-3,0
766   600   555    M=26    NSL=66,69,68,69   G=2,1,1,1              LP=-3,0
769   603   558    M=26    NSL=66,66,68,68   G=2,1,1,1              LP=-3,0
683   562   563    M=26    NSL=66,66,68,68                          LP=-2,0
684   563   564    M=9     NSL=30,94,32,95   G=2,1,1,1              LP=-2,0
687   566   567    M=9     NSL=30,69,32,69                          LP=-2,0
688   567   568    M=9     NSL=30,94,32,95                          LP=-2,0
689   568   569    M=9     NSL=30,69,32,69                          LP=-2,0
690   569   570    M=16    NSL=90,13,92,15   G=3,1,1,1              LP=-2,0
694   573   574    M=9     NSL=30,69,32,69                          LP=-2,0
695   574   575    M=9     NSL=30,94,32,95                          LP=-2,0
696   575   576    M=9     NSL=30,69,32,69                          LP=-2,0
697   576   577    M=9     NSL=30,94,32,95   G=2,1,1,1              LP=-2,0
700   580   579    M=26    NSL=66,66,68,68                          LP=2,0
772   606   563    M=26    NSL=66,66,68,68   G=2,1,1,1              LP=-3,0
775   609   566    M=26    NSL=66,69,68,69                          LP=-3,0
776   610   567    M=26    NSL=66,69,68,69   G=1,1,1,1              LP=-3,0
778   612   574    M=26    NSL=66,69,68,69   G=2,1,1,1              LP=-3,0
781   615   577    M=26    NSL=66,66,68,68   G=2,1,1,1              LP=-3,0
701   581   582    M=26    NSL=100,100,101,101                      LP=-2,0
702   582   583    M=9     NSL=10,102,12,103  G=5,1,1,1             LP=-2,0
708   588   589    M=16    NSL=90,13,92,15  G=3,1,1,1               LP=-2,0
712   592   593    M=9     NSL=22,102,24,103                        LP=-2,0
713   593   594    M=9     NSL=22,102,24,103  G=4,1,1,1             LP=-2,0
718   599   598    M=26    NSL=100,100,101,101                      LP=2,0
719   173   582    M=26    NSL=100,100,101,101  G=1,1,1,1   LP=-3,0
721   683   584    M=26    NSL=100,100,101,101  G=3,1,1,1   LP=-3,0
725   687   593    M=26    NSL=100,100,101,101  G=5,1,1,1   LP=-3,0
C PORTAL 11
739   663   664    M=16    NSL=90,87,92,88   G=3,1,1,1    LP=-2,0
743   668   669    M=16    NSL=90,87,92,88   G=3,1,1,1    LP=-2,0
747   673   674    M=16    NSL=90,87,92,88   G=3,1,1,1    LP=-2,0
751   678   679    M=16    NSL=90,87,92,88   G=3,1,1,1    LP=-2,0
C PORTAL 12
1225  624   625    M=8     NSL=13,17,15,19   G=3,1,1,1    LP=-2,0
1229  629   630    M=8     NSL=13,17,15,19   G=3,1,1,1    LP=-2,0
1233  634   635    M=8     NSL=13,17,15,19   G=3,1,1,1    LP=-2,0
1237  639   640    M=8     NSL=13,17,15,19   G=3,1,1,1    LP=-2,0
C ELEMEN BALOK   SEJAJAR SUMBU - Y
C LANTAI 2
784     18     134    M=14    NSL=65,26,67,28                    LP=3,0
785     19     135    M=14    NSL=26,26,28,28   G=1,1,1,1        LP=3,0
787     21     137    M=5     NSL=65,26,67,28                    LP=3,0
788     26     146    M=11    NSL=42,65,44,67                    LP=3,0
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789	27	147	M=14	NSL=42,42,44,44	G=1,1,1,1	LP=3,0
791	29	149	M=14	NSL=42,65,44,67		LP=3,0
792	134	232	M=10	NSL=33,21,35,23		LP=3,0
793	135	233	M=6	NSL=21,21,23,23	G=1,1,1,1	LP=3,0
795	137	235	M=11	NSL=21,69,23,69	G=1,1,1,1	LP=3,0
797	139	237	M=11	NSL=21,21,23,23		LP=3,0
798	213	238	M=12	NSL=70,69,89,69		LP=3,0
799	140	213	M=12	NSL=70,62,89,64		LP=3,0
800	141	214	M=12	NSL=62,62,64,64	G=1,1,1,1	LP=3,0
802	143	216	M=12	NSL=70,62,71,64		LP=3,0
803	216	241	M=12	NSL=70,69,71,69		LP=3,0
804	144	242	M=11	NSL=9,9,11,11	G=2,1,1,1	LP=3,0
807	147	245	M=6	NSL=9,9,11,11	G=1,1,1,1	LP=3,0
809	149	247	M=10	NSL=33,9,35,11		LP=3,0
810	232	318	M=6	NSL=83,69,85,69		LP=3,0
21	645	644	M=4	NSL=83,96,85,97		LP=3,0
811	233	319	M=18	NSL=83,6,85,8		LP=3,0
812	234	320	M=9	NSL=6,6,8,8	G=4,1,1,1	LP=3,0
817	239	325	M=18	NSL=6,6,8,8	G=1,1,1,1	LP=3,0
819	241	327	M=18	NSL=6,6,8,8	G=4,1,1,1	LP=3,0
824	246	332	M=18	NSL=83,6,85,8		LP=3,0
22	646	647	M=4	NSL=83,96,85,97		LP=3,0
825	247	333	M=5	NSL=69,69,69,69		LP=3,0
826	318	421	M=5	NSL=33,9,35,11		LP=3,0
827	319	422	M=6	NSL=9,9,11,11	G=4,1,1,1	LP=3,0
832	324	392	M=12	NSL=70,58,71,60		LP=3,0
833	392	748	M=11	NSL=70,69,71,69		LP=3,0
1317	748	427	M=11	NSL=70,69,71,69		LP=3,0
834	427	486	M=8	NSL=70,69,71,69		LP=3,0
835	325	393	M=18	NSL=58,58,60,60		LP=3,0
836	393	488	M=20	NSL=1,69,3,69		LP=3,0
837	326	394	M=13	NSL=58,69,60,69		LP=3,0
838	394	410	M=13	NSL=76,69,77,69		LP=3,0
839	410	490	M=13	NSL=76,37,77,39		LP=3,0
840	327	395	M=15	NSL=69,70,69,72		LP=3,0
841	395	411	M=15	NSL=69,70,69,72		LP=3,0
842	411	428	M=15	NSL=80,70,81,82		LP=3,0
843	428	491	M=8	NSL=80,70,81,82		LP=3,0
844	328	429	M=6	NSL=29,29,31,31	G=4,1,1,1	LP=3,0
849	333	434	M=5	NSL=33,29,35,31		LP=3,0
850	421	525	M=5	NSL=33,9,35,11		LP=3,0
851	422	526	M=6	NSL=9,9,11,11	G=4,1,1,1	LP=3,0
856	486	624	M=8	NSL=70,18,71,20		LP=3,0
857	624	531	M=8	NSL=70,14,71,16		LP=3,0
858	487	625	M=18	NSL=18,18,20,20		LP=3,0
859	625	532	M=18	NSL=14,14,16,16		LP=3,0
860	489	626	M=18	NSL=18,18,20,20		LP=3,0
861	626	533	M=18	NSL=14,14,16,16		LP=3,0
862	490	627	M=18	NSL=18,18,20,20		LP=3,0
863	627	534	M=18	NSL=14,14,16,16		LP=3,0
864	491	628	M=4	NSL=18,70,20,72		LP=3,0
865	628	535	M=8	NSL=14,70,16,72		LP=3,0
866	429	536	M=6	NSL=29,29,31,31	G=4,1,1,1	LP=3,0
871	434	541	M=5	NSL=33,29,35,21		LP=3,0
872	531	663	M=10	NSL=91,69,93,69		LP=3,0
873	532	664	M=18	NSL=91,91,93,93	G=2,1,1,1	LP=3,0
876	535	667	M=10	NSL=91,69,93,69		LP=3,0

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1241    663    731    M=26    NSL=87,69,88,69                    LP=3,0
1242    667    732    M=26    NSL=87,69,88,69                    LP=3,0
1243    668    733    M=26    NSL=87,69,88,69                    LP=3,0
1244    672    734    M=26    NSL=87,69,88,69                    LP=3,0
1245    673    735    M=26    NSL=87,69,88,69                    LP=3,0
1246    677    736    M=26    NSL=87,69,88,69                    LP=3,0
1247    678    737    M=26    NSL=87,69,88,69                    LP=3,0
1248    682    738    M=26    NSL=87,69,88,69                    LP=3,0
C LANTAI 3
877      40    156    M=14    NSL=65,26,66,28                    LP=3,0
878      41    157    M=5     NSL=26,26,28,28   G=1,1,1,1        LP=3,0
880      43    159    M=14    NSL=26,65,28,67                    LP=3,0
881     160     45    M=15    NSL=34,69,36,69   G=1,1,1,1        LP=-3,0
883      47    162    M=15    NSL=69,69,69,69                    LP=3,0
884      48    218    M=24    NSL=69,69,69,69   G=1,1,1,1        LP=3,0
886      50    163    M=15    NSL=69,69,69,69                    LP=3,0
887     164     51    M=15    NSL=34,69,36,69   G=1,1,1,1        LP=-3,0
889      54    166    M=14    NSL=42,65,44,67                    LP=3,0
890      55    167    M=14    NSL=42,42,44,44   G=1,1,1,1        LP=3,0
892      57    169    M=14    NSL=42,65,44,67                    LP=3,0
893     156    250    M=10    NSL=33,21,35,23                    LP=3,0
894     157    251    M=6     NSL=21,21,23,23   G=1,1,1,1        LP=3,0
896     159    253    M=11    NSL=9,21,11,23                     LP=3,0
897     160    254    M=11    NSL=9,9,11,11     G=1,1,1,1        LP=3,0
899     162    217    M=12    NSL=70,69,71,69                    LP=3,0
900     217    256    M=12    NSL=70,45,71,47                    LP=3,0
901     218    257    M=11    NSL=45,45,47,47                    LP=3,0
902     219    619    M=11    NSL=45,45,47,47                    LP=3,0
903     220    259    M=12    NSL=70,45,71,47                    LP=3,0
904     163    220    M=12    NSL=70,69,71,69                    LP=3,0
905     164    260    M=11    NSL=9,9,11,11     G=2,1,1,1        LP=3,0
908     167    263    M=6     NSL=9,9,11,11     G=1,1,1,1        LP=3,0
910     169    265    M=10    NSL=9,33,11,35                     LP=3,0
911     250    336    M=5     NSL=69,69,69,69                    LP=3,0
27      648    649    M=4     NSL=83,96,85,97                    LP=3,0
912     251    337    M=18    NSL=83,6,85,8                      LP=3,0
913     252    338    M=9     NSL=6,6,8,8       G=4,1,1,1        LP=3,0
918     618    343    M=18    NSL=6,6,8,8                        LP=3,0
919     258    344    M=18    NSL=6,6,8,8                        LP=3,0
920     259    345    M=18    NSL=6,6,8,8       G=4,1,1,1        LP=3,0
925     264    350    M=18    NSL=83,6,85,8                      LP=3,0
28      650    651    M=4     NSL=83,96,85,97                    LP=3,0
926     265    351    M=5     NSL=69,69,69,69                    LP=3,0
927     336    437    M=5     NSL=33,21,35,23                    LP=3,0
928     337    438    M=6     NSL=21,21,23,23   G=4,1,1,1        LP=3,0
933     342    396    M=10    NSL=70,58,89,60                    LP=3,0
934     396    749    M=10    NSL=70,69,89,69                    LP=3,0
1318    749    443    M=10    NSL=70,69,89,69                    LP=3,0
935     443    492    M=10    NSL=70,69,89,69                    LP=3,0
936     343    397    M=18    NSL=58,58,60,60                    LP=3,0
937     397    494    M=20    NSL=1,69,3,69                      LP=3,0
938     344    398    M=13    NSL=58,69,60,69                    LP=3,0
939     398    412    M=13    NSL=76,69,77,69                    LP=3,0
940     412    496    M=13    NSL=76,37,77,39                    LP=3,0
941     345    399    M=15    NSL=69,70,69,72                    LP=3,0
942     399    413    M=15    NSL=69,70,69,72                    LP=3,0
943     413    444    M=15    NSL=80,70,81,82                    LP=3,0
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944     444     497     M=8     NSL=80,70,81,82                         LP=3,0
945     346     445     M=6     NSL=29,29,31,31   G=4,1,1,1             LP=3,0
950     351     450     M=5     NSL=33,29,35,31                         LP=3,0
951     437     544     M=5     NSL=33,21,35,23                         LP=3,0
952     438     545     M=6     NSL=21,21,23,23   G=4,1,1,1             LP=3,0
957     492     629     M=8     NSL=70,18,71,20                         LP=3,0
958     629     550     M=8     NSL=70,14,89,16                         LP=3,0
959     493     630     M=18    NSL=18,18,20,20                         LP=3,0
960     630     551     M=18    NSL=14,14,16,16                         LP=3,0
961     495     631     M=18    NSL=18,18,20,20                         LP=3,0
962     631     552     M=18    NSL=14,14,16,16                         LP=3,0
963     496     632     M=18    NSL=18,18,20,20                         LP=3,0
964     632     553     M=18    NSL=14,14,16,16                         LP=3,0
965     497     633     M=8     NSL=18,70,20,72                         LP=3,0
966     633     554     M=8     NSL=14,70,16,72                         LP=3,0
967     445     555     M=6     NSL=29,29,31,31   G=4,1,1,1             LP=3,0
972     450     560     M=5     NSL=33,29,35,31                         LP=3,0
973     550     668     M=25    NSL=91,69,93,69                         LP=3,0
974     551     669     M=18    NSL=91,91,93,93   G=2,1,1,1             LP=3,0
977     554     672     M=25    NSL=91,69,93,69                         LP=3,0
C LANTAI 4
978     68      176     M=14    NSL=42,65,44,67                         LP=3,0
979     69      177     M=14    NSL=42,42,44,44   G=1,1,1,1             LP=3,0
981     71      179     M=14    NSL=42,65,44,67                         LP=3,0
982     180     73      M=15    NSL=34,69,36,69   G=1,1,1,1             LP=-3,0
984     184     75      M=15    NSL=34,69,36,69   G=1,1,1,1             LP=-3,0
986     78      186     M=14    NSL=42,65,44,67                         LP=3,0
987     79      187     M=14    NSL=42,42,44,44   G=1,1,1,1             LP=3,0
989     81      189     M=14    NSL=42,65,44,67                         LP=3,0
990     176     267     M=10    NSL=9,33,11,35                          LP=3,0
991     177     268     M=6     NSL=9,9,11,11     G=1,1,1,1             LP=3,0
993     179     270     M=11    NSL=9,9,11,11     G=2,1,1,1             LP=3,0
996     221     273     M=12    NSL=70,45,71,47                         LP=3,0
997     222     274     M=11    NSL=45,45,47,47                         LP=3,0
998     223     621     M=11    NSL=45,45,47,47                         LP=3,0
999     224     276     M=12    NSL=70,45,71,47                         LP=3,0
1000    182     221     M=15    NSL=70,69,71,69                         LP=3,0
1001    183     224     M=15    NSL=70,69,71,69                         LP=3,0
1002    184     277     M=11    NSL=9,9,11,11     G=2,1,1,1             LP=3,0
1005    187     280     M=6     NSL=9,9,11,11     G=1,1,1,1             LP=3,0
1007    189     282     M=10    NSL=9,33,11,35                          LP=3,0
1008    267     354     M=5     NSL=69,69,69,69                         LP=3,0
1177    652     653     M=4     NSL=83,96,85,97                         LP=3,0
1009    268     355     M=18    NSL=83,6,85,8                           LP=3,0
1010    269     356     M=18    NSL=6,6,8,8       G=4,1,1,1             LP=3,0
1015    620     361     M=18    NSL=6,6,8,8                             LP=3,0
1016    275     362     M=18    NSL=6,6,8,8                             LP=3,0
1017    276     363     M=18    NSL=6,6,8,8       G=4,1,1,1             LP=3,0
1023    281     368     M=18    NSL=83,6,85,8                           LP=3,0
1178    654     655     M=4     NSL=83,96,85,97                         LP=3,0
1024    282     369     M=5     NSL=69,69,69,69                         LP=3,0
1025    354     453     M=5     NSL=29,33,31,35                         LP=3,0
1026    355     454     M=6     NSL=29,29,31,31   G=4,1,1,1             LP=3,0
1031    360     400     M=10    NSL=70,72,58,60                         LP=3,0
1032    400     750     M=10    NSL=70,69,72,69                         LP=3,0
1319    750     459     M=10    NSL=70,69,72,69                         LP=3,0
1033    459     498     M=10    NSL=70,69,72,69                         LP=3,0
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1034    361    401    M=18    NSL=58,58,60,60                  LP=3,0
1035    401    500    M=20    NSL=1,69,3,69                    LP=3,0
1036    362    402    M=13    NSL=58,69,60,69                  LP=3,0
1037    402    414    M=13    NSL=76,69,77,69                  LP=3,0
1038    414    502    M=13    NSL=76,37,77,39                  LP=3,0
1039    363    403    M=15    NSL=69,70,69,72                  LP=3,0
1040    403    415    M=15    NSL=69,70,69,72                  LP=3,0
1041    415    460    M=15    NSL=80,70,81,82                  LP=3,0
1042    460    503    M=8     NSL=80,70,81,82                  LP=3,0
1043    364    461    M=6     NSL=29,29,31,31  G=4,1,1,1       LP=3,0
1048    369    466    M=5     NSL=33,29,35,31                  LP=3,0
1049    453    563    M=5     NSL=29,33,31,35                  LP=3,0
1050    454    564    M=6     NSL=29,29,31,31  G=4,1,1,1       LP=3,0
1055    498    634    M=8     NSL=70,18,72,20                  LP=3,0
1056    499    635    M=18    NSL=18,18,20,20                  LP=3,0
1057    501    636    M=18    NSL=18,18,20,20  G=1,1,1,1       LP=3,0
1059    503    638    M=8     NSL=18,70,20,72                  LP=3,0
1060    634    569    M=8     NSL=70,14,72,16                  LP=3,0
1061    635    570    M=18    NSL=14,14,16,16  G=2,1,1,1       LP=3,0
1064    638    573    M=8     NSL=14,70,16,72                  LP=3,0
1065    461    574    M=6     NSL=29,29,31,31  G=4,1,1,1       LP=3,0
1070    466    579    M=5     NSL=29,33,31,35                  LP=3,0
1071    569    673    M=25    NSL=91,69,93,69                  LP=3,0
1072    570    674    M=18    NSL=91,91,93,93  G=2,1,1,1       LP=3,0
1075    573    677    M=25    NSL=91,69,93,69                  LP=3,0
C LANTAI 5
1076    100    194    M=14    NSL=42,106,44,107                LP=3,0
1077    101    195    M=14    NSL=42,42,44,44  G=4,1,1,1       LP=3,0
1082    106    200    M=15    NSL=42,70,44,72                  LP=3,0
1083    107    226    M=22    NSL=46,46,48,48  G=1,1,1,1       LP=3,0
1085    109    203    M=15    NSL=26,70,28,72                  LP=3,0
1086    110    204    M=14    NSL=26,26,28,28  G=4,1,1,1       LP=3,0
1091    115    209    M=14    NSL=26,106,28,107                LP=3,0
1092    194    285    M=10    NSL=9,104,11,105                 LP=3,0
1093    195    286    M=6     NSL=9,9,11,11    G=1,1,1,1       LP=3,0
1095    197    288    M=11    NSL=9,9,11,11    G=2,1,1,1       LP=3,0
1098    200    225    M=12    NSL=70,70,71,72                  LP=3,0
1099    225    291    M=12    NSL=70,45,71,47                  LP=3,0
1100    226    292    M=11    NSL=45,45,47,47                  LP=3,0
1101    227    623    M=11    NSL=45,45,47,47                  LP=3,0
1102    228    294    M=12    NSL=70,45,89,47                  LP=3,0
1103    203    228    M=12    NSL=70,70,72,89                  LP=3,0
1104    204    295    M=11    NSL=21,21,23,23  G=2,1,1,1       LP=3,0
1107    207    298    M=6     NSL=21,21,23,23  G=1,1,1,1       LP=3,0
1109    209    300    M=10    NSL=21,104,23,105                LP=3,0
1110    285    372    M=5     NSL=69,69,69,69                  LP=3,0
1179    656    657    M=4     NSL=83,96,85,97                  LP=3,0
1111    286    373    M=18    NSL=83,6,85,8                    LP=3,0
1112    287    374    M=18    NSL=6,6,8,8      G=4,1,1,1       LP=3,0
1117    622    379    M=18    NSL=6,6,8,8                      LP=3,0
1118    293    380    M=18    NSL=6,6,8,8                      LP=3,0
1119    294    381    M=29    NSL=6,6,8,8      G=4,1,1,1       LP=3,0
1124    299    386    M=18    NSL=83,6,85,8                    LP=3,0
1180    658    659    M=4     NSL=83,96,85,97                  LP=3,0
1125    300    387    M=5     NSL=69,69,69,69                  LP=3,0
1126    372    469    M=5     NSL=9,104,11,105                 LP=3,0
1127    373    470    M=6     NSL=9,9,11,11    G=4,1,1,1       LP=3,0
```

```
1132    378    404    M=11    NSL=70,58,71,60                 LP=3,0
1133    404    751    M=11    NSL=70,69,71,69                 LP=3,0
1320    751    475    M=11    NSL=70,69,71,69                 LP=3,0
1134    475    504    M=8     NSL=70,69,71,69                 LP=3,0
1135    379    405    M=18    NSL=58,58,60,60                 LP=3,0
1136    405    506    M=20    NSL=1,69,3,69                   LP=3,0
1137    380    406    M=13    NSL=58,69,60,69                 LP=3,0
1138    406    416    M=13    NSL=76,69,77,69                 LP=3,0
1139    416    508    M=13    NSL=76,37,77,39                 LP=3,0
1140    381    407    M=15    NSL=70,69,89,69                 LP=3,0
1141    407    417    M=15    NSL=70,69,89,69                 LP=3,0
1142    417    476    M=15    NSL=80,70,81,89                 LP=3,0
1143    476    509    M=15    NSL=80,70,81,89                 LP=3,0
1144    382    477    M=6     NSL=21,21,23,23  G=4,1,1,1      LP=3,0
1149    387    482    M=5     NSL=21,104,23,105               LP=3,0
1150    469    582    M=5     NSL=9,104,11,105                LP=3,0
1151    470    583    M=6     NSL=9,9,11,11    G=4,1,1,1      LP=3,0
1156    504    639    M=8     NSL=70,18,71,20                 LP=3,0
1161    639    588    M=8     NSL=70,14,71,16                 LP=3,0
1157    505    640    M=18    NSL=18,18,20,20                 LP=3,0
1158    507    641    M=18    NSL=18,18,20,20  G=1,1,1,1      LP=3,0
1160    509    643    M=8     NSL=18,70,20,89                 LP=3,0
1162    640    589    M=18    NSL=14,14,16,16  G=2,1,1,1      LP=3,0
1165    643    592    M=8     NSL=14,70,16,89                 LP=3,0
1166    477    593    M=6     NSL=21,21,23,23  G=4,1,1,1      LP=3,0
1171    482    598    M=5     NSL=21,104,23,105               LP=3,0
1172    588    678    M=25    NSL=66,91,68,93                 LP=3,0
1173    589    679    M=18    NSL=91,91,93,93  G=2,1,1,1      LP=3,0
1176    592    682    M=25    NSL=66,91,68,93                 LP=3,0
C ELEMEN BALOK BORDES
1503    835    836    M=15    NSL=98,98,99,99                 LP=3,0
1504    837    838    M=15    NSL=98,98,99,99                 LP=3,0
1505    839    840    M=15    NSL=98,98,99,99                 LP=3,0
1506    841    842    M=15    NSL=98,98,99,99                 LP=3,0
1565    843    844    M=15    NSL=98,98,99,99                 LP=3,0
1566    845    846    M=15    NSL=98,98,99,99                 LP=3,0
1567    847    848    M=15    NSL=98,98,99,99                 LP=3,0
1568    849    850    M=15    NSL=98,98,99,99                 LP=3,0
C ELEMEN RING BALOK
55      693    694    M=28                    G=3,1,1,1       LP=2,0
194     697    698    M=28                    G=3,1,1,1       LP=2,0
212     701    702    M=28                    G=3,1,1,1       LP=2,0
1197    705    706    M=28                    G=3,1,1,1       LP=2,0
1204    711    710    M=28                    G=14,1,1,1      LP=2,0
1200    708    739    M=28                                    LP=3,0
1201    739    740    M=28                                    LP=3,0
1202    740    709    M=28                                    LP=3,0
1203    709    710    M=28                                    LP=3,0
1219    710    741    M=28                                    LP=3,0
1220    741    711    M=28                                    LP=3,0
1221    711    742    M=28                                    LP=3,0
1222    742    712    M=28                                    LP=3,0
1285    727    743    M=28                                    LP=3,0
1286    743    728    M=28                                    LP=3,0
1287    728    744    M=28                                    LP=3,0
1288    744    729    M=28                                    LP=3,0
1289    729    730    M=28                                    LP=3,0
```

```
1290    730    745    M=28                                          LP=3,0
1291    745    746    M=28                                          LP=3,0
1292    746    693    M=28                                          LP=3,0
C ELEMEN LIFT
1577    851    852    M=28     NSL=78,69,97,69                      LP=2,0
1578    852    853    M=28     NSL=78,69,97,69                      LP=2,0
1579    854    855    M=28     NSL=78,78,97,97 G=1,1,1,1            LP=2,0
1581    857    858    M=28     NSL=78,69,97,69 G=1,1,1,1            LP=2,0
1583    851    854    M=28     NSL=78,69,97,69                      LP=3,0
1584    852    855    M=29     NSL=78,108,97,97                     LP=3,0
1585    853    856    M=28     NSL=78,69,97,69                      LP=3,0
1586    854    857    M=28     NSL=78,69,97,69                      LP=3,0
1587    855    858    M=29     NSL=78,108,97,97                     LP=3,0
1588    856    859    M=28     NSL=78,69,97,69                      LP=3,0
1589    859    718    M=28                                          LP=3,0
1590    702    853    M=28                                          LP=3,0
:
LOADS
C BEBAN PADA JOINT RING BALOK
694                    F=0,-11.0238,-55.119,0,0,0                   L=1
695                    F=0,-11.2548,-56.299,0,0,0
696  705     1         F=0,-11.3968,-56.984,0,0,0
706                    F=0,-11.2548,-56.299,0,0,0
707                    F=0,-11.0238,-55.119,0,0,0
739                    F=5.5734,0,-9.876,0,0,0
740                    F=17.213,0,-20.56,0,0,0
710                    F=17.213,0,-20.56,0,0,0
741                    F=17.213,0,-20.56,0,0,0
742                    F=5.5734,0,-9.876,0,0,0
713                    F=0,11.0238,-55.119,0,0,0
714                    F=0,11.2548,-56.299,0,0,0
715  724     1         F=0,11.3968,-56.984,0,0,0
725                    F=0,11.2548,-56.299,0,0,0
726                    F=0,11.0238,-55.119,0,0,0
743                    F=-5.5734,0,-9.876,0,0,0
744                    F=-17.213,0,-20.56,0,0,0
729                    F=-17.213,0,-20.56,0,0,0
745                    F=-17.213,0,-20.56,0,0,0
746                    F=-5.5734,0,-9.876,0,0,0
C BEBAN GEMPA RING BALOK
693                    F=50.036,0,0,0,0,0        L=5
730                    F=66.714,0,0,0,0,0
729                    F=50.036,0,0,0,0,0
728                    F=66.714,0,0,0,0,0
727                    F=33.357,0,0,0,0,0
693                    F=0,8.895,0,0,0,0         L=6
708                    F=0,8.895,0,0,0,0
694  707     1         F=0,17.790,0,0,0,0
C BEBAN GEMPA LANTAI 5
100                    F=296.913,0,0,0,0,0   L=5
285                    F=395.885,0,0,0,0,0
372                    F=296.913,0,0,0,0,0
469                    F=395.885,0,0,0,0,0
582                    F=197.942,0,0,0,0,0
100                    F=0,52.785,0,0,0,0    L=6
115                    F=0,52.785,0,0,0,0
101   114     1        F=0,105.569,0,0,0,0
```

```
C BEBAN GEMPA LANTAI 4
68                      F=209.926,0,0,0,0,0  L=5
267                     F=279.902,0,0,0,0,0
354                     F=209.926,0,0,0,0,0
453                     F=279.902,0,0,0,0,0
563                     F=139.951,0,0,0,0,0
68                      F=0,37.32,0,0,0,0     L=6
81                      F=0,37.32,0,0,0,0
69  71   1              F=0,74.64,0,0,0,0
73  74   1              F=0,74.64,0,0,0,0
222  223  1             F=0,74.64,0,0,0,0
183                     F=0,74.64,0,0,0,0
75  76   1              F=0,74.64,0,0,0,0
78  80   1              F=0,74.64,0,0,0,0
C BEBAN GEMPA LANTAI 3
40                      F=147.879,0,0,0,0,0     L=5
250                     F=197.172,0,0,0,0,0
336                     F=147.879,0,0,0,0,0
437                     F=197.172,0,0,0,0,0
544                     F=98.586,0,0,0,0,0
40                      F=0,26.290,0,0,0,0       L=6
57                      F=0,26.290,0,0,0,0
41  43   1              F=0.52.579,0,0,0,0
45  52   1              F=0,52.579,0,0,0,0
54  56   1              F=0.52.579,0,0,0,0
C BEBAN GEMPA LANTAI 2
18                      F=93.254,0,0,0,0,0       L=5
232                     F=124.339,0,0,0,0,0
318                     F=93.254,0,0,0,0,0
421                     F=124.339,0,0,0,0,0
525                     F=62.169,0,0,0,0,0
18                      F=0,16.579,0,0,0,0       L=6
29                      F=0,16.579,0,0,0,0
19    21   1            F=0,33.157,0,0,0,0
138  139   1            F=0,33.157,0,0,0,0
22    25   1            F=0,33.157,0,0,0,0
144  145   1            F=0,33.157,0,0,0,0
26    28   1            F=0,33.157,0,0,0,0
:
COMBO
C      DD       DD      LL      LL       EQx      EQy
C (1,2DD + 1,6DL)
1    C=1.35    1.35    1.8     1.8        0        0
C 1,05 (DD + θLL ± EQ)
2    C=1.181   1.181   0.591   0.591     1.181    0.227
3    C=1.181   1.181   0.591   0.591    -1.181    0.227
4    C=1.181   1.181   0.591   0.591     1.181   -0.227
5    C=1.181   1.181   0.591   0.591    -1.181   -0.227
6    C=1.181   1.181   0.591   0.591     1.181    0.227
7    C=1.181   1.181   0.591   0.591    -1.181    0.227
8    C=1.181   1.181   0.591   0.591     1.181   -0.227
9    C=1.181   1.181   0.591   0.591    -1.181   -0.227
C  0.9 (DD ± EQ)
10   C=1.013   1.013     0       0       1.013    0.304
11   C=1.013   1.013     0       0      -1.013    0.304
12   C=1.013   1.013     0       0       1.013   -0.304
13   C=1.013   1.013     0       0      -1.013   -0.304
```

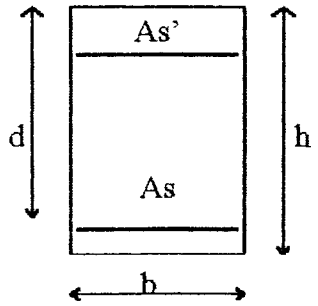
```
14  C=1.013  1.013    0        0       0.304    1.013
15  C=1.013  1.013    0        0      -0.304    1.013
16  C=1.013  1.013    0        0       0.304   -1.013
17  C=1.013  1.013    0        0      -0.304   -1.013


HITUNGAN SAPCON STRUKTUR TIGA DIMENSI
CONTROL
IX=0    IU=S    IP=0    IC=7,21,1
COMBO
C 1.2 DL = 1.2 x 0.9/0.8 = 1.35
C 1.6 LL = 1.6 x 0.9/0.8 = 1.8
C 1.05 DD = 1.05 x 0.9/0.8 = 1.181
C 1.05 LR x LL = 1.05 x 0.5 x 0.9/0.8 = 0.591
C 1.05 EQx = 1.05 x 0.9/0.8  = 1.181
C 1.05 EQy = 1.05 x 0.9/0.8  = 1.181
C 30% x 1.05 EQx =0.3 x 1.05 x 0.9/0.8  = 0.227
C 30% x 1.05 EQy =0.3 x 1.05 x 0.9/0.8  = 0.227
C 0.9 DD = 0.9 x 0.9/0.8 = 1.013
C 0.9 EQx = 0.9 x 0.9/0.8  = 1.013
C 0.9 EQy = 0.9 x 0.9/0.8  = 1.013
C 30% x 0.9 EQx =0.3 x 0.9 x 0.9/0.8  = 0.304
C 30% x 0.9 EQy =0.3 x 0.9 x 0.9/0.8  = 0.304
C      DD       DD       LL      LL         EQx      EQy
C  (1.2DD + 1.6DL)
1    C=1.35    1.35    1.8      1.8          0        0
C    1,05 ( DD + θLL ± EQ )
2    C=1.181   1.181   0.591    0.591     1.181     0.227
3    C=1.181   1.181   0.591    0.591    -1.181     0.227
4    C=1.181   1.181   0.591    0.591     1.181    -0.227
5    C=1.181   1.181   0.591    0.591    -1.181    -0.227
6    C=1.181   1.181   0.591    0.591     1.181     0.227
7    C=1.181   1.181   0.591    0.591    -1.181     0.227
8    C=1.181   1.181   0.591    0.591     1.181    -0.227
9    C=1.181   1.181   0.591    0.591    -1.181    -0.227
C  0,9 (DD ± EQ)
10   C=1.013   1.013    0        0        1.013     0.304
11   C=1.013   1.013    0        0       -1.013     0.304
12   C=1.013   1.013    0        0        1.013    -0.304
13   C=1.013   1.013    0        0       -1.013    -0.304
14   C=1.013   1.013    0        0        0.304     1.013
15   C=1.013   1.013    0        0       -0.304     1.013
16   C=1.013   1.013    0        0        0.304    -1.013
17   C=1.013   1.013    0        0       -0.304    -1.013
:
SECTION
1    MN=C  SH=C T=.7,0.6,0.0625     E=2.1E7  IS=RR-5-5\
     A=3.14*.025*.025  F=4E5,2E4,0.75*4E5,0.65*2E4
2    MN=C  SH=C T=0.7,0.5,0.0625     E=2.1E7 IS=RR-4-4\
     A=3.14*.025*.025  F=4E5,2E4,0.75*4E5,0.65*9E5
3    MN=C  SH=C   T=0.5,0.5,0.0625  E=2.1E7  IS=RR-3-3\
     A=3.14*.025*.025  F=4E5,2E4,0.75*4E5,0.65*9E5
4    MN=C SH=B T=1.0,0.4,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
5    MN=C SH=B T=0.65,0.3,0.0625,0.0625    E=2.1E7
     F=4E5,2E4,0.75*2.4E5
6    MN=C SH=B T=0.95,0.3,0.0625,0.0625    E=2.1E7
```

```
     F=4E5,2E4,0.75*2.4E5
7    MN=C SH=B T=0.5,0.3,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
8    MN=C SH=B T=0.9,0.3,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
9    MN=C SH=B T=0.6,0.3,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
10   MN=C SH=B T=0.7,0.3,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
11   MN=C SH=B T=0.75,0.3,0.0625,0.0625    E=2.1E7
     F=4E5,2E4,0.75*2.4E5
12   MN=C SH=B T=0.8,0.3,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
13   MN=C SH=B T=0.4,0.2,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
14   MN=C SH=B T=0.55,0.3,0.0625,0.0625    E=2.1E7
     F=4E5,2E4,0.75*2.4E5
15   NN=C SH=B T=0.5,0.3,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
16   MN=C SH=B T=0.8,0.25,0.0625,0.0625    E=2.1E7
     F=4E5,2E4,0.75*2.4E5
17   MN=C SH=B T=0.85,0.25,0.0625,0.0625   E=2.1E7
     F=4E5,2E4,0.75*2.4E5
18   MN=C SH=B T=0.4,0.35,0.0625,0.0625    E=2.1E7
     F=4E5,2E4,0.75*2.4E5
19   MN=C SH=B T=0.6,0.25,0.0625,0.0625    E=2.1E7
     F=4E5,2E4,0.75*2.4E5
20   MN=C SH=B T=0.5,0.2,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
21   MN=C SH=B T=0.6,0.2,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
22   MN=C SH=B T=0.5,0.3,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
23   MN=C SH=B T=0.4,0.2,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
24   MN=C SH=B T=0.4,0.3,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
25   MN=C SH=B T=0.45,0.3,0.0625,0.0625    E=2.1E7
     F=4E5,2E4,0.75*2.4E5
26   MN=C SH=B T=0.7,0.1,0.0625,0.0625     E=2.1E7
     F=4E5,2E4,0.75*2.4E5
27   MN=C SH=B T=0.45,0.45,0.0625,0.0625   E=2.1E7
     F=4E5,2E4,0.75*2.4E5
28   MN=C SH=B T=0.5,0.35,0.0625,0.0625    E=2.1E7
     F=4E5,2E4,0.75*2.4E5
29   MN=C SH=B T=0.6,0.35,0.0625,0.0625    E=2.1E7
     F=4E5,2E4,0.75*2.4E5
```

3.4. Perhitungan balok (elemen 812)

3.4.1. Perhitungan tulangan lentur



d = 800-40-10-(25/2) = 737,5 mm

a. Pada Tumpuan

$M^- = 998$ KN m ; $M^+ = 499$ KN m

Pada SAPCON rumus yang digunakan

$$As = \frac{Mu}{\Phi . fy . (d - \frac{a}{2})} \quad ; \quad (d - \tfrac{a}{2}) \Rightarrow 0{,}9 . d$$

$$As^- = \frac{998x10^6}{0{,}8x400x0{,}9x737.5} = 4698 \text{ mm}^2 = 46{,}98 \text{ cm}^2$$

$$As^+ = \frac{499x10^6}{0{,}8x400x0{,}9x737{,}5} = 2349 \text{ mm}^2 = 23{,}49 \text{ cm}^2$$

Pada keluaran sapcon dihasilkan

$As^- = 46{,}02 \text{ cm}^2$; $As^+ = 20{,}47 \text{ cm}^2$

digunakan $\varnothing_{25}$, $A_1\varnothing = \frac{1}{4} \times 3{,}14 \times 2{,}5^2 = 4{,}91 \text{ cm}^2$

N = 46,02/4,91 = 9,37 dipakai 10Ø25 untuk tulangan atas (negatif)

N = 20,46/4,91 = 4,16 dipakai 5Ø25 untuk tulangan bawah (positif)

b. Pada Lapangan

$M^- = 647$ KN m ; $M^+ = 211$ KN m

$$As^{-} = \frac{647x10^{6}}{0.8x400x0.9x737,5} = 3046 \text{ mm}^2 = 30,46 \text{ cm}^2$$

$$As^{+} = \frac{211x10^{6}}{0.8x400x0.9x737,5} = 993 \text{ mm}^2 = 9,93 \text{ cm}^2$$

Pada keluaran sapcon dihasilkan

$As^{-} = 27,36 \text{ cm}^2$; $As^{+} = 10,17 \text{ cm}^2$

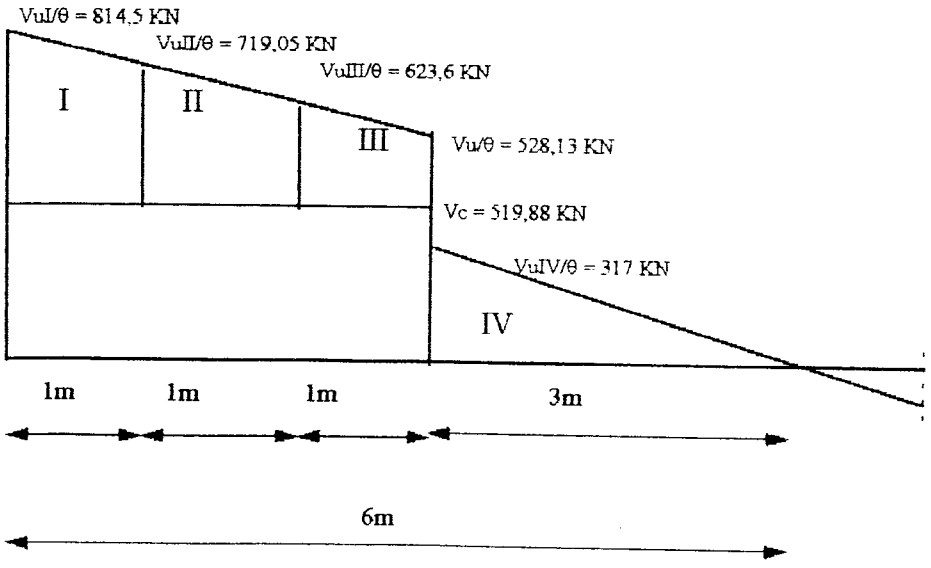
Perbedaan yang cukup kecil ini disebabkan oleh faktor pembulatan, tulangan yang digunakan $\varnothing_{25}$, $A_{1\varnothing} = \frac{1}{4} \times 3,14 \times 2,5^2 = 4,91 \text{ cm}^2$

N = 27,36/4,91 = 5,57 dipakai 6∅25 untuk tulangan atas (negatif)

N = 10,17/4,91 = 2,07 dipakai 3∅25 untuk tulangan bawah (positif)

3.4.2. Perhitungan tulangan geser

Elemen 812 (40/80), dari hitungan SAP'90 didapat Vu = 488,70 KN, pada perhitungan tulangan geser ini di bagi menjadi beberapa daerah



Perhitungan Tulangan geser daerah I

d = 800-40-10-12.5 = 737.5 mm

VuI = 488,70 KN ; VuI/θ = 488,70/0,6 = 814,5 KN

$$Vc = \frac{1}{6}\sqrt{20}.400.737,5 = 519,88 \text{ KN}$$

Vs = 814,5 - 519,88 = 294,62 KN

Tulangan sengkang dipakai ∅10

$A_1\varnothing = ¼ \times 3,14 \times 1^2 = 0,785 \text{ cm}^2$; $Av = 2 \times 0,785 = 1,57 \text{ cm}^2$

$$s = \frac{Av.fy.d}{Vs} \quad ; \quad s = \frac{157.240.737,5}{294,62.10^3} = 106,19 \text{ mm}$$

Dipakai tulangan ∅10 - 100

Perhitungan Tulangan geser daerah II

VuII = 431,43 KN ; VuII/θ = 431,43/0,6 = 719,05 KN

$$Vc = \frac{1}{6}\sqrt{20}.400.737,5 = 519,88 \text{ KN}$$

Vs = 719,05 - 519,88 = 199,17 KN

$$s = \frac{157.240.737,5}{199,17.10^3} = 122,43 \text{ mm}$$

Dipakai tulangan ∅10 - 120

Perhitungan Tulangan geser daerah III

VuIII = 374,16 KN ; VuIII/θ = 374,16/0,6 = 623,6 KN

$$Vc = \frac{1}{6}\sqrt{20}.400.737,5 = 519,88 \text{ KN}$$

Vs = 623,6 - 519,88 = 106,72 KN

$$s = \frac{157.240.737,5}{106,72.10^3} = 144,53 \text{ mm}$$

Dipakai tulangan ∅10 - 140

Perhitungan Tulangan geser daerah IV

Untuk perhitungan daerah IV, karena gaya lintangnya masih lebih kecil daripada Vc (kekuatan beton menahan gaya geser), sehingga dipakai tulangan geser minimum, dalam hal ini diambil ∅10 - 300

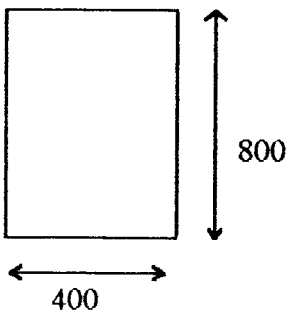
Jarak maksimum tulangan

- $\frac{Vu}{\theta} \leq 3\,Vc$; $s \leq 600$; $s \leq d/2$
- $\frac{Vu}{\theta} \leq 5\,Vc$; $s \leq 300$; $s \leq d/4$

3.4.3. Perhitungan Tulangan Torsi

Dari keluaran SAP90 didapat

Tu = 65,49 KNm



$$Tc = \frac{\sqrt{f'c}}{15}.\Sigma x^2.y$$

$\Sigma x^2.y = 400^2.800 = 128000000 \text{ mm}^3$

3.5. Perhitungan Kolom

3.5.1 Penulangan lentur

Data hasil dari analisis program SAP90 didapat, untuk kolom 50/50 lantai I

Pu = 1810 KN

Mu = 444 KNm

Dengan memplotkan nilai tersebut ke dalam diagram interaksi M dan P maka didapatkan rasio penulangan kolom = 1,2 %.

Maka As total = 1,2 % x Ag = 1,2 % x 250000 = 3000 mm^2

As = As' = ½ x As total = 1500 mm^2

Digunakan tulangan 4 ∅25 = 19963,48 mm^2 > 1500 mm^2

3.5.2. Penulangan geser

Besarnya gaya geser rencana yang bekerja pada kolom ditentukan berdasarkan persamaan berikut yaitu :

$$V_{u,k} = \frac{M_{u,k-a} + M_{u,k-b}}{h_k}$$

Karena pada kolom lantai satu ujung bawahnya menyatu dengan lantai dasar, maka Mu,k-b = 0, sehingga :

Vu,k = 444 / 4,3 = 103,256 KN

Panjang daerah dimana beton tidak ikut diperhitungkan dalam menahan gaya geser ditentukan berdasarkan nilai terbesar dari pernyataan berikut, yaitu:

1) h = 500 mm , Pu = 1810 KN < 0,3xAgxFc' = 0,3x250000x20 = 1500 KN
2) 1,5 h = 1,5 x 500 =750 mm, Pu = 1810 > 0,3xAgxFc' = 0,3x250000x20 = 1500 KN

3) 1/6 Tinggi bersih kolom = 1/6 x 4300 = 716,67 mm ≈ 720 mm

4) sebesar 450 mm

Maka nilai yang menentukan 750 mm.

a) di dalam daerah sendi plastis

Vu,k desain = Vu,k / ϕ

Vu,k desain = 103,256 / 0,60 = 172,093 KN

Av = 2 (¼ . π . D^2)

= 2 (¼ . π . 10^2)

= 157,08 mm^2

Jarak sengkang perlu adalah

S = (Av . Fy . d) / (Vu,k desain . 10^3)

= (157,08 x 240 x 435,5) / (172,093 x 10^3)

= 95,402 mm

Dipakai ∅10 - 90

b) di luar daerah sendi plastis

Pada daerah ini kontribusi Vc diperhitungkan dalam memberikan tahanan geser. Kemampuan beton dalam menahan gaya geser.

Vc = (1 + (Pu/(14. Ag))) . (√fc' / 6) . b . d

Vc = (1 + (1810000 / (14 x 250000))) . (√20 / 6) . 500 . 435,5 . 10^{-3}

Vc = 246,234 KN

Karena Vc > Vu,k desain maka dipasang sengkang minimum yaitu ∅10 -100

TABEL 3.8 DIAGRAM INTERAKSI KOLOM 50/50 1%

1%	Po				**********							Mn	
b =	500	500	500	500	500	500	500	500	500	500	500	500	= b
ht =	500	500	500	500	500	500	500	500	500	500	500	500	= ht
d' =		64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	= d'
d =		435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	= d
x =		300	290	270	261.3	200	190	180	150	125	100		= x
Ag =	250000	250000	250000	250000	250000	250000	250000	250000	250000	250000	250000	250000	= Ag
Ast =	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	= Ast
As =	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	=As
As'=	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	= As'
fc' =	20	20	20	20	20	20	20	20	20	20	20	20	= fc'
fy =	400	400	400	400	400	400	400	400	400	400	400	400	= fy
a		255	246.5	229.5	222.105	170	161.5	153	127.5	106.25	85	58.82353	a
fs' < fy		400	400	400	400	400	396.3158	385	342	290.4	213		fs' < fy
fs < fy		271	301	368	400	400	400	400	400	400	400		fs < fy
Mnb	0	417.165	424.1834	437.9255	443.8761	419.9831	413.0418	403.7168	369.9578	333.9474	288.1163	203.0441	Mnb
Pnb	5207.5	2307.5	2197.707	1969.778	1866.643	1423.75	1346.895	1260.5	990	744.875	467.5	0	Pnb

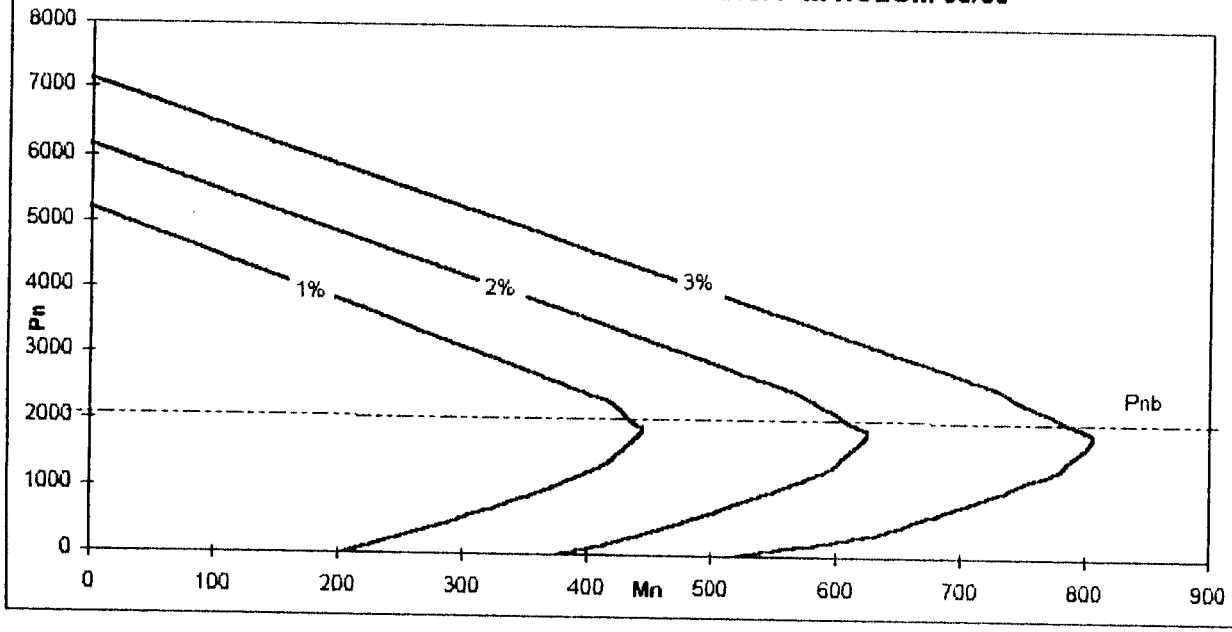
TABEL 3.9 DIAGRAM INTERAKSI KOLOM 50/50 2 %

2%	Po				**********							Mn	
b =	500	500	500	500	500	500	500	500	500	500	500	500	= b
ht =	500	500	500	500	500	500	500	500	500	500	500	500	= ht
d' =		64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	= d'
d =		435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	= d
x =		300	290	270	261.3	200	190	180	150	125	100		= x
Ag =	250000	250000	250000	250000	250000	250000	250000	250000	250000	250000	250000	250000	= Ag
Ast =	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	= Ast
As =	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	=As
As'=	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	= As'
fc' =	20	20	20	20	20	20	20	20	20	20	20	20	= fc'
fy =	400	400	400	400	400	400	400	400	400	400	400	400	= fy
a		255	246.5	229.5	222.105	170	161.5	153	127.5	106.25	85	117.6471	a
fs' < fy		400	400	400	400	400	396.3158	385	342	290.4	213		fs' < fy
fs < fy		271	301	368	400	400	400	400	400	400	400		fs < fy
Mnb	0	568.811	582.7939	612.0121	625.4342	601.5413	593.7456	581.7968	538.0672	490.092	426.3138	376.6765	Mnb
Pnb	6165	2447.5	2300.164	1988.806	1845.393	1402.5	1321.039	1220.5	896.25	586.625	212.5	0	Pnb

TABEL 3.10 DIAGRAM INTERAKSI KOLOM 50/50 3 %

3%	Po				**********							Mn	
b =	500	500	500	500	500	500	500	500	500	500	500	500	= b
ht =	500	500	500	500	500	500	500	500	500	500	500	500	= ht
d' =		64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	= d'
d =		435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	435.5	= d
x =		300	290	270	261.3	200	190	180	150	130	120		= x
Ag =	250000	250000	250000	250000	250000	250000	250000	250000	250000	250000	250000	250000	= Ag
Ast =	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	= Ast
As =	3750	3750	3750	3750	3750	3750	3750	3750	3750	3750	3750	3750	=As
As'=	3750	3750	3750	3750	3750	3750	3750	3750	3750	3750	3750	3750	= As'
fc' =	20	20	20	20	20	20	20	20	20	20	20	20	= fc'
fy =	400	400	400	400	400	400	400	400	400	400	400	400	= fy
a		255	246.5	229.5	222.105	170	161.5	153	127.5	110.5	102	176.4706	a
fs' < fy		400	400	400	400	400	396.3158	385	342	302.3077	277.5		fs' < fy
fs < fy		271	301	368	400	400	400	400	400	400	400		fs < fy
Mnb	0	720.458	741.4044	786.0987	806.9923	783.0994	774.4495	759.8768	706.1766	659.6361	631.9933	520.8971	Mnb
Pnb	7122.5	2587.5	2402.621	2007.833	1824.143	1381.25	1295.184	1180.5	802.5	509.1538	343.875	0	Pnb

GAMBAR 3.8 DIAGRAM INTERAKSI P-M KOLOM 50/50



TABEL 3.11 DIAGRAM INTERAKSI KOLOM 70/50 1 %

1%	Po				**********							Mn	
b =	500	500	500	500	500	500	500	500	500	500	500	500	= b
ht =	700	700	700	700	700	700	700	700	700	700	700	700	= ht
d' =		64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	= d'
d =		635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	= d
x =		500	450	400	381.3	340	330	310	300	290	275		= x
Ag =	350000	350000	350000	350000	350000	350000	350000	350000	350000	350000	350000	350000	= Ag
Ast =	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	= Ast
As =	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	=As
As'=	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	= As'
fc' =	20	20	20	20	20	20	20	20	20	20	20	20	= fc'
fy =	400	400	400	400	400	400	400	400	400	400	400	400	= fy
a		425	382.5	340	324.105	289	280.5	263.5	255	246.5	233.75	82.35294	a
fs' < fy		400	400	400	400	400	400	400	400	400	400		fs' < fy
fs < fy		163	247	353	400	400	400	400	400	400	400		fs < fy
Mnb	0	769.314	831.0662	888.0489	908.9815	896.0171	891.3028	880.0318	873.4751	866.3043	854.3966	416.0265	Mnb
Pnb	7290.5	3998.2	3488.667	2942.063	2725.143	2426.75	2354.5	2210	2137.75	2065.5	1957.125	0	Pnb

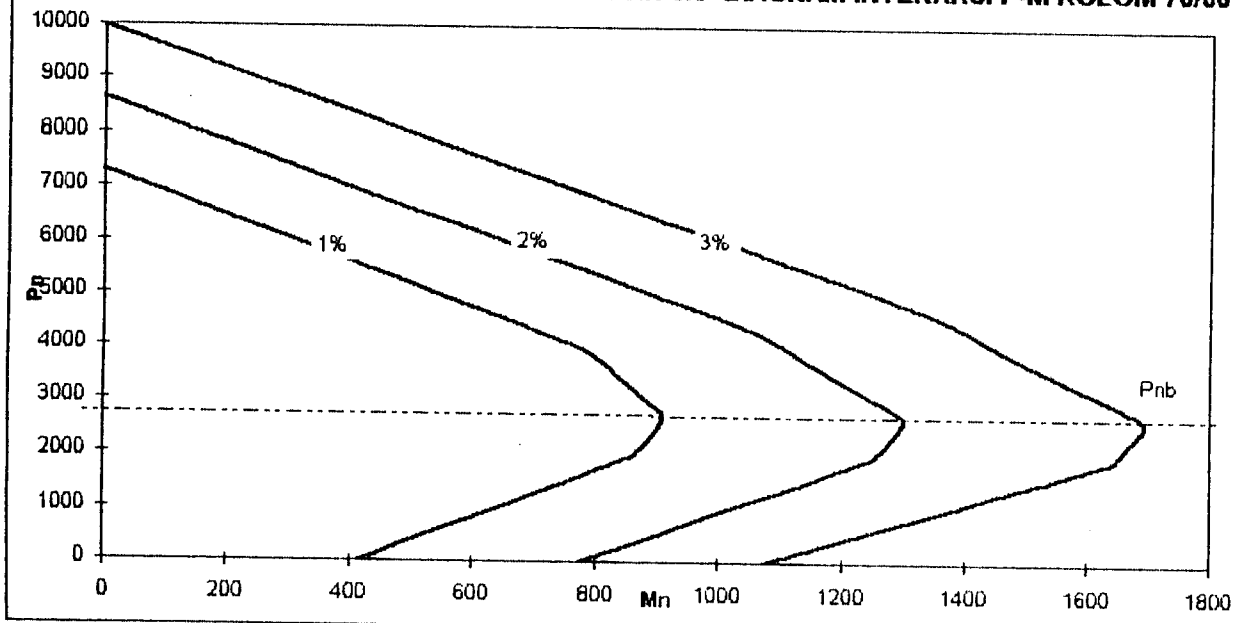
TABEL 3.12 DIAGRAM INTERAKSI KOLOM 70/50 2 %

2%	Po				**********							Mn	
b =	500	500	500	500	500	500	500	500	500	500	500	500	= b
ht =	700	700	700	700	700	700	700	700	700	700	700	700	= ht
d' =		64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	= d'
d =		635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	= d
x =		500	450	400	381.3	340	330	310	300	290	275		= x
Ag =	350000	350000	350000	350000	350000	350000	350000	350000	350000	350000	350000	350000	= Ag
Ast =	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000	= Ast
As =	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	=As
As'=	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	= As'
fc' =	20	20	20	20	20	20	20	20	20	20	20	20	= fc'
fy =	400	400	400	400	400	400	400	400	400	400	400	400	= fy
a		425	382.5	340	324.105	289	280.5	263.5	255	246.5	233.75	164.7059	a
fs' < fy		400	400	400	400	400	400	400	400	400	400		fs' < fy
fs < fy		163	247	353	400	400	400	400	400	400	400		fs < fy
Mnb	0	1041.91	1145.997	1255.898	1300.188	1287.224	1282.509	1271.238	1264.682	1257.511	1245.603	774.4059	Mnb
Pnb	8631	4383.9	3726.083	2994.125	2695.393	2397	2324.75	2180.25	2108	2035.75	1927.375	0	Pnb

TABEL 3.13 DIAGRAM INTERAKSI KOLOM 70/50 3 %

3%	Po				**********							Mn	
b =	500	500	500	500	500	500	500	500	500	500	500	500	= b
ht =	700	700	700	700	700	700	700	700	700	700	700	700	= ht
d' =		64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	= d'
d =		635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	= d
x =		500	450	400	381.3	340	330	310	300	290	275		= x
Ag =	350000	350000	350000	350000	350000	350000	350000	350000	350000	350000	350000	350000	= Ag
Ast =	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	= Ast
As =	5250	5250	5250	5250	5250	5250	5250	5250	5250	5250	5250	5250	=As
As'=	5250	5250	5250	5250	5250	5250	5250	5250	5250	5250	5250	5250	= As'
fc' =	20	20	20	20	20	20	20	20	20	20	20	20	= fc'
fy =	400	400	400	400	400	400	400	400	400	400	400	400	= fy
a		425	382.5	340	324.105	289	280.5	263.5	255	246.5	233.75	247.0588	a
fs' < fy		400	400	400	400	400	400	400	400	400	400		fs' < fy
fs < fy		163	247	353	400	400	400	400	400	400	400		fs < fy
Mnb	0	1314.5	1460.927	1623.747	1691.394	1678.43	1673.716	1662.445	1655.888	1648.717	1636.809	1075.138	Mnb
Pnb	9971.5	4769.6	3963.5	3046.188	2665.643	2367.25	2295	2150.5	2078.25	2006	1897.625	0	Pnb

GAMBAR 3.9 DIAGRAM INTERAKSI P-M KOLOM 70/60



TABEL 3.14 DIAGRAM INTERAKSI KOLOM 70/60 1 %

1%	Po				**********							Mn	
b =	600	600	600	600	600	600	600	600	600	600	600	600	= b
ht =	700	700	700	700	700	700	700	700	700	700	700	700	= ht
d' =		64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	= d'
d =		635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	= d
x =		500	450	400	381.3	340	330	310	300	290	275		= x
Ag =	420000	420000	420000	420000	420000	420000	420000	420000	420000	420000	420000	420000	= Ag
Ast =	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	= Ast
As =	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	=As
As'=	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	= As'
fc' =	20	20	20	20	20	20	20	20	20	20	20	20	= fc'
fy =	400	400	400	400	400	400	400	400	400	400	400	400	= fy
a		425	382.5	340	324.105	289	280.5	263.5	255	246.5	233.75	82.35294	a
fs' < fy		400	400	400	400	400	400	400	400	400	400		fs' < fy
fs < fy		163	247	353	400	400	400	400	400	400	400		fs < fy
Mnb	0	923.177	997.2795	1065.659	1090.778	1075.221	1069.563	1056.038	1048.17	1039.565	1025.276	499.2318	Mnb
Pnb	8748.6	4797.84	4186.4	3530.475	3270.171	2912.1	2825.4	2652	2565.3	2478.6	2348.55	0	Pnb

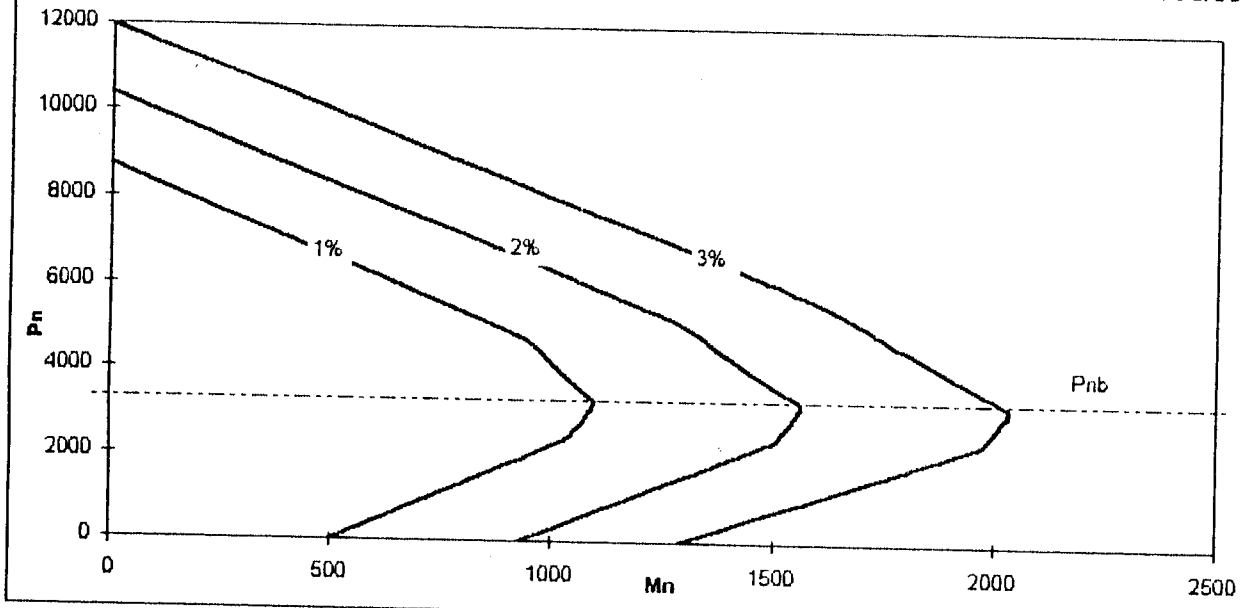
TABEL 3.15 DIAGRAM INTERAKSI KOLOM 70/60 2 %

2%	Po				**********							Mn	
b =	600	600	600	600	600	600	600	600	600	600	600	600	= b
ht =	700	700	700	700	700	700	700	700	700	700	700	700	= ht
d' =		64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	= d'
d =		635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	= d
x =		500	450	400	381.3	340	330	310	300	290	275		= x
Ag =	420000	420000	420000	420000	420000	420000	420000	420000	420000	420000	420000	420000	= Ag
Ast =	8400	8400	8400	8400	8400	8400	8400	8400	8400	8400	8400	8400	= Ast
As =	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	=As
As'=	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200	= As'
fc' =	20	20	20	20	20	20	20	20	20	20	20	20	= fc'
fy =	400	400	400	400	400	400	400	400	400	400	400	400	= fy
a		425	382.5	340	324.105	289	280.5	263.5	255	246.5	233.75	164.7059	a
fs' < fy		400	400	400	400	400	400	400	400	400	400		fs' < fy
fs < fy		163	247	353	400	400	400	400	400	400	400		fs < fy
Mnb	0	1250.29	1375.196	1507.077	1560.225	1544.668	1539.011	1525.486	1517.618	1509.013	1494.724	929.2871	Mnb
Pnb	10357.2	5260.68	4471.3	3592.95	3234.471	2876.4	2789.7	2616.3	2529.6	2442.9	2312.85	0	Pnb

TABEL 3.16 DIAGRAM INTERAKSI KOLOM 70/60 3 %

3%	Po				**********							Mn	
b =	600	600	600	600	600	600	600	600	600	600	600	600	= b
ht =	700	700	700	700	700	700	700	700	700	700	700	700	= ht
d' =		64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	= d'
d =		635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	635.5	= d
x =		500	450	400	381.3	340	330	310	300	290	275		= x
Ag =	420000	420000	420000	420000	420000	420000	420000	420000	420000	420000	420000	420000	= Ag
Ast =	12600	12600	12600	12600	12600	12600	12600	12600	12600	12600	12600	12600	= Ast
As =	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	=As
As'=	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	= As'
fc' =	20	20	20	20	20	20	20	20	20	20	20	20	= fc'
fy =	400	400	400	400	400	400	400	400	400	400	400	400	= fy
a		425	382.5	340	324.105	289	280.5	263.5	255	246.5	233.75	247.0588	a
fs' < fy		400	400	400	400	400	400	400	400	400	400		fs' < fy
fs < fy		163	247	353	400	400	400	400	400	400	400		fs < fy
Mnb	0	1577.41	1753.112	1948.496	2029.673	2014.116	2008.459	1994.933	1987.065	1978.46	1964.171	1290.166	Mnb
Pnb	11965.8	5723.52	4756.2	3655.425	3198.771	2840.7	2754	2580.6	2493.9	2407.2	2277.15	0	Pnb

GAMBAR 3.10 DIAGRAM INTERAKSI P-M KOLOM 70/60



TABEL 3.17 PENULANGAN KOLOM

Lantai	Dimensi mm	Gaya Aksial (KN)	Momen (KN-m)		Geser (KN)		Vc (KN)	Luas Tulangan		Tulangan Lentur Dipakai				Tulangan Geser	
			Bawah	Atas	Tumpuan	Lapangan		As (mm2)	As' (mm2)	As (mm2)	D As	As' (mm2)	D As'	Tumpuan	Lapangan
I	500 / 500	1810	0	444	172.093	172.093	246.234	1500	1500	1963.48	4D25	1963.48	4D25	P10 - 90	P10 -300
	500 / 700	2708	0	490	189.922	189.922	367.725	1750	1750	1963.48	4D25	1963.48	4D25	P10 -100	P10 -300
	600 / 700	2789	0	613	237.597	237.597	419.008	2100	2100	2454.37	5D25	2454.37	5D25	P10 -100	P10 -300
II	500 / 500	796	444	418	334.109	134.896	199.213	1875	1875	1963.48	4D25	1963.48	4D25	P10 - 60	P10 -300
	500 / 700	1637	490	452	356.116	49.157	315.959	1750	1750	1963.48	4D25	1963.48	4D25	P10 - 60	P10 -300
	600 / 700	1315	613	499	431.008	83.244	347.764	2100	2100	2454.37	5D25	2454.37	5D25	P10 - 60	P10 -300
III	500 / 500	484	418	325	287.985	103.24	184.745	1500	1500	1963.48	4D25	1963.48	4D25	P10 - 60	P10 -300
	500 / 700	1113	452	357	313.566	22.933	290.633	1750	1750	1963.48	4D25	1963.48	4D25	P10 - 70	P10 -300
	600 / 700	1137	499	364	334.496	334.496	339.16	2100	2100	2454.37	5D25	2454.37	5D25	P10 - 70	P10 -300
IV	500 / 500	303	325	242	219.767	43.415	176.352	1250	1250	1472.62	3D25	1472.62	3D25	P10 - 70	P10 -300
	500 / 700	575	357	425	303.101	38.472	264.629	2100	2100	2454.37	5D25	2454.37	5D25	P10 - 70	P10 -300
	600 / 700	588	364	531	346.899	34.274	312.625	2100	2100	2454.37	5D25	2454.37	5D25	P10 - 60	P10 -300
V	500 / 500	117	242	61	117.442	117.442	167.726	1250	1250	1472.62	3D25	1472.62	3D25	P10 -100	P10 -300
	500 / 700	112	425	469	346.512	104.262	242.25	2450	2450	2454.37	5D25	2454.37	5D25	P10 - 60	P10 -300
	600 / 700	144	531	439	375.969	84.805	291.164	2100	2100	2454.37	5D25	2454.37	5D25	P10 - 60	P10 -300

3.6. Perhitungan Pondasi

3.6.1. Perencanaan Dimensi Pelat

Beban kolom Pu = 1810 KN ; P = 1347 KN ; σ tanah = 200 KN/m^2

Kedalaman tanah = 2 m ; dengan berat rata - rata 19,6 KN/m^3 ; fc' = 20 Mpa

Tulangan pokok : $\varnothing_{19}$ dan tulangan susut : $\varnothing_8$

Tekanan tanah yang timbul dibawah pondasi akibat beban tersebut :

2 (19,6) = 39,2 KN/m^2 Maka tekanan tanah ijin efektif :

200 - 39,2 = 160,8 KN/m^2

A_{perlu} = 1347 / 160,8 = 8,377 m^2

dipakai ukuran 3 x 3 = 9 m^2

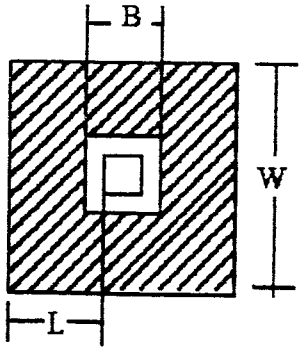
p_u = Pu / A =1810/9 = 201,11 KN/m^2

Tebal pondasi diambil 700 mm dan tebal selimut beton = 50 mm

Maka d = 700 - 50 - 19 = 631 mm

Kontrol Geser

Untuk dua arah



B = lebar kolom + (1/2 . d) 2

= 500 + 631 = 1131 mm

$V_u = p_u (W^2 - B^2)$

$= 201,11.(3^2 - 1,131^2)$

= 1552,7 KN

Karena $\beta_c = 1$ maka , kuat geser maksimum akan menjadi :

Vc $= 4 (\sqrt{fc'}) . bo . d$

$= 4 (\sqrt{20}) (1131) (4) (631)$

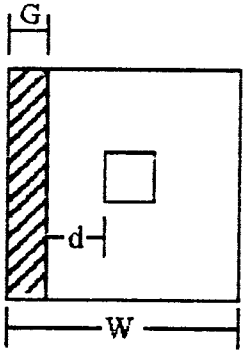
$= 50579,86$ KN

$\Phi vc = 0,6 . 50579,86$

$= 30347,9$ KN

Maka, Vu $< \Phi$ Vc .....aman

Untuk satu arah



Vu $= p_u . W . G$

$= 201,11 . 3 . 0,631$

$= 380,7$ KN

Vc $= 1/6 (\sqrt{fc'}) b_w . d$

$= 1/6 (\sqrt{20}) . 3000 . 631$

$= 1410,96$ KN

$\Phi vc = 0,6 . 1410,96$

$= 846,6$ KN

Maka, Vu $< \Phi$ Vc ..... aman

Momen rencana dapat dihitung

$Mu = 1/2 \cdot pu \cdot L^2.$

$= 1/2 \cdot 201,11 \cdot 1,25^2.$

$= 157,12$ KNm

3.6.2. Perencanaan tulangan

$\rho_{min} = 1,4 / fy$

$= 0,00292$

$$\rho_b = \frac{0,85.f'c.\beta 1}{fy} \cdot \frac{600}{600+fy}$$

$$\rho_b = \frac{0,85.20.0,85}{400} \cdot \frac{600}{600+400} = 0,0216$$

$\rho_{max} = 0,75 \cdot \rho b$

$= 0,0162$

$m = fy / (0,85 \cdot f'c)$

$= 23,53$

$Rn = Mu / (\Phi . b \cdot d)$

$= 157,12 .10^6 / (0,8 \cdot 1000 \cdot 625^2)$

$= 0,493$ Mpa

$$\rho_{perlu} = \frac{1}{m}\left[1-\sqrt{\left[1-\frac{2m.Rn}{fy}\right]}\right]$$

$\rho_{perlu} = 0,00123 < \rho_{min} = 0,00292$

$As = \rho_{perlu} \cdot b \cdot d$

$= 0,00123. 1000 \cdot 631 = 777,69 \text{ mm}^2$

Cek terhadap ρ_{min}

$As_{min} = \rho_{min} . b . d$

$= 0,00292 . 1000 . 631 = 1845$

$As' = 1,33\ As$

$= 1,33 . 777,69 = 1034,33\ mm^2$

$As_{terpakai} = 1034,33\ mm^2$

Jarak tulangan $= (0,25 . \pi . D^2 . 1000) / As$

$= (0,25 . \pi . 19^2 . 1000) / 1034,33$

$= 274$ mm

Dipakai $\varnothing_{19}$ - 270

Tulangan susut 20% As $= 206,87\ mm^2$

Jarak tulangan $= (0,25 . \pi . D^2 . 1000) / As$

$= (0,25 . \pi . 8^2 . 1000) / 206,87$

$= 242$ mm $= 24$ cm

Dipakai $\varnothing_{8}$ - 240

Tabel 3.18 Penulangan pondasi

Dimensi Kolom	B (mm)	A(m)	Tul.Pokok	Tul.susut
500/500	300	8,377	D19-270	D8-240
700/500	350	12,25	D19-240	D8-200
700/600	350	13,47	D19-230	D8-200

PENUTUP

Alhamdulillah wa syukrulillah, hanya dengan Rahmat dan Hidayah Allah SWT penyusun dapat menyelesaikan Tugas Akhir Perencanaan Gedung Megister Manajemen, UGM Yogyakarta ini dengan baik dan penuh perjuangan.

Beberapa hal yang disajikan dalam tugas akhir ini, hanya merupakan sebagian masalah yang ada dalam suatu perencanaan gedung, sehingga belum dapat dijadikan pegangan sepenuhnya tentang seluk-beluk persoalan yang harus diatasi untuk berdirinya sebuah gedung. Masih banyak lagi hal-hal yang harus dibahas dan diketahui, bukan hanya disiplin ilmu teknik sipil saja, tetapi juga dari berbagai disiplin ilmu lain yang memerlukan kerja sama antar berbagai disiplin ilmu. Tugas akhir ini hanya terbatas pada hal-hal yang penyusun ketahui, sehingga sangat disadari bahwa tugas akhir ini jauh dari sempurna seperti yang diharapkan.

Kritik dan saran sangat penyusun harapkan demi menuju kesempurnaan. Penyusun berharap semoga tugas akhir ini dapat bermanfaat bagi yang membacanya khususnya bagi penyusun sendiri.

Akhir kata tidak lupa penyusun mengucapkan terima kasih yang sedalam-dalamnya kepada semua pihak yang telah membantu terselesaikannya laporan ini. Semoga segala amal baiknya mendapat balasan yang setara dari Allah SWT, Amien.

Shodakallahuladzim.

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LAMPIRAN

LAMPIRAN 1. DATA SONDIR LOKASI PROYEK

A. BANGUNAN GEDUNG INDUK

1. HASIL PENYELIDIKAN

a. Lapisan-lapisan Tanah

Secara garis besar, kondisi tanah di lokasi ini adalah sebagai berikut.

Jenis tanah di lokasi ini dapat dikatakan hampir seluruhnya berupa tanah pasiran volkanik sedikit berlanau, yang kondisinya berlapis-lapis dengan masing-masing lapisan: tebal, kepadatan, serta kedalamannya agak bervariasi.

Dari hasil uji sondir sebanyak 6 titik yang dilaksanakan di lokasi ini (lihat gambar: titik-titik sondir T1 sampai dengan T2), ternyata lapisan tanah yang dapat ditembus oleh konis sondir dengan alat sondir 2 ton hanya sampai sedalam 1 sampai 1,80 m. Pada kedalaman tersebut nilai sondir telah melampaui 200 kg/cm^2 sehingga telah melampaui kemampuan alat sondir.

Dari hasil pemboran dan pembuatan sumur uji, diketahui bahwa pada kedalaman tersebut dijumpai lapisan tanah berupa cadas pasir berkerikil yang sangat keras. Untuk mengetahui ketebalan cadas tersebut telah diusahakan dengan pemboran dan menggali sumur uji. Pada dua sumur uji yang digali dengan tenaga orang, hanya berhasil sampai sedalam, yang pertama 4,50 m dan yang kedua 6,0 m. Dan ternyata tanahnya tetap cadas keras dan di bawahnya terdapat krakal dan batu-batu yang terlalu sukar untuk dapat mendalamkan lagi. Beberapa pemboran secara manual telah dicoba dilakukan, dan hanya satu titik yang kebetulan berhasil dan mencapai kedalaman 7 m, dan menunjukkan bahwa seluruh lapisan tanah berupa cadas keras.

Di bawah kedalaman 7 m, belum dapat diketahui secara langsung bagaimana keadaan lapisan-lapisan tanahnya, namun diperkirakan tidak akan dijumpai tanah yang sangat tidak padat atau tanah lunak. Di samping itu, dengan tebal lapisan cadas mulai dari kedalaman sekitar 1 - 1,80 m sampai kedalaman sekitar 7 m pada seluruh luas lokasi, kita sudah bisa yakin bahwa tanah di lokasi ini akan mampu memikul bangunan gedung 5 lantai yang akan dibuat di lokasi ini.

b. Muka Air Tanah

Pada saat penyelidikan lapangan (Juni 1995), muka air tanah terdapat pada kedalaman sekitar 7,20 - 7,50 m dari permukaan tanah.

2. PEMBAHASAN FONDASI

Dengan kondisi tanah seperti yang diuraikan di atas, maka bagi bangunan gedung Induk Proyek MM UGM yang merupakan bangunan 5 lantai yang akan dibuat di lokasi ini, dapat direkomendasikan penggunaan fondasi dangkal berupa *individual spread footing* atau *strip footing* di bawah kolom-kolom yang dasarnya diletakkan pada kedalaman 2 m terhadap permukaan tanah asli.

Kapasitas dukung ijin netto tanah dapat diambil dengan sangat aman sebesar:

$$q_a = 2 \text{ kg/cm}^2 = 20 \text{ t/m}^2$$

dengan penurunan yang sangat kecil dan dapat diabaikan.

LAMPIRAN 2. OUT PUT TANGGA 1

ANALISA PLAT TANGGA [KN-M]

S H E L L E L E M E N T F O R C E S

MEMBRANE FORCES ARE IN FORCE PER UNIT LENGTH
BENDING MOMENTS ARE IN MOMENTS PER UNIT LENGTH

ELEMENT ID 30 ----------
LOAD COND 1 ----------

JOINT	F11	F22	F12	FMAX	FMIN	ANGLE
32	4.8327E+00	2.9942E+01	-4.0574E+01	5.9859E+01	-2.5085E+01	-53.60
33	-3.5352E+00	-1.1897E+01	-4.2261E+01	3.4751E+01	-5.0183E+01	-42.18
45	1.4217E+01	6.4241E+01	-1.4333E+02	1.8472E+02	-1.0626E+02	-49.95
46	-7.6578E+00	-4.5144E+01	-1.4474E+02	1.1954E+02	-1.7235E+02	-41.31
JOINT	M11	M22	M12	MMAX	MMIN	ANGLE
32	-1.5570E+01	-4.9942E-01	2.3867E-01	-4.9564E-01	-1.5574E+01	89.09
33	-1.5714E+01	-6.7546E-01	-1.1954E+00	-5.8103E-01	-1.5809E+01	-85.48
45	-2.7295E+01	-3.9779E+00	6.7310E-01	-3.9585E+00	-2.7314E+01	88.35
46	-2.7373E+01	-4.0669E+00	-1.8479E+00	-3.9213E+00	-2.7519E+01	-85.49

ELEMENT ID 49 ----------
LOAD COND 1 ----------

JOINT	F11	F22	F12	FMAX	FMIN	ANGLE
68	2.9637E+01	1.4819E+02	1.0791E-01	1.4819E+02	2.9637E+01	89.95
69	4.9861E+00	2.4930E+01	-3.6006E+00	2.5561E+01	4.3559E+00	-80.07
73	5.3478E+00	1.4337E+02	-7.0112E-01	1.4337E+02	5.3443E+00	-89.71
74	-1.9102E+01	2.0113E+01	-4.4097E+00	2.0603E+01	-1.9592E+01	-83.66
JOINT	M11	M22	M12	MMAX	MMIN	ANGLE
68	-6.5154E+00	-3.2577E+01	6.7584E-01	-6.4979E+00	-3.2595E+01	1.48
69	-5.9856E+00	-2.9928E+01	1.0444E+00	-5.9401E+00	-2.9974E+01	2.49
73	1.7287E+00	-8.2919E+00	2.3097E-00	2.2355E+00	-8.7986E+00	12.37
74	-1.2404E+00	-7.6572E+00	2.6782E+00	-2.6945E-01	-8.6281E+00	19.93

ELEMENT ID 51 ----------
LOAD COND 1 ----------

JOINT	F11	F22	F12	FMAX	FMIN	ANGLE
70	-1.9511E+01	-9.7556E+01	-2.4204E+00	-1.9436E+01	-9.7631E+01	-1.77
71	-4.4352E+01	-2.2176E+02	4.1010E-01	-4.4351E+01	-2.2176E+02	.13
75	1.3825E+01	-9.0890E+01	-1.9074E+00	1.3860E+01	-9.0924E+01	-1.04
76	-1.1014E+01	-2.1509E+02	9.2299E-01	-1.1010E+01	-2.1510E+02	.26
JOINT	M11	M22	M12	MMAX	MMIN	ANGLE
70	-5.2553E+00	-2.6276E+01	1.0912E+00	-5.1988E+00	-2.6333E+01	2.96
71	-4.4455E+00	-2.2227E+01	1.1987E+00	-4.3651E+00	-2.2308E+01	3.84
75	-1.3405E+00	-7.2683E+00	2.7998E+00	-2.2719E-01	-8.3816E+00	21.68
76	-4.4628E-01	-7.0320E+00	2.9073E+00	5.5352E-01	-8.1318E+00	20.72

ELEMENT ID 63 ----------
LOAD COND 1 ----------

JOINT	F11	F22	F12	FMAX	FMIN	ANGLE
85	9.6785E+00	-8.6786E+01	2.5079E+00	9.7437E+00	-8.6851E+01	1.49
86	-1.4017E+01	-2.0526E+02	3.5031E+00	-1.3953E+01	-2.0533E+02	1.05
90	2.2579E+01	-8.4206E+01	2.0984E+00	2.2620E+01	-8.4247E+01	1.13
91	-1.1156E+00	-2.0268E+02	3.0935E+00	-1.0681E+00	-2.0273E+02	.88

ANALISA PLAT TANGGA [KN-M]

S H E L L E L E M E N T F O R C E S

ELEMENT ID 63

JOINT	M11	M22	M12	MMAX	MMIN	ANGLE
85	7.5388E-01	9.9418E+00	3.4448E+00	1.1090E+01	-3.9424E-01	71.57
86	5.5165E-01	1.0017E+01	3.4428E+00	1.1137E+01	-5.6809E-01	71.98
90	6.4192E-01	9.6886E+00	3.3128E+00	1.0892E+01	-5.6190E-01	71.08
91	5.3064E-01	9.7073E+00	3.3108E+00	1.0896E+01	-6.5842E-01	71.29

ELEMENT ID 72
LOAD COND 1

JOINT	F11	F22	F12	FMAX	FMIN	ANGLE
95	-1.5495E+01	-2.8535E+01	1.7362E+00	-1.5262E+01	-2.8768E+01	7.54
96	-3.9164E+01	-1.4688E+02	-2.4966E+01	-3.3659E+01	-1.5239E+02	-12.43
39	3.8498E+00	-2.4666E+01	2.4344E+01	1.7804E+01	-3.8620E+01	29.82
52	-1.9819E+01	-1.4301E+02	-2.3777E+00	-1.9773E+01	-1.4306E+02	-1.11

JOINT	M11	M22	M12	MMAX	MMIN	ANGLE
95	-1.2123E+00	3.0689E+00	2.8078E+00	4.4590E+00	-2.6024E+00	63.66
96	-8.7729E-01	3.4152E+00	2.3944E+00	4.4845E+00	-1.9466E+00	65.94
39	-2.4137E+00	-8.0744E+00	-8.4237E-02	-2.4124E+00	-8.0757E+00	-.85
52	-1.0025E+01	-1.6550E+01	-4.9762E-01	-9.9869E+00	-1.6588E+01	-4.34

ELEMENT ID 76
LOAD COND 1

JOINT	F11	F22	F12	FMAX	FMIN	ANGLE
100	1.9247E+01	9.6236E+01	-2.0368E+00	9.6289E+01	1.9193E-01	-88.49
101	-6.3350E+00	-3.1675E+01	-3.2526E+00	-3.9242E+00	-3.2086E+01	-7.20
105	1.5414E+01	9.5468E+01	-2.9149E+00	9.5574E+01	1.5308E-01	-87.92
106	-1.0167E+01	-3.2441E+01	-4.1306E+00	-9.4256E+00	-3.3182E+01	-10.17

JOINT	M11	M22	M12	MMAX	MMIN	ANGLE
100	-5.3075E+00	-2.6538E+01	-1.0870E+00	-5.2520E+00	-2.6593E+01	-2.92
101	-6.0415E+00	-3.0207E+01	-1.0397E+00	-5.9968E+00	-3.0252E+01	-2.46
105	-1.3745E+00	-7.4801E+00	-2.7784E+00	-2.9946E-01	-8.5551E+00	-21.15
106	-1.2295E+00	-7.8743E+00	-2.7311E+00	-2.5104E-01	-8.8528E+00	-19.71

ELEMENT ID 88
LOAD COND 1

JOINT	F11	F22	F12	FMAX	FMIN	ANGLE
115	1.1487E+01	9.0271E+01	2.3586E+00	9.0341E+01	1.1417E+01	88.29
116	-1.5767E+01	-4.5999E+01	-2.0726E+00	-1.5625E+01	-4.6140E+01	-3.90
120	1.2213E+01	9.0416E+01	-5.3398E-01	9.0419E+01	1.2209E+01	-89.61
121	-1.5040E+01	-4.5853E+01	-4.9651E+00	-1.4259E+01	-4.6633E+01	-8.93

JOINT	M11	M22	M12	MMAX	MMIN	ANGLE
115	7.9558E-01	9.9833E+00	-3.5576E+00	1.1200E+01	-4.2087E-01	-71.12
116	5.6077E-01	1.0056E+01	-3.5924E+00	1.1262E+01	-6.4517E-01	-71.44
120	5.4456E-01	9.9186E+00	-3.4829E+00	1.1071E+01	-6.0786E-01	-71.69
121	4.3339E-01	9.9504E+00	-3.5178E+00	1.1110E+01	-7.2574E-01	-71.76

ELEMENT ID 96
LOAD COND 1

JOINT	F11	F22	F12	FMAX	FMIN	ANGLE
125	2.9200E+01	3.2289E+01	1.9801E+01	5.0605E+01	1.0884E-01	47.23
126	1.4044E+01	-4.3494E+01	2.7964E+01	2.5395E+01	-5.4845E+01	22.09
27	1.6801E+00	2.6784E+01	2.1687E+01	3.9290E+01	-1.0825E+01	60.03
14	-1.3476E+01	-4.8998E+01	2.9850E+01	3.4973E+00	-6.5971E+01	29.62

LAMPIRAN 3. OUT PUT FRAME

DATA UNTUK FORTAL 3DIMENSI KN-M

FLEXURAL AND SHEAR DESIGN OF BEAM-TYPE ELEMENTS

ELEM ID	SECTION SIZE DEPTH X WIDTH	STATN LOC	REQUIRED REINFORCING TOP	<LC>	BOT	<LC>	SHR	<LC>	DESIGN FORCES -M33	+M33	V22
177	.70 X .10										
		.0	2.20	<15>	2.20	<16>	10.49	< 1>	3	1	102
		.3	2.20	< 1>	2.20	<17>	10.68	< 1>	3	1	104
		.6	2.20	< 1>	2.20	<17>	10.81	< 1>	3	1	105
		1.0	2.20	< 1>	2.20	<17>	10.89	< 1>	7	1	106
		1.3	2.20	< 1>	2.20	<17>	10.92	< 1>	11	6	107
182	.60 X .30										
		.0	14.03	< 7>	11.67	< 8>	19.62	< 1>	244	207	161
		1.0	5.88	< 7>	6.29	< 8>	19.32	< 1>	109	116	159
		2.0	5.56	<14>	5.56	< 1>	18.56	< 1>	61	52	153
		3.0	5.92	< 6>	6.28	< 9>	19.29	< 1>	110	116	159
		4.0	14.08	< 8>	11.64	< 7>	19.59	< 1>	244	206	161
395	.70 X .30										
		.0	17.34	< 7>	14.56	< 8>	23.87	< 1>	355	304	233
		1.0	7.59	< 7>	7.60	< 8>	23.65	< 1>	166	166	231
		2.0	6.59	<15>	6.59	< 1>	23.04	< 1>	89	77	225
		3.0	7.14	< 8>	7.56	< 7>	23.49	< 1>	157	165	229
		4.0	16.57	< 8>	14.75	< 7>	23.70	< 1>	342	308	231
400	.60 X .25										
		.0	12.00	< 9>	5.65	<10>	14.11	< 1>	208	104	116
		1.1	5.58	< 7>	4.63	<12>	13.77	< 1>	103	29	113
		2.3	4.63	<11>	4.63	< 8>	12.90	< 1>	52	62	106
		3.5	4.63	<11>	4.78	< 1>	12.03	< 1>	52	89	99
		4.6	4.63	<15>	6.28	< 1>	11.69	< 1>	52	115	96
476	1.00 X .40										
		.0	12.93	<13>	12.93	< 1>	19.90	< 1>	119	278	285
		1.1	12.93	<12>	12.93	< 7>	20.17	< 1>	119	224	289
		2.2	12.93	<10>	12.93	< 9>	20.66	< 1>	119	250	296
		3.3	12.93	< 6>	12.93	< 9>	21.16	< 1>	260	248	303
		4.4	14.75	< 6>	12.93	< 9>	21.42	< 1>	475	237	307
495	.60 X .20										
		.0	11.17	< 9>	10.55	< 6>	20.33	< 1>	190	181	167
		.8	5.00	< 9>	5.18	< 6>	20.33	< 1>	91	95	167
		1.5	3.71	<13>	3.71	< 1>	20.33	< 1>	48	45	167
		2.3	4.99	< 6>	5.00	< 9>	20.33	< 1>	91	92	167
		3.0	11.26	< 6>	10.25	< 9>	20.33	< 1>	191	176	167
574	.85 X .25										
		.0	6.79	<16>	11.65	< 1>	18.90	< 1>	0	307	228
		.8	6.79	<12>	11.29	< 1>	18.91	< 1>	0	299	228
		1.5	6.79	<12>	10.18	< 1>	19.49	< 1>	0	271	235
		2.3	6.79	<12>	8.28	< 1>	20.08	< 1>	0	223	242
		3.0	6.79	<12>	6.79	< 7>	20.67	< 1>	0	178	249
654	.80 X .25										
		.0	18.64	< 7>	8.70	<12>	27.27	< 1>	436	218	308
		.8	12.96	< 7>	6.36	<12>	27.14	< 1>	316	55	306
		1.5	8.10	< 7>	6.36	<12>	26.76	< 1>	204	55	302
		2.3	6.36	< 7>	6.36	< 8>	26.38	< 1>	109	93	298
		3.0	6.36	<11>	6.36	< 8>	26.25	< 1>	109	134	296
789	.55 X .30										
		.0	16.38	< 1>	7.57	<15>	23.90	< 1>	250	125	178
		.8	10.54	<16>	5.04	<15>	23.74	< 1>	169	31	177
		1.5	6.16	<17>	5.04	<14>	23.25	< 1>	103	39	173
		2.3	5.04	<17>	5.04	<14>	22.77	< 1>	62	66	170
		3.0	5.04	<17>	5.42	< 6>	22.61	< 1>	62	91	169
797	.75 X .30										

			.0	12.72	(16)	7.11	(15)	12.19	(1)	296	148	128
			1.5	7.11	(16)	7.11	(15)	11.85	(1)	162	142	125
			3.0	7.11	(16)	7.11	(15)	10.97	(1)	74	135	115
			4.5	7.11	(16)	7.11	(1)	10.09	(1)	74	124	106
			6.0	7.11	(15)	7.11	(1)	10.38	(1)	74	99	109
799	.80 X	.30										
			.0	12.85	(17)	7.63	(14)	31.99	(1)	318	159	361
			.5	10.18	(17)	7.63	(14)	31.92	(1)	256	72	360
			1.0	7.73	(17)	7.63	(14)	31.71	(1)	197	84	358
			1.5	7.63	(16)	7.63	(15)	31.49	(1)	148	98	355
			2.0	7.63	(16)	7.63	(15)	31.42	(1)	105	112	355
821	.40 X	.35										
			.0	4.07	(17)	9.70	(1)	22.65	(1)	31	106	117
			.8	4.07	(17)	5.41	(1)	22.88	(1)	31	62	118
			1.5	4.07	(14)	4.07	(17)	23.58	(1)	31	27	122
			2.3	4.60	(14)	4.07	(17)	24.28	(1)	53	27	125
			3.0	11.59	(1)	5.42	(17)	24.51	(1)	125	62	127
836	.50 X	.20										
			.0	5.02	(1)	3.02	(15)	4.30	(1)	74	37	29
			1.5	3.02	(16)	3.02	(15)	4.30	(1)	19	9	29
			3.0	3.02	(17)	3.02	(1)	4.30	(1)	18	18	29
			4.5	3.02	(13)	3.02	(1)	4.30	(1)	18	18	29
			6.0	3.02	(7)	3.02	(12)	4.30	(1)	18	9	29
839	.40 X	.20										
			.0	9.15	(1)	4.14	(14)	10.12	(1)	93	47	32
			1.0	2.94	(17)	2.33	(14)	9.70	(1)	34	12	50
			2.0	2.33	(16)	2.33	(1)	8.56	(1)	23	17	44
			3.0	2.33	(10)	2.33	(1)	7.84	(1)	23	26	40
			4.0	2.33	(14)	2.33	(17)	7.94	(1)	23	19	41
842	.50 X	.30										
			.0	10.44	(17)	6.77	(14)	25.24	(1)	149	100	169
			.5	5.97	(17)	4.95	(14)	24.60	(1)	89	74	165
			1.0	4.53	(17)	4.53	(14)	23.96	(1)	37	45	160
			1.5	4.53	(10)	4.53	(1)	23.32	(1)	37	35	156
			2.0	4.53	(14)	4.39	(17)	22.68	(1)	37	69	152
865	.90 X	.30										
			.0	8.66	(17)	8.66	(14)	33.52	(1)	120	135	430
			.6	8.66	(14)	8.66	(17)	33.93	(1)	120	95	435
			1.2	8.66	(14)	8.66	(17)	34.33	(1)	161	189	440
			1.8	11.10	(14)	9.66	(17)	34.73	(1)	317	278	445
			2.4	17.30	(14)	12.74	(17)	35.13	(1)	479	361	450
870	.95 X	.30										
			.0	9.18	(12)	9.18	(1)	13.74	(1)	131	205	187
			1.5	9.18	(14)	9.18	(17)	14.01	(1)	131	181	190
			3.0	9.18	(14)	9.18	(17)	14.69	(1)	139	217	200
			4.5	10.37	(15)	9.18	(16)	15.37	(1)	316	223	209
			6.0	17.86	(15)	9.18	(16)	15.64	(1)	525	263	212
871	.65 X	.30										
			.0	12.41	(16)	8.90	(15)	13.13	(1)	241	177	118
			1.5	6.08	(16)	6.08	(15)	12.72	(1)	86	103	114
			3.0	6.08	(14)	6.08	(1)	11.84	(1)	73	51	106
			4.5	6.45	(15)	6.89	(16)	12.86	(1)	131	135	116
			6.0	15.32	(15)	10.29	(16)	13.26	(1)	291	203	119

PORTAL TIBA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
177								
	1	.00						.00
			.0	.00	.00	.00	.00	
			.3	-5.39	-.91	.00	.00	
			.7	-9.44	-3.36	.00	.00	
			1.0	-12.15	-6.90	.00	.00	
			1.3	-13.33	-11.11	.00	.00	
	2	.00						.00
			.0	.00	.00	.00	.00	
			.3	-4.16	-.70	.00	.00	
			.7	-7.30	-2.59	.00	.00	
			1.0	-9.43	-5.34	.00	.00	
			1.3	-10.56	-8.61	.00	.00	
	3	.00						.00
			.0	.00	.00	.00	.00	
			.3	-4.16	-.70	.00	.00	
			.7	-7.30	-2.59	.00	.00	
			1.0	-9.43	-5.34	.00	.00	
			1.3	-10.56	-8.61	.00	.00	
	4	.00						.00
			.3	.00	.00	.00	.00	
			.3	-4.16	-.70	.00	.00	
			.7	-7.30	-2.59	.00	.00	
			1.0	-9.43	-5.34	.00	.00	
			1.3	-10.56	-8.61	.00	.00	
	5	.00						.00
			.0	.00	.00	.00	.00	
			.3	-4.16	-.70	.00	.00	
			.7	-7.30	-2.59	.00	.00	
			1.0	-9.43	-5.34	.00	.00	
			1.3	-10.56	-8.61	.00	.00	
	6	.00						.00
			.0	.00	.00	.00	.00	
			.3	-4.16	-.70	.00	.00	
			.7	-7.30	-2.59	.00	.00	
			1.0	-9.43	-5.34	.00	.00	
			1.3	-10.56	-8.61	.00	.00	
	7	.00						.00
			.0	.00	.00	.00	.00	
			.3	-4.16	-.70	.00	.00	
			.7	-7.30	-2.59	.00	.00	
			1.0	-9.43	-5.34	.00	.00	
			1.3	-10.56	-8.61	.00	.00	
	8	.00						.00
			.0	.00	.00	.00	.00	
			.3	-4.16	-.70	.00	.00	
			.7	-7.30	-2.59	.00	.00	
			1.0	-9.43	-5.34	.00	.00	
			1.3	-10.56	-8.61	.00	.00	
	9	.00						.00
			.0	.00	.00	.00	.00	
			.3	-4.16	-.70	.00	.00	

PORTAL TIGA DINESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			.7	-7.30	-2.59	.00	.00	
			1.0	-9.43	-5.34	.00	.00	
			1.3	-10.56	-8.61	.00	.00	
	10	.00						.00
			.0	.00	.00	.00	.00	
			.3	-3.28	-.55	.00	.00	
			.7	-5.77	-2.04	.00	.00	
			1.0	-7.47	-4.22	.00	.00	
			1.3	-9.40	-6.82	.00	.00	
	11	.00						.00
			.0	.00	.00	.00	.00	
			.3	-3.28	-.55	.00	.00	
			.7	-5.77	-2.04	.00	.00	
			1.0	-7.47	-4.22	.00	.00	
			1.3	-9.40	-6.82	.00	.00	
	12	.00						.00
			.0	.00	.00	.00	.00	
			.3	-3.28	-.55	.00	.00	
			.7	-5.77	-2.04	.00	.00	
			1.0	-7.47	-4.22	.00	.00	
			1.3	-9.40	-6.82	.00	.00	
	13	.00						.00
			.0	.00	.00	.00	.00	
			.3	-3.28	-.55	.00	.00	
			.7	-5.77	-2.04	.00	.00	
			1.0	-7.47	-4.22	.00	.00	
			1.3	-9.40	-6.82	.00	.00	
	14	.00						.00
			.0	.00	.00	.00	.00	
			.3	-3.28	-.55	.00	.00	
			.7	-5.77	-2.04	.00	.00	
			1.0	-7.47	-4.22	.00	.00	
			1.3	-9.40	-6.82	.00	.00	
	15	.00						.00
			.0	.00	.00	.00	.00	
			.3	-3.28	-.55	.00	.00	
			.7	-5.77	-2.04	.00	.00	
			1.0	-7.47	-4.22	.00	.00	
			1.3	-9.40	-6.82	.00	.00	
	16	.00						.00
			.0	.00	.00	.00	.00	
			.3	-3.28	-.55	.00	.00	
			.7	-5.77	-2.04	.00	.00	
			1.0	-7.47	-4.22	.00	.00	
			1.3	-9.40	-6.82	.00	.00	
	17	.00						.00
			.0	.00	.00	.00	.00	
			.3	-3.28	-.55	.00	.00	
			.7	-5.77	-2.04	.00	.00	
			1.0	-7.47	-4.22	.00	.00	
			1.3	-9.40	-6.82	.00	.00	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
182								
	1	-9.00						-.69
			.0	35.72	-25.71	-.18	.43	
			1.0	23.54	5.02	-.18	.25	
			2.0	-.28	17.33	-.18	.07	
			3.0	-23.97	4.52	-.18	-.11	
			4.0	-36.03	-26.58	-.18	-.29	
	2	-103.78						.02
			.0	-86.53	206.35	3.39	-7.21	
			1.0	-95.82	115.91	3.39	-3.81	
			2.0	-112.74	12.04	3.39	-.42	
			3.0	-129.59	-109.54	3.39	2.97	
			4.0	-138.80	-244.47	3.39	6.37	
	3	91.08						-.25
			.0	138.63	-243.63	-4.47	9.36	
			1.0	129.34	-108.94	-4.47	5.48	
			2.0	112.42	12.36	-4.47	1.01	
			3.0	95.37	115.94	-4.47	-3.47	
			4.0	86.36	206.17	-4.47	-7.94	
	4	-103.47						-.53
			.0	-86.62	206.67	4.20	-8.31	
			1.0	-95.91	116.14	4.20	-5.11	
			2.0	-112.83	12.19	4.20	-.92	
			3.0	-129.67	-109.48	4.20	3.28	
			4.0	-138.89	-244.50	4.20	7.48	
	5	91.39						-.80
			.0	138.54	-243.34	-3.67	7.86	
			1.0	129.25	-108.71	-3.67	4.18	
			2.0	112.33	12.51	-3.67	.31	
			3.0	95.49	116.00	-3.67	-3.16	
			4.0	86.28	206.14	-3.67	-6.83	
	6	-103.78						.02
			.0	-86.53	206.35	3.39	-7.21	
			1.0	-95.82	115.91	3.39	-3.81	
			2.0	-112.74	12.04	3.39	-.42	
			3.0	-129.59	-109.54	3.39	2.97	
			4.0	-138.80	-244.47	3.39	6.37	
	7	91.08						-.25
			.0	138.63	-243.65	-4.47	9.34	
			1.0	129.34	-108.94	-4.47	5.48	
			2.0	112.42	12.36	-4.47	1.01	
			3.0	95.37	115.94	-4.47	-3.47	
			4.0	86.36	206.17	-4.47	-7.94	
	8	-103.47				8 -103.47		
			.0	-86.62	206.67	4.20	-8.31	
			1.0	-95.91	116.14	4.20	-5.11	
			2.0	-112.83	12.19	4.20	-.92	
			3.0	-129.67	-109.48	4.20	3.28	
			4.0	-138.89	-244.50	4.20	7.48	
	9	91.39						-.80
			.0	138.54	-243.34	-3.67	7.86	
			1.0	129.25	-108.71	-3.67	4.18	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			2.0	112.33	12.51	-3.67	.51	
			3.0	95.49	116.00	-3.67	-3.16	
			4.0	86.28	206.14	-3.67	-6.83	
	10	-88.23						.26
			.0	-76.99	178.98	2.73	-5.71	
			1.0	-84.17	98.96	2.73	-2.98	
			2.0	-96.66	8.31	2.73	-.25	
			3.0	-109.11	-94.35	2.73	2.48	
			4.0	-116.32	-207.38	2.73	5.21	
	11	78.91						.03
			.0	116.23	-207.01	-4.02	9.02	
			1.0	108.96	-93.90	-4.02	5.00	
			2.0	96.47	9.08	-4.02	.99	
			3.0	84.02	99.06	-4.02	-3.05	
			4.0	76.21	178.96	-4.02	-7.07	
	12	-87.81						-.47
			.0	-77.02	179.40	3.80	-8.32	
			1.0	-84.29	99.26	3.80	-4.72	
			2.0	-96.78	9.00	3.80	-.97	
			3.0	-109.23	-94.27	3.80	2.89	
			4.0	-116.44	-207.62	3.80	6.69	
	13	79.33						-.71
			.0	116.11	-206.59	-2.95	6.20	
			1.0	108.85	-93.60	-2.95	3.26	
			2.0	96.33	9.27	-2.95	.31	
			3.0	83.90	99.13	-2.95	-2.63	
			4.0	76.19	178.92	-2.95	-7.08	
	14	-30.22						1.04
			.0	-9.18	43.41	-.89	2.72	
			1.0	-16.45	31.11	-.89	1.84	
			2.0	-28.94	8.68	-.89	.39	
			3.0	-41.39	-26.75	-.89	.07	
			4.0	-48.60	-72.26	-.89	-.87	
	15	19.93						.97
			.0	48.78	-72.43	-2.91	7.13	
			1.0	41.51	-26.77	-2.91	4.23	
			2.0	29.02	8.76	-2.91	1.32	
			3.0	16.87	31.29	-2.91	-1.59	
			4.0	9.26	43.74	-2.91	-4.50	
	16	-28.87						-1.41
			.0	-9.07	14.82	2.70	-5.53	
			1.0	-16.83	32.13	2.70	-3.76	
			2.0	-29.33	9.22	2.70	-1.26	
			3.0	-41.78	-26.50	2.70	1.43	
			4.0	-48.99	-72.40	2.70	4.13	
	17	21.32						-1.49
			.0	48.39	-71.02	.67	-2.23	
			1.0	41.12	-25.75	.67	-1.56	
			2.0	28.63	9.40	.67	-.39	
			3.0	16.18	31.54	.67	-.22	
			4.0	8.97	43.60	.67	.45	

PORTAL TIGA DIMEENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
395								
	1	-.17						1.94
			.0	41.70	-35.62	.61	-1.22	
			1.0	28.48	.59	.61	-.71	
			2.0	2.87	17.05	.61	-.09	
			3.0	-22.64	6.39	.61	.52	
			4.0	-35.75	-23.92	.61	1.13	
	2	-101.96						1.52
			.0	-132.31	300.97	5.63	-11.14	
			1.0	-142.47	164.18	5.65	-5.49	
			2.0	-160.32	13.29	5.63	.16	
			3.0	-178.10	-156.42	5.65	5.81	
			4.0	-187.98	-340.16	5.63	11.46	
	3	113.85						1.04
			.0	193.60	-333.47	-3.43	8.00	
			1.0	183.64	-166.14	-3.43	4.58	
			2.0	165.80	9.08	-3.43	1.15	
			3.0	148.02	165.48	-3.43	-2.28	
			4.0	138.13	307.83	-3.43	-5.71	
	4	-115.68						1.50
			.0	-133.69	304.25	4.25	-9.83	
			1.0	-143.85	166.29	4.25	-5.58	
			2.0	-161.70	14.22	4.25	-1.33	
			3.0	-179.28	-156.68	4.25	2.92	
			4.0	-189.16	-341.61	4.25	7.18	
	5	100.12						1.02
			.0	192.42	-352.19	-4.83	9.31	
			1.0	182.46	-164.04	-4.83	4.49	
			2.0	164.61	10.00	-4.83	-.74	
			3.0	146.84	165.22	-4.83	-5.16	
			4.0	136.95	306.41	-4.83	-8.98	
	6	-101.96						1.52
			.0	-132.31	300.97	5.63	-11.14	
			1.0	-142.47	164.18	5.65	-5.49	
			2.0	-160.32	13.29	5.63	.16	
			3.0	-178.10	-156.42	5.65	5.81	
			4.0	-187.98	-340.16	5.63	11.46	
	7	113.85						1.04
			.0	193.60	-333.47	-3.43	8.00	
			1.0	183.64	-166.14	-3.43	4.58	
			2.0	165.80	9.08	-3.43	1.15	
			3.0	148.02	165.48	-3.43	-2.28	
			4.0	138.13	307.83	-3.43	-5.71	
	8	-115.68						1.50
			.0	-133.69	304.25	4.25	-9.83	
			1.0	-143.85	166.29	4.25	-5.58	
			2.0	-161.70	14.22	4.25	-1.33	
			3.0	-179.28	-156.68	4.25	2.92	
			4.0	-189.16	-341.61	4.25	7.18	
	9	100.12						1.02
			.0	192.42	-352.19	-4.83	9.31	
			1.0	182.46	-164.04	-4.83	4.49	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			2.0	164.61	10.00	-4.83	-.34	
			3.0	146.84	165.22	-4.83	-5.16	
			4.0	136.95	306.41	-4.83	-9.99	
	10	-84.54						1.09
			.0	-116.74	260.22	5.12	-9.74	
			1.0	-124.46	140.09	5.12	-4.63	
			2.0	-137.41	9.49	5.12	.49	
			3.0	-150.33	-134.71	5.12	5.61	
			4.0	-157.99	-289.34	5.12	10.73	
	11	100.56						.68
			.0	162.78	-302.84	-2.67	6.67	
			1.0	155.27	-143.24	-2.67	4.01	
			2.0	142.31	5.88	-2.67	1.34	
			3.0	129.40	141.40	-2.67	-1.33	
			4.0	121.73	266.49	-2.67	-3.99	
	12	-102.92						1.06
			.0	-118.32	264.62	3.25	-7.39	
			1.0	-126.04	142.91	3.25	-4.75	
			2.0	-139.00	10.73	3.25	-1.50	
			3.0	-151.91	-135.06	3.25	1.75	
			4.0	-159.57	-291.27	3.25	4.99	
	13	82.18						.65
			.0	161.40	-298.44	-4.54	8.43	
			1.0	153.68	-140.42	-4.54	3.89	
			2.0	140.72	7.12	-4.54	-.63	
			3.0	127.81	141.05	-4.54	-5.19	
			4.0	120.15	264.36	-4.54	-9.73	
	14	1.66						.98
			.0	-17.00	58.04	4.58	-6.04	
			1.0	-24.72	37.65	4.58	-1.47	
			2.0	-37.68	6.79	4.58	3.11	
			3.0	-50.59	-37.68	4.58	7.69	
			4.0	-58.25	-93.57	4.58	12.27	
	15	57.21						.86
			.0	66.74	-110.93	2.24	-1.12	
			1.0	59.22	-47.38	2.24	1.13	
			2.0	46.27	5.79	2.24	3.37	
			3.0	33.35	45.18	2.24	5.61	
			4.0	25.69	74.23	2.24	7.85	
	16	-59.57						.88
			.0	-22.28	72.72	-1.66	-.30	
			1.0	-30.00	47.05	-1.66	-1.86	
			2.0	-42.96	10.91	-1.66	-3.53	
			3.0	-55.87	-38.84	-1.66	-5.19	
			4.0	-63.53	-99.01	-1.66	-6.85	
	17	-4.02						.76
			.0	61.66	-96.26	-4.00	4.72	
			1.0	53.95	-37.98	-4.00	.73	
			2.0	40.99	9.82	-4.00	-3.27	
			3.0	28.08	44.02	-4.00	-7.27	
			4.0	20.41	67.79	-4.00	-11.27	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
400								
	1	18.00						13.21
			.0	116.33	-189.25	-.10	.22	
			1.2	98.20	-43.35	-.10	.10	
			2.3	66.11	31.35	-.10	-.01	
			3.5	34.02	68.70	-.10	-.12	
			4.6	13.77	114.90	-.10	-.24	
	2	-23.37						8.41
			.0	61.66	-48.67	.28	-.24	
			1.2	48.86	16.41	.28	-.01	
			2.3	27.45	60.43	.28	.31	
			3.5	6.05	79.85	.28	.63	
			4.6	-6.70	77.66	.28	.96	
	3	52.41						16.07
			.0	95.63	-206.92	-.17	-.27	
			1.2	82.84	-102.77	-.17	-.47	
			2.3	61.43	-19.68	-.17	-.67	
			3.5	40.02	38.51	-.17	-.86	
			4.6	27.27	75.68	-.17	-1.06	
	4	-30.11						7.61
			.0	82.02	-49.50	.02	.60	
			1.2	69.72	16.56	.02	.63	
			2.3	48.31	61.36	.02	.65	
			3.5	26.90	81.67	.02	.68	
			4.6	13.84	80.76	.02	.71	
	5	45.67						9.27
			.0	96.49	-207.74	-.43	.66	
			1.2	83.69	-102.62	-.43	.17	
			2.3	62.28	-18.38	-.43	-.32	
			3.5	40.86	40.63	-.43	-.81	
			4.6	28.13	78.79	-.43	-1.30	
	6	-23.37						8.41
			.0	61.66	-48.67	.28	-.24	
			1.2	48.86	16.41	.28	-.01	
			2.3	27.45	60.43	.28	.31	
			3.5	6.05	79.85	.28	.63	
			4.6	-6.70	77.66	.28	.96	
	7	52.41						16.07
			.0	95.63	-206.92	-.17	-.27	
			1.2	82.84	-102.77	-.17	-.47	
			2.3	61.43	-19.68	-.17	-.67	
			3.5	40.02	38.51	-.17	-.86	
			4.6	27.27	75.68	-.17	-1.06	
	8	-30.11						7.61
			.0	82.02	-49.50	.02	.60	
			1.2	69.72	16.56	.02	.63	
			2.3	48.31	61.36	.02	.65	
			3.5	26.90	81.67	.02	.68	
			4.6	13.84	80.76	.02	.71	
	9	45.67						9.27
			.0	96.49	-207.74	-.43	.66	
			1.2	83.69	-102.62	-.43	.17	

PORTAL TIGA DIMENSNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
476								
	1	24.43						11.57
			.0	-43.24	278.39	-.24	-.21	
			1.1	-67.32	219.47	-.24	-.48	
			2.2	-103.76	125.97	-.24	-.75	
			3.3	-140.20	-8.81	-.24	-1.02	
			4.4	-164.20	-178.11	-.24	-1.29	
	2	-32.25						6.28
			.0	-113.92	223.04	-.95	2.20	
			1.1	-132.38	88.75	-.95	1.15	
			2.2	-158.39	-70.91	-.95	.10	
			3.3	-184.78	-260.14	-.95	-.94	
			4.4	-203.20	-474.71	-.95	-1.99	
	3	63.75						1.62
			.0	55.26	172.11	.72	-3.77	
			1.1	36.80	223.92	.72	-2.98	
			2.2	10.39	250.36	.72	-2.18	
			3.3	-15.60	247.23	.72	-1.39	
			4.4	-34.02	218.77	.72	-.60	
	4	-30.10						15.16
			.0	-117.41	221.99	-1.02	3.46	
			1.1	-131.87	88.26	-1.02	2.34	
			2.2	-158.08	-70.84	-1.02	1.22	
			3.3	-184.27	-259.50	-1.02	.10	
			4.4	-202.69	-473.51	-1.02	-1.02	
	5	65.90						10.50
			.0	55.77	171.06	.65	-2.50	
			1.1	37.31	223.44	.65	-1.78	
			2.2	11.11	250.44	.65	-1.07	
			3.3	-15.09	247.87	.65	-.35	
			4.4	-33.51	219.97	.65	.37	
	6	-32.25						6.28
			.0	-113.92	223.04	-.95	2.20	
			1.1	-132.38	88.75	-.95	1.15	
			2.2	-158.39	-70.91	-.95	.10	
			3.3	-184.78	-260.14	-.95	-.94	
			4.4	-203.20	-474.71	-.95	-1.99	
	7	63.75						1.62
			.0	55.26	172.11	.72	-3.77	
			1.1	36.80	223.92	.72	-2.98	
			2.2	10.39	250.36	.72	-2.18	
			3.3	-15.60	247.23	.72	-1.39	
			4.4	-34.02	218.77	.72	-.60	
	8	-30.10						15.16
			.0	-117.41	221.99	-1.02	3.46	
			1.1	-131.87	88.26	-1.02	2.34	
			2.2	-158.08	-70.84	-1.02	1.22	
			3.3	-184.27	-259.50	-1.02	.10	
			4.4	-202.69	-473.51	-1.02	-1.02	
	9	65.90						10.50
			.0	55.77	171.06	.65	-2.50	
			1.1	37.31	223.44	.65	-1.78	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			2.2	11.11	250.44	.65	-1.07	
			3.3	-15.09	247.87	.65	-.35	
			4.4	-33.31	219.97	.65	.37	
	10	-30.53						2.35
			.0	-93.33	167.60	-.77	1.60	
			1.1	-107.83	57.74	-.77	.75	
			2.2	-127.37	-71.38	-.77	-.09	
			3.3	-146.92	-222.48	-.77	-.94	
			4.4	-161.38	-392.81	-.77	-1.78	
	11	51.82						-1.64
			.0	51.79	123.92	.67	-3.52	
			1.1	37.29	173.68	.67	-2.79	
			2.2	17.74	204.19	.67	-2.03	
			3.3	-1.80	212.72	.67	-1.32	
			4.4	-16.27	202.01	.67	-.59	
	12	-27.64						14.25
			.0	-93.64	166.20	-.85	3.29	
			1.1	-107.14	57.09	-.85	2.35	
			2.2	-126.69	-71.27	-.85	1.41	
			3.3	-146.23	-221.62	-.85	.47	
			4.4	-160.70	-391.20	-.85	-.47	
	13	54.70						10.25
			.0	32.47	122.32	.38	-1.83	
			1.1	37.97	173.03	.55	-1.19	
			2.2	18.43	204.30	.38	-.55	
			3.3	-1.12	213.87	.55	.08	
			4.4	-15.59	203.62	.38	.72	
			14	-5.07				-12.91
			.0	-43.34	157.55	-.15	-2.16	
			1.1	-57.84	99.07	-.15	-2.34	
			2.2	-77.39	24.94	-.15	-2.53	
			3.3	-96.93	-71.18	-.15	-2.71	
			4.4	-111.40	-186.53	-.15	-2.89	
	15	19.64						-14.11
			.0	.21	149.84	.27	-3.79	
			1.1	-14.29	103.87	.27	-3.41	
			2.2	-33.84	107.84	.27	-3.11	
			3.3	-53.38	59.43	.27	-2.82	
			4.4	-67.85	-8.02	.27	-2.53	
	16	4.53						26.72
			.0	-41.06	149.28	-.45	3.47	
			1.1	-55.56	96.91	-.45	2.97	
			2.2	-75.11	35.29	-.45	2.47	
			3.3	-94.65	-68.33	-.45	1.97	
			4.4	-109.12	-181.17	-.45	1.47	
	17	29.25						35.82
			.0	2.49	136.17	-.02	1.93	
			1.1	-12.01	131.70	-.02	1.91	
			2.2	-31.56	107.98	-.02	1.88	
			3.3	-51.10	62.27	-.02	1.85	
			4.4	-65.57	-2.67	-.02	1.83	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			1.5	121.97	2.85	.21	.00	
			2.3	115.04	91.53	.21	.16	
			3.0	111.13	176.16	.21	.32	
	10	9.11						.58
			.0	-98.79	176.70	1.41	-1.79	
			.8	-101.78	81.21	1.41	-.73	
			1.5	-106.39	3.18	1.41	.03	
			2.3	-111.40	-78.68	1.41	1.39	
			3.0	-114.38	-163.46	1.41	2.45	
	11	-5.35						.81
			.0	110.35	-168.77	1.78	-2.49	
			.8	107.34	-76.98	1.78	-1.16	
			1.5	102.37	1.83	1.78	.17	
			2.3	97.72	76.81	1.78	1.50	
			3.0	94.74	148.87	1.78	2.37	
	12	7.01						-.70
			.0	-96.00	132.11	-.69	1.12	
			.8	-99.00	79.10	-.69	.61	
			1.5	-103.82	3.13	-.69	.03	
			2.3	-108.62	-76.63	-.69	-.47	
			3.0	-111.61	-159.33	-.69	-.94	
	13	-7.45						-.47
			.0	113.12	-162.97	-.33	.42	
			.8	110.12	-79.09	-.33	.17	
			1.5	105.31	1.20	-.33	-.07	
			2.3	100.50	78.87	-.33	-.31	
			3.0	97.52	153.01	-.33	-.56	
	14	6.51						2.15
			.0	-28.83	30.93	3.99	-5.43	
			.8	-31.84	28.31	3.99	-2.44	
			1.5	-36.65	3.74	3.99	.56	
			2.3	-41.46	-26.66	3.99	3.55	
			3.0	-44.44	-58.99	3.99	6.54	
	15	3.17						2.22
			.0	33.92	-43.59	4.10	-5.64	
			.8	30.92	-19.16	4.10	-2.57	
			1.5	26.11	2.54	4.10	.51	
			2.3	21.30	20.00	4.10	3.58	
			3.0	18.32	34.74	4.10	6.58	
	16	-.61						-2.11
			.0	-19.59	36.97	-3.01	4.27	
			.8	-22.58	21.28	-3.01	2.01	
			1.5	-27.40	3.63	-3.01	-.25	
			2.3	-32.20	-19.81	-3.01	-2.51	
			3.0	-35.18	-45.20	-3.01	-4.76	
	17	-4.85						-2.04
			.0	43.18	-57.37	-2.90	4.36	
			.8	40.18	-26.20	-2.90	1.88	
			1.5	35.36	2.24	-2.90	-.29	
			2.3	30.56	26.85	-2.90	-2.47	
			3.0	27.57	48.03	-2.90	-4.63	

PORTAL TIBA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
574								
	1	86.17						-.91
			.0	-1.26	307.30	-.13	-.12	
			.8	-23.40	298.57	-.13	-.22	
			1.5	-50.23	270.97	-.13	-.31	
			2.3	-77.06	223.23	-.13	-.41	
			3.0	-99.13	156.63	-.13	-.00	
	2	14.34						-2.17
			.0	-25.25	214.48	-3.23	4.84	
			.8	-40.34	190.21	-3.23	2.42	
			1.5	-58.36	163.20	-3.23	-.01	
			2.3	-76.37	102.68	-3.23	-2.43	
			3.0	-91.41	39.43	-3.23	-4.86	
	3	106.27						.82
			.0	20.83	214.31	2.62	-3.02	
			.8	5.74	224.79	2.62	-3.05	
			1.5	-12.28	222.35	2.62	-1.09	
			2.3	-30.30	206.38	2.62	.88	
			3.0	-45.34	177.89	2.62	2.83	
	4	12.41						-2.62
			.0	-26.09	211.33	-2.76	4.83	
			.8	-41.18	186.43	-2.76	2.76	
			1.5	-59.19	148.80	-2.76	.69	
			2.3	-77.21	97.64	-2.76	-1.38	
			3.0	-92.25	33.76	-2.76	-3.46	
	5	104.34						.47
			.0	19.99	211.36	3.10	-3.04	
			.8	4.90	221.02	3.10	-2.71	
			1.5	-13.12	217.94	3.10	-.39	
			2.3	-31.13	201.34	3.10	1.93	
			3.0	-46.18	172.03	3.10	4.25	
	6	14.34						-2.17
			.0	-25.25	214.48	-3.23	4.84	
			.8	-40.34	190.21	-3.23	2.42	
			1.5	-58.36	163.20	-3.23	-.01	
			2.3	-76.37	102.68	-3.23	-2.43	
			3.0	-91.41	39.43	-3.23	-4.86	
	7	106.27						.82
			.0	20.83	214.31	2.62	-3.02	
			.8	5.74	224.79	2.62	-3.05	
			1.5	-12.28	222.35	2.62	-1.09	
			2.3	-30.30	206.38	2.62	.88	
			3.0	-45.34	177.89	2.62	2.83	
	8	12.41						-2.62
			.0	-26.09	211.33	-2.76	4.83	
			.8	-41.18	186.43	-2.76	2.76	
			1.5	-59.19	148.80	-2.76	.69	
			2.3	-77.21	97.64	-2.76	-1.38	
			3.0	-92.25	33.76	-2.76	-3.46	
	9	104.34						.47
			.0	19.99	211.36	3.10	-3.04	
			.8	4.90	221.02	3.10	-2.71	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			1.5	-13.12	217.94	3.10	-.39	
			2.3	-31.13	201.34	3.10	1.93	
			3.0	-46.18	172.03	3.10	4.25	
	10	4.50						-1.80
			.0	-22.25	153.91	-2.87	4.17	
			.8	-32.98	135.42	-2.87	2.01	
			1.5	-45.62	105.94	-2.87	-.14	
			2.3	-58.27	66.98	-2.87	-2.29	
			3.0	-68.97	19.05	-2.87	-4.44	
	11	83.35						.77
			.0	17.28	155.94	2.16	-4.30	
			.8	6.54	165.08	2.16	-2.68	
			1.5	-5.10	165.25	2.16	-1.06	
			2.3	-18.74	155.93	2.16	.56	
			3.0	-29.45	137.69	2.16	2.19	
	12	1.91						-2.27
			.0	-23.27	151.79	-2.23	4.14	
			.8	-34.10	130.26	-2.23	2.47	
			1.5	-46.75	100.05	-2.23	.79	
			2.3	-59.39	60.24	-2.23	-.86	
			3.0	-70.09	11.47	-2.23	-2.56	
	13	80.77						.30
			.0	16.15	131.72	2.79	-4.72	
			.8	5.42	160.03	2.79	-2.22	
			1.5	-7.22	159.29	2.79	-.13	
			2.3	-19.87	149.19	2.79	1.96	
			3.0	-30.37	130.06	2.79	4.06	
	14	35.10						-.36
			.0	-7.11	160.83	-1.85	1.27	
			.8	-17.84	151.69	-1.85	-.16	
			1.5	-30.48	133.38	-1.85	-1.34	
			2.3	-43.12	105.97	-1.85	-2.93	
			3.0	-53.83	69.40	-1.85	-4.52	
	15	58.77						.41
			.0	4.75	160.84	-.34	-1.31	
			.8	-5.98	160.59	-.34	-1.57	
			1.5	-18.62	151.37	-.34	-1.82	
			2.3	-31.26	132.66	-.34	-2.08	
			3.0	-41.97	104.99	-.34	-2.33	
	16	26.50						-1.92
			.0	-10.85	146.80	.26	1.16	
			.8	-21.58	134.85	.26	1.36	
			1.5	-34.23	113.92	.26	1.59	
			2.3	-46.87	83.51	.26	1.75	
			3.0	-57.57	44.13	.26	1.95	
	17	50.16						-1.15
			.0	1.01	146.80	1.77	-1.28	
			.8	-9.72	143.75	1.77	-.05	
			1.5	-22.37	131.72	1.77	1.28	
			2.3	-35.01	110.20	1.77	2.61	
			3.0	-45.71	79.72	1.77	3.94	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
654								
	1	42.02						10.18
			.0	182.78	-368.67	-.63	.93	
			.8	172.04	-234.86	-.63	.46	
			1.5	162.00	-113.10	-.63	-.01	
			2.3	131.97	-6.86	-.63	-.49	
			3.0	121.31	87.36	-.63	-.96	
	2	-9.44						5.19
			.0	96.14	-88.79	-3.56	6.15	
			.8	88.12	-19.20	-3.56	3.48	
			1.5	74.05	41.77	-3.56	.81	
			2.3	59.98	91.87	-3.56	-1.86	
			3.0	52.00	133.37	-3.56	-4.53	
	3	64.42						10.20
			.0	163.91	-436.12	3.10	-3.96	
			.8	155.89	-315.71	3.10	-3.63	
			1.5	141.81	-203.91	3.10	-1.31	
			2.3	127.75	-102.98	3.10	1.02	
			3.0	119.77	-10.66	3.10	3.34	
	4	-7.16						3.24
			.0	96.07	-87.84	-3.90	7.17	
			.8	88.05	-18.30	-3.90	4.20	
			1.5	73.98	42.62	-3.90	1.27	
			2.3	59.91	92.67	-3.90	-1.66	
			3.0	51.93	134.11	-3.90	-4.38	
	5	66.70						8.25
			.0	163.84	-435.17	2.75	-4.97	
			.8	155.82	-314.80	2.75	-2.91	
			1.5	141.74	-203.06	2.75	-.84	
			2.3	127.68	-102.19	2.75	1.23	
			3.0	119.70	-9.92	2.75	3.29	
	6	-9.44						5.19
			.0	96.14	-88.79	-3.56	6.15	
			.8	88.12	-19.20	-3.56	3.48	
			1.5	74.05	41.77	-3.56	.81	
			2.3	59.98	91.87	-3.56	-1.86	
			3.0	52.00	133.37	-3.56	-4.53	
	7	64.42						10.20
			.0	163.91	-436.12	3.10	-3.96	
			.8	155.89	-315.71	3.10	-3.63	
			1.5	141.81	-203.91	3.10	-1.31	
			2.3	127.75	-102.98	3.10	1.02	
			3.0	119.77	-10.66	3.10	3.34	
	8	-7.16						3.24
			.0	96.07	-87.84	-3.90	7.17	
			.8	88.05	-18.30	-3.90	4.20	
			1.5	73.98	42.62	-3.90	1.27	
			2.3	59.91	92.67	-3.90	-1.66	
			3.0	51.93	134.11	-3.90	-4.38	
	9	66.70						8.25
			.0	163.84	-435.17	2.75	-4.97	
			.8	155.82	-314.80	2.75	-2.91	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			1.5	141.74	-203.06	2.75	-.84	
			2.3	127.68	-102.19	2.75	1.23	
			3.0	119.70	-9.92	2.75	3.29	
	10	-12.83						3.80
			.0	67.07	-45.19	-3.89	4.92	
			.8	60.90	3.13	-2.89	2.75	
			1.5	50.61	45.05	-2.89	.38	
			2.3	40.33	79.04	-2.89	-1.59	
			3.0	34.17	106.64	-2.89	-3.76	
	11	50.52						8.10
			.0	125.20	-343.11	2.82	-5.46	
			.8	119.02	-251.19	2.82	-3.35	
			1.5	108.73	-165.68	2.82	-1.24	
			2.3	98.45	-88.09	2.82	.88	
			3.0	92.30	-16.90	2.82	2.99	
	12	-9.78						1.18
			.0	66.98	-43.92	-3.36	4.84	
			.8	60.80	4.34	-3.36	3.72	
			1.5	50.51	46.19	-3.36	1.60	
			2.3	40.23	80.11	-3.36	-1.31	
			3.0	34.08	107.84	-3.36	-3.83	
	13	53.58						5.45
			.0	125.11	-341.84	2.36	-4.14	
			.8	118.93	-249.99	2.36	-2.38	
			1.5	108.64	-164.54	2.36	-.61	
			2.3	98.36	-87.02	2.36	1.16	
			3.0	92.20	-15.90	2.36	2.92	
	14	5.78						8.34
			.0	87.53	-150.94	-.36	-.25	
			.8	81.35	-87.28	-.36	-.82	
			1.5	71.06	-30.02	-.36	-.79	
			2.3	60.78	19.31	-.36	-1.05	
			3.0	54.62	62.23	-.36	-1.32	
	15	24.79						9.64
			.0	104.97	-240.35	1.36	-3.27	
			.8	98.79	-163.60	1.36	-2.35	
			1.5	88.50	-93.26	1.36	-1.33	
			2.3	78.22	-30.85	1.36	-.31	
			3.0	72.07	25.17	1.36	.71	
	16	15.95						-.35
			.0	87.21	-146.68	-1.90	4.14	
			.8	81.03	-83.25	-1.90	3.72	
			1.5	70.75	-26.23	-1.90	1.70	
			2.3	60.47	22.87	-1.90	-.13	
			3.0	54.31	65.37	-1.90	-1.55	
	17	34.97						.94
			.0	104.66	-236.09	-.18	1.03	
			.8	98.48	-159.58	-.18	.89	
			1.5	88.19	-89.47	-.18	.75	
			2.3	77.91	-27.29	-.18	.62	
			3.0	71.75	28.50	-.18	.48	

PORTAL TIGA DIMENSNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
789								
	1	53.05						14.05
			.0	134.46	-249.34	.57	-1.01	
			.8	126.52	-151.16	.57	-.58	
			1.5	110.36	-61.82	.57	-.16	
			2.3	94.26	14.40	.57	.27	
			3.0	86.40	81.63	.57	.69	
	2	43.65						-2.93
			.0	106.12	-175.25	-9.73	16.93	
			.8	100.09	-97.58	-9.73	9.63	
			1.5	88.73	-26.44	-9.73	2.34	
			2.3	77.40	35.52	-9.73	-4.96	
			3.0	71.43	91.00	-9.73	-12.25	
	3	35.76						24.44
			.0	78.08	-136.16	10.27	-18.06	
			.8	72.02	-79.55	10.27	-10.36	
			1.5	60.66	-29.46	10.27	-2.65	
			2.3	49.33	11.45	10.27	5.05	
			3.0	43.36	45.87	10.27	12.75	
	4	39.36						-4.20
			.0	116.01	-221.57	-9.47	16.64	
			.8	109.98	-136.49	-9.47	9.54	
			1.5	98.62	-57.93	-9.47	2.44	
			2.3	87.29	11.45	-9.47	-4.66	
			3.0	81.32	74.34	-9.47	-11.76	
	5	31.47						23.18
			.0	87.94	-182.49	10.53	-18.35	
			.8	81.91	-118.46	10.53	-10.45	
			1.5	70.55	-60.96	10.53	-2.53	
			2.3	59.22	-12.63	10.53	5.35	
			3.0	53.25	29.21	10.53	13.25	
	6	43.65						-2.93
			.0	106.12	-175.25	-9.73	16.93	
			.8	100.09	-97.58	-9.73	9.63	
			1.5	88.73	-26.44	-9.73	2.34	
			2.3	77.40	35.52	-9.73	-4.96	
			3.0	71.43	91.00	-9.73	-12.25	
	7	35.76						24.44
			.0	78.08	-136.16	10.27	-18.06	
			.8	72.02	-79.55	10.27	-10.36	
			1.5	60.66	-29.46	10.27	-2.65	
			2.3	49.33	11.45	10.27	5.05	
			3.0	43.36	45.87	10.27	12.75	
	8	39.36						-4.20
			.0	116.01	-221.57	-9.47	16.64	
			.8	109.98	-136.49	-9.47	9.54	
			1.5	98.62	-57.93	-9.47	2.44	
			2.3	87.29	11.45	-9.47	-4.66	
			3.0	81.32	74.34	-9.47	-11.76	
	9	31.47						23.18
			.0	87.94	-182.49	10.53	-18.35	
			.8	81.91	-118.46	10.53	-10.45	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			1.5	70.55	-60.96	10.53	-2.55	
			2.3	59.22	-12.63	10.53	5.35	
			3.0	53.25	29.21	10.53	13.25	
								-3.33
10		33.92						
			.0	78.03	-118.84	-8.45	14.88	
			.8	73.33	-61.85	-8.45	8.34	
			1.5	65.02	-9.75	-8.45	2.00	
			2.3	56.72	35.68	-8.45	-4.34	
			3.0	52.06	76.24	-8.45	-10.68	
								20.15
11		27.14						
			.0	53.95	-85.52	8.70	-15.33	
			.8	49.26	-46.39	8.70	-8.81	
			1.5	40.94	-12.34	8.70	-1.28	
			2.3	32.64	15.02	8.70	4.24	
			3.0	27.98	37.33	8.70	10.77	
								-5.03
12		28.17						
			.0	91.27	-160.88	-8.10	14.29	
			.8	86.58	-113.96	-8.10	8.21	
			1.5	78.26	-51.92	-8.10	1.13	
			2.3	69.96	3.43	-8.10	-5.95	
			3.0	65.30	33.93	-8.10	-10.02	
								15.46
13		21.40						
			.0	67.19	-147.36	9.05	-15.72	
			.8	62.50	-98.50	9.05	-8.94	
			1.5	54.19	-34.52	9.05	-2.15	
			2.3	45.88	-17.22	9.05	4.64	
			3.0	41.23	15.22	9.05	11.47	
								6.86
14		38.25						
			.0	54.16	-74.76	-2.86	4.63	
			.8	49.46	4.32	-2.86	2.46	
			1.5	41.15	38.83	-2.86	.34	
			2.3	32.85	66.05	-2.86	-1.80	
			3.0	28.19	88.71	-2.86	-3.94	
								13.91
15		35.22						
			.0	46.93	-24.70	2.29	-4.39	
			.8	42.24	8.97	2.29	-2.56	
			1.5	33.92	37.73	2.29	-.94	
			2.3	25.62	59.85	2.29	.77	
			3.0	20.94	77.09	2.29	2.19	
								1.21
16		19.09						
			.0	98.29	-241.30	-1.69	3.33	
			.8	93.59	-169.32	-1.69	2.06	
			1.5	85.28	-102.01	-1.69	.79	
			2.3	76.98	-41.40	-1.69	-.46	
			3.0	72.32	14.86	-1.69	-1.75	
								8.26
17		17.06						
			.0	91.06	-231.44	3.45	-3.67	
			.8	86.37	-164.68	3.45	-3.08	
			1.5	78.05	-102.79	3.45	-.49	
			2.3	69.75	-47.59	3.45	2.10	
			3.0	65.10	2.75	3.45	4.69	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
797								
	1	35.95						-.37
			.0	124.24	-193.46	.26	-.72	
			1.5	98.45	-22.52	.26	-.33	
			3.0	48.71	88.92	.26	.06	
			4.5	-.90	123.65	.26	.45	
			6.0	-26.51	99.26	.26	.34	
	2	27.24						-9.10
			.0	75.19	-85.87	-4.78	14.14	
			1.5	56.99	15.52	-4.78	6.96	
			3.0	24.81	77.43	-4.78	-.21	
			4.5	-7.30	89.95	-4.78	-7.38	
			6.0	-25.34	63.23	-4.78	-14.55	
	3	37.29						8.45
			.0	73.13	-75.93	6.96	-20.98	
			1.5	54.93	22.36	6.96	-10.54	
			3.0	22.75	81.18	6.96	-.10	
			4.5	-9.36	90.62	6.96	10.34	
			6.0	-27.40	60.81	6.96	20.78	
	4	11.83						-8.99
			.0	91.99	-178.73	-6.63	20.08	
			1.5	73.79	-82.14	-6.63	10.13	
			3.0	41.61	34.97	-6.63	.17	
			4.5	9.50	72.70	-6.63	-9.78	
			6.0	-8.34	71.17	-6.63	-19.73	
	5	21.89						8.56
			.0	89.94	-168.81	5.11	-15.04	
			1.5	71.73	-45.30	5.11	-7.38	
			3.0	39.53	38.73	5.11	.28	
			4.5	7.44	73.37	5.11	7.94	
			6.0	-10.69	68.76	5.11	15.60	
	6	27.24						-9.10
			.0	75.19	-85.87	-4.78	14.14	
			1.5	56.99	15.52	-4.78	6.96	
			3.0	24.81	77.43	-4.78	-.21	
			4.5	-7.30	89.95	-4.78	-7.38	
			6.0	-25.34	63.23	-4.78	-14.55	
	7	37.29						8.45
			.0	73.13	-75.93	6.96	-20.98	
			1.5	54.93	22.36	6.96	-10.54	
			3.0	22.75	81.18	6.96	-.10	
			4.5	-9.36	90.62	6.96	10.34	
			6.0	-27.40	60.81	6.96	20.78	
	8	11.83						-8.99
			.0	91.99	-178.73	-6.63	20.08	
			1.5	73.79	-82.14	-6.63	10.13	
			3.0	41.61	34.97	-6.63	.17	
			4.5	9.50	72.70	-6.63	-9.78	
			6.0	-8.34	71.17	-6.63	-19.73	
	9	21.89						8.56
			.0	89.94	-168.81	5.11	-15.04	
			1.5	71.73	-45.30	5.11	-7.38	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			3.0	39.55	38.73	5.11	.28	
			4.5	7.44	73.37	5.11	7.94	
			6.0	-10.60	68.76	5.11	15.60	
	10	23.32						-7.80
			.0	46.94	-29.71	-3.69	10.79	
			1.5	33.62	32.07	-3.69	5.26	
			3.0	11.85	66.32	-3.69	-.28	
			4.5	-9.86	67.65	-3.69	-5.81	
			6.0	-23.09	41.38	-3.69	-11.34	
	11	32.15						7.25
			.0	45.18	-21.20	6.38	-19.33	
			1.5	31.86	37.94	6.38	-9.76	
			3.0	10.09	69.74	6.38	-.19	
			4.5	-11.63	68.22	6.38	9.39	
			6.0	-24.85	39.51	6.38	18.96	
	12	2.89						-7.65
			.0	69.44	-134.07	-6.17	18.74	
			1.5	56.12	-58.53	-6.17	9.49	
			3.0	34.33	9.66	-6.17	.23	
			4.5	12.64	44.54	-6.17	-9.02	
			6.0	-.39	32.22	-6.17	-18.28	
	13	11.52						7.40
			.0	67.68	-140.36	3.90	-11.38	
			1.5	54.36	-52.67	3.90	-5.53	
			3.0	32.59	12.89	3.90	.32	
			4.5	10.87	45.12	3.90	6.17	
			6.0	-2.35	30.15	3.90	12.02	
	14	50.60						-2.70
			.0	20.09	118.28	2.73	-9.03	
			1.5	6.76	139.79	2.73	-4.94	
			3.0	-15.09	133.93	2.73	-.84	
			4.5	-36.72	94.80	2.73	3.26	
			6.0	-49.94	28.44	2.73	7.35	
	15	53.19						1.81
			.0	19.36	120.84	5.75	-18.07	
			1.5	6.23	141.55	5.75	-9.44	
			3.0	-15.33	134.92	5.75	-.81	
			4.5	-37.25	94.97	5.75	7.82	
			6.0	-50.47	27.82	5.75	16.45	
	16	-16.15						-2.21
			.0	93.06	-296.10	-5.54	17.48	
			1.5	81.74	-162.14	-5.54	9.17	
			3.0	59.98	-55.71	-5.54	.85	
			4.5	38.26	17.60	-5.54	-7.45	
			6.0	23.03	63.71	-5.54	-15.76	
	17	-15.56						2.31
			.0	94.03	-297.55	-2.52	8.44	
			1.5	81.21	-160.38	-2.52	4.66	
			3.0	59.45	-54.84	-2.52	.89	
			4.5	37.73	17.97	-2.52	-2.89	
			6.0	24.59	63.29	-2.52	-6.67	

PORTAL TIGA DIMEENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
799								
	1	68.51						-6.89
			.0	169.51	-271.78	9.15	-8.34	
			.5	155.33	-190.46	9.15	-3.76	
			1.0	138.42	-116.90	9.15	.81	
			1.5	121.51	-52.04	9.15	5.39	
			2.0	107.33	5.06	9.15	9.97	
	2	29.41						-42.33
			.0	74.11	-107.61	4.33	-2.19	
			.5	64.64	-72.84	4.33	-.03	
			1.0	53.39	-43.26	4.33	2.14	
			1.5	42.13	-19.46	4.33	4.30	
			2.0	32.66	-.83	4.33	6.47	
	3	56.70						30.50
			.0	139.06	-182.38	9.90	-13.76	
			.5	129.59	-115.14	9.90	-8.42	
			1.0	118.34	-53.09	9.90	-3.47	
			1.5	107.09	3.20	9.90	1.48	
			2.0	97.61	54.30	9.90	6.43	
	4	36.66						-39.54
			.0	91.13	-187.04	2.37	2.24	
			.5	81.66	-143.77	2.37	3.42	
			1.0	70.41	-105.68	2.37	4.61	
			1.5	59.15	-73.36	2.37	5.79	
			2.0	49.68	-46.23	2.37	6.98	
	5	63.97						33.29
			.0	156.09	-261.81	7.93	-8.93	
			.5	146.61	-186.06	7.93	-4.97	
			1.0	135.36	-115.30	7.93	-1.00	
			1.5	124.11	-50.71	7.93	2.97	
			2.0	114.63	8.90	7.93	6.93	
	6	29.41						-42.33
			.0	74.11	-107.61	4.33	-2.19	
			.5	64.64	-72.84	4.33	-.03	
			1.0	53.39	-43.26	4.33	2.14	
			1.5	42.13	-19.46	4.33	4.30	
			2.0	32.66	-.83	4.33	6.47	
	7	56.70						30.50
			.0	139.06	-182.38	9.90	-13.76	
			.5	129.59	-115.14	9.90	-8.42	
			1.0	118.34	-53.09	9.90	-3.47	
			1.5	107.09	3.20	9.90	1.48	
			2.0	97.61	54.30	9.90	6.43	
	8	36.66						-39.54
			.0	91.13	-187.04	2.37	2.24	
			.5	81.66	-143.77	2.37	3.42	
			1.0	70.41	-105.68	2.37	4.61	
			1.5	59.15	-73.36	2.37	5.79	
			2.0	49.68	-46.23	2.37	6.98	
	9	63.97						33.29
			.0	156.09	-261.81	7.93	-8.93	
			.5	146.61	-186.06	7.93	-4.97	

PORTAL TIBA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ		
			1.0	135.26	-115.50	7.93	-1.00			
			1.5	124.11	-80.71	7.93	2.97			
			2.0	114.63	8.90	7.93	6.93			
	10	16.66						-36.21		
			.0	42.27	-43.34	3.22	-2.06			
			.5	35.75	-26.26	3.22	-.45			
			1.0	27.92	-10.29	3.22	1.17			
			1.5	20.10	1.67	3.22	2.78			
			2.0	13.48	10.01	3.22	4.39			
	11	40.06						26.27		
			.0	98.08	-109.97	8.00	-11.64			
			.5	91.46	-82.54	8.00	-7.64			
			1.0	83.64	-18.71	8.00	-3.64			
			1.5	75.81	21.10	8.00	.36			
			2.0	69.19	37.30	8.00	4.33			
	12	26.38						-32.47		
			.0	63.16	-152.22	.60	3.68			
			.5	58.54	-121.24	.60	4.17			
			1.0	50.72	-93.87	.60	4.47			
			1.5	42.89	-70.52	.60	4.77			
			2.0	36.28	-50.78	.60	5.07			
	13	49.79						30.01		
			.0	120.37	-216.39	5.37	-5.70			
			.5	114.26	-157.82	5.37	-3.82			
			1.0	106.43	-102.30	5.37	-.74			
			1.5	98.61	-51.09	5.37	2.35			
			2.0	91.99	-7.49	5.37	5.02			
	14	17.50						-18.70		
			.0	33.38	35.77	7.96	-12.33			
			.5	28.67	71.80	7.96	-8.35			
			1.0	20.84	84.23	7.96	-4.37			
			1.5	13.02	92.65	7.96	-.39			
			2.0	6.40	97.15	7.96	3.59			
	15	20.57						.05		
			.0	52.00	16.77	9.39	-10.21			
			.5	45.39	60.92	9.39	-10.51			
			1.0	37.56	81.70	9.39	-6.81			
			1.5	29.73	98.48	9.39	-1.12			
			2.0	23.12	111.24	9.39	3.58			
	16	45.92						-6.25		
			.0	111.24	-298.71	-.80	7.14			
			.5	104.62	-244.70	-.80	7.04			
			1.0	96.80	-194.29	-.80	6.64			
			1.5		1.5	88.97	-147.90		-.80	6.24
			2.0	82.35	-106.12	-.80	5.84			
	17	52.94						12.50		
			.0	127.96	-317.96	.63	4.27			
			.5	121.34	-255.58	.63	4.88			
			1.0	113.51	-196.82	.63	5.20			
			1.5	105.69	-142.07	.63	5.52			
			2.0	99.07	-90.93	.63	5.83			

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
821								
	1	46.18						-.52
			.0	-36.97	106.30	.79	-1.17	
			.8	-62.57	62.22	.79	-.57	
			1.5	-77.06	10.42	.79	.02	
			2.3	-91.50	-53.35	.79	.61	
			3.0	-97.01	-124.80	.79	1.21	
	2	46.13						3.14
			.0	-46.53	81.87	-.09	-.44	
			.8	-50.32	45.90	-.09	-.51	
			1.5	-59.68	5.00	-.09	-.58	
			2.3	-69.00	-43.60	-.09	-.65	
			3.0	-72.73	-97.10	-.09	-.72	
	3	47.09						-3.68
			.0	-45.45	80.28	-.67	1.64	
			.8	-49.24	45.11	-.67	1.14	
			1.5	-58.60	5.02	-.67	.64	
			2.3	-67.92	-42.77	-.67	.14	
			3.0	-71.65	-95.46	-.67	-.36	
	4	17.09						2.98
			.0	-33.74	69.26	1.82	-3.33	
			.8	-39.53	41.38	1.82	-1.96	
			1.5	-48.89	8.37	1.82	-.61	
			2.3	-58.21	-31.94	1.82	.75	
			3.0	-61.94	-77.34	1.82	2.12	
	5	18.04						-3.85
			.0	-34.66	67.66	1.25	-1.27	
			.8	-38.45	40.59	1.25	-.33	
			1.5	-47.81	8.39	1.25	.30	
			2.3	-57.13	-31.11	1.25	1.54	
			3.0	-60.86	-75.70	1.25	2.48	
	6	46.13						3.14
			.0	-46.53	81.87	-.09	-.44	
			.8	-50.32	45.90	-.09	-.51	
			1.5	-59.68	5.00	-.09	-.58	
			2.3	-69.00	-43.60	-.09	-.65	
			3.0	-72.73	-97.10	-.09	-.72	
	7	47.09						-3.68
			.0	-45.45	80.28	-.67	1.64	
			.8	-49.24	45.11	-.67	1.14	
			1.5	-58.60	5.02	-.67	.64	
			2.3	-67.92	-42.77	-.67	.14	
			3.0	-71.65	-95.46	-.67	-.36	
	8	17.09						2.98
			.0	-33.74	69.26	1.82	-3.33	
			.8	-39.53	41.38	1.82	-1.96	
			1.5	-48.89	8.37	1.82	-.61	
			2.3	-58.21	-31.94	1.82	.75	
			3.0	-61.94	-77.34	1.82	2.12	
	9	18.04						-3.85
			.0	-34.66	67.66	1.25	-1.27	
			.8	-38.45	40.59	1.25	-.33	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT	LOAD	AXIAL	DIST	1-2 PLANE		1-3 PLANE		AXIAL		
ID	COMB	FORCE	ENDI	SHEAR	MOMENT	SHEAR	MOMENT	TORQ		
			1.5	-47.81	8.59	1.25	.60			
			2.3	-57.17	-31.11	1.25	1.54			
			3.0	-60.86	-75.70	1.25	2.48			
	10	42.27						2.79		
			.0	-37.74	63.78	-.60	.41			
			.8	-40.43	34.69	-.60	-.04			
			1.5	-46.74	2.23	-.60	-.49			
			2.3	-53.03	-35.41	-.60	-.94			
			3.0	-58.67	-76.40	-.60	-1.39			
	11	43.10						-3.07		
			.0	-36.82	62.41	-1.09	2.20			
			.8	-39.50	34.02	-1.09	1.38			
			1.5	-45.81	2.25	-1.09	.56			
			2.3	-52.10	-34.70	-1.09	-.27			
			3.0	-54.75	-74.99	-1.09	-1.09			
	12	3.38						2.67		
			.0	-23.29	46.89	1.97	-3.49			
			.8	-25.98	28.64	1.97	-2.01			
			1.5	-32.29	7.02	1.97	-.74			
			2.3	-38.58	-19.79	1.97	.94			
			3.0	-41.22	-49.94	1.97	2.42			
	13	4.20						-3.29		
			.0	-22.37	45.32	1.48	-1.71			
			.8	-25.05	27.97	1.48	-.80			
			1.5	-31.36	7.04	1.48	.31			
			2.3	-37.65	-19.07	1.48	1.61			
			3.0	-40.30	-48.33	1.48	2.72			
	14	87.92						1.00		
			.0	-54.27	83.00	-3.77	3.39			
			.8	-56.96	41.81	-3.77	1.76			
			1.5	-63.27	-3.34	-3.77	-.37			
			2.3	-69.55	-53.38	-3.77	-2.89			
			3.0	-72.20	-106.76	-3.77	-3.72			
	15	88.16						-.76		
			.0	-53.99	82.89	-3.92	6.13			
			.8	-56.66	41.31	-3.92	3.19			
			1.5	-62.99	-3.34	-3.92	.25			
			2.3	-69.28	-53.16	-3.92	-2.69			
			3.0	-71.92	-106.74	-3.92	-3.63			
	16	-41.69						.26		
			.0	-3.12	36.72	4.79	-7.42			
			.8	-5.80	21.35	4.79	-3.83			
			1.5	-10.11	12.61	4.79	-.27			
			2.3		2.3	-21.40	-1.32		4.79	3.36
			3.0	-24.05	-18.39	4.79	6.96			
	17	-41.44						-1.50		
			.0	-5.84	26.31	4.65	-6.38			
			.8	-8.53	21.15	4.65	-3.40			
			1.5	-14.84	12.61	4.65	.08			
			2.3	-21.13	-1.10	4.65	3.57			
			3.0	-23.77	-18.17	4.65	7.05			

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
836								
	1	-.12						1.87
			.0	43.14	-73.74	-.08	.24	
			1.5	32.43	-15.55	-.08	.12	
			3.0	11.74	17.36	-.08	.01	
			4.5	-9.74	18.47	-.08	-.10	
			6.0	-20.40	-3.65	-.08	-.22	
	2	9.28						1.20
			.0	30.16	-48.29	-.49	1.62	
			1.5	22.30	-8.00	-.49	.38	
			3.0	7.94	15.10	-.49	.14	
			4.5	-6.40	15.83	-.49	-.59	
			6.0	-14.23	-.60	-.49	-1.33	
	3	-9.86						1.39
			.0	27.86	-44.25	.43	-1.14	
			1.5	20.00	-7.41	.43	-.79	
			3.0	5.63	12.25	.43	-.14	
			4.5	-8.70	9.53	.43	.51	
			6.0	-16.53	-10.34	.43	1.16	
	4	9.66						1.16
			.0	31.59	-55.58	-.54	1.77	
			1.5	23.73	-13.14	-.54	.96	
			3.0	9.38	12.12	-.54	.15	
			4.5	-4.97	15.00	-.54	-.66	
			6.0	-12.79	.73	-.54	-1.47	
	5	-9.48						1.35
			.0	29.20	-51.34	.38	-1.13	
			1.5	21.44	-12.54	.38	-.71	
			3.0	7.08	9.27	.38	-.17	
			4.5	-7.27	8.70	.38	.44	
			6.0	-15.09	-9.01	.38	1.02	
	6	9.28						1.20
			.0	30.16	-48.29	-.49	1.62	
			1.5	22.30	-8.00	-.49	.38	
			3.0	7.94	15.10	-.49	.14	
			4.5	-6.40	15.83	-.49	-.59	
			6.0	-14.23	-.60	-.49	-1.33	
	7	-9.86						1.39
			.0	27.86	-44.25	.43	-1.14	
			1.5	20.00	-7.41	.43	-.79	
			3.0	5.63	12.25	.43	-.14	
			4.5	-8.70	9.53	.43	.51	
			6.0	-16.53	-10.34	.43	1.16	
	8	9.66						1.16
			.0	31.59	-55.58	-.54	1.77	
			1.5	23.73	-13.14	-.54	.96	
			3.0	9.38	12.12	-.54	.15	
			4.5	-4.97	15.00	-.54	-.66	
			6.0	-12.79	.73	-.54	-1.47	
	9	-9.48						1.35
			.0	29.20	-51.34	.38	-1.13	
			1.5	21.44	-12.54	.38	-.71	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			3.0	7.08	9.27	.38	-.13	
			4.5	-7.27	8.70	.38	.44	
			6.0	-15.09	-9.01	.38	1.02	
10		7.87						.85
			.0	21.39	-32.14	-.40	1.33	
			1.5	15.43	-3.91	-.40	.72	
			3.0	9.23	11.85	-.40	.12	
			4.5	-4.97	11.77	-.40	-.48	
			6.0	-10.91	-.76	-.40	-1.08	
11		-8.55						1.01
			.0	19.42	-28.68	.39	-1.29	
			1.5	13.46	-3.40	.39	-.70	
			3.0	7.26	9.41	.39	-.12	
			4.5	-5.94	8.36	.39	.46	
			6.0	-12.88	-9.12	.39	1.05	
12		8.38						.80
			.0	23.31	-41.90	-.47	1.53	
			1.5	17.35	-10.79	-.47	.63	
			3.0	7.19	7.86	-.47	.13	
			4.5	-3.05	10.66	-.47	-.57	
			6.0	-8.99	1.02	-.47	-1.27	
13		-9.04						.96
			.0	21.74	-38.11	.32	-1.09	
			1.5	15.38	-10.28	.32	-.50	
			3.0	5.18	5.42	.32	-.11	
			4.5	-5.02	8.26	.32	.37	
			6.0	-10.96	-7.24	.32	.36	
14		1.52						.96
			.0	18.46	-19.55	-.05	.17	
			1.5	12.49	4.28	-.05	.10	
			3.0	2.29	19.60	-.05	.03	
			4.5	-7.90	11.16	-.05	-.04	
			6.0	-13.84	-5.76	-.05	-.12	
15		-3.40						1.01
			.0	17.87	-18.31	.19	-.21	
			1.5	11.90	4.43	.19	-.03	
			3.0	1.70	14.92	.19	-.04	
			4.5	-8.49	9.54	.19	.24	
			6.0	-14.43	-8.27	.19	.32	
16		3.23						.80
			.0	24.87	-32.07	-.27	.85	
			1.5	18.90	-18.63	-.27	.45	
			3.0	8.70	7.33	-.27	.05	
			4.5	-1.49	7.48	-.27	-.35	
			6.0	-7.47	.17	-.27	-.73	
17		-1.70						.85
			.0	24.28	-31.03	-.03	.07	
			1.5	18.31	-18.47	-.03	.02	
			3.0	8.11	1.62	-.03	-.02	
			4.5	-2.08	5.86	-.03	-.06	
			6.0	-8.03	-2.34	-.03	-.11	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
839								
	1	3.57						-3.73
			.0	80.98	-93.42	-.22	.39	
			1.0	56.58	-23.88	-.22	.16	
			2.0	24.23	16.90	-.22	-.06	
			3.0	-4.85	25.93	-.22	-.28	
			4.0	-25.63	10.41	-.22	-.51	
	2	.80						-5.28
			.0	46.89	-48.88	-2.31	4.06	
			1.0	31.19	-9.40	-2.31	2.25	
			2.0	10.82	11.83	-2.31	-.07	
			3.0	-7.51	13.05	-2.31	-2.38	
			4.0	-21.21	-1.33	-2.31	-4.70	
	3	15.48						.05
			.0	53.19	-60.23	1.86	-3.79	
			1.0	37.48	-14.57	1.86	-1.93	
			2.0	17.11	12.95	1.86	-.08	
			3.0	-1.22	20.45	1.86	1.78	
			4.0	-14.92	12.17	1.86	3.64	
	4	-11.09						-5.21
			.0	51.68	-63.12	-2.15	4.30	
			1.0	35.97	-18.85	-2.15	2.15	
			2.0	15.61	7.16	-2.15	-.00	
			3.0	-2.73	18.16	-2.15	-2.16	
			4.0	-16.42	7.37	-2.15	-4.31	
	5	3.59						.12
			.0	57.97	-74.39	2.02	-4.06	
			1.0	42.27	-24.03	2.02	-2.03	
			2.0	21.90	8.28	2.02	-.01	
			3.0	3.57	20.57	2.02	2.01	
			4.0	-10.13	17.07	2.02	4.07	
	6	.80						-5.28
			.0	46.89	-48.88	-2.31	4.06	
			1.0	31.19	-9.40	-2.31	2.25	
			2.0	10.82	11.83	-2.31	-.07	
			3.0	-7.51	13.05	-2.31	-2.38	
			4.0	-21.21	-1.33	-2.31	-4.70	
	7	15.48						.05
			.0	53.19	-60.23	1.86	-3.79	
			1.0	37.48	-14.57	1.86	-1.93	
			2.0	17.11	12.95	1.86	-.08	
			3.0	-1.22	20.45	1.86	1.78	
			4.0	-14.92	12.17	1.86	3.64	
	8	-11.09				8 -11.09		
			.0	51.68	-63.12	-2.15	4.30	
			1.0	35.97	-18.85	-2.15	2.15	
			2.0	15.61	7.16	-2.15	-.00	
			3.0	-2.73	18.16	-2.15	-2.16	
			4.0	-16.42	7.37	-2.15	-4.31	
	9	3.59						.12
			.0	57.97	-74.39	2.02	-4.06	
			1.0	42.27	-24.03	2.02	-2.03	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			2.0	21.90	8.28	2.02	-.01	
			3.0	3.57	20.57	2.02	2.01	
			4.0	-10.13	17.07	2.02	4.03	
	10	3.08						-4.19
			.0	29.39	-28.20	-2.00	3.93	
			1.0	19.02	-3.63	-2.00	1.93	
			2.0	8.64	8.24	-2.00	-.07	
			3.0	-6.51	6.13	-2.00	-2.07	
			4.0	-15.86	-3.18	-2.00	-4.07	
	11	15.67						.38
			.0	34.98	-38.04	1.38	-3.23	
			1.0	24.42	-8.07	1.58	-1.65	
			2.0	11.04	9.79	1.58	-.07	
			3.0	-1.11	14.49	1.58	1.51	
			4.0	-10.47	8.37	1.38	3.09	
	12	-10.85						-4.10
			.0	33.99	-47.27	-1.78	3.38	
			1.0	25.43	-16.29	-1.78	1.80	
			2.0	12.05	2.38	-1.78	.02	
			3.0	-.10	8.29	-1.78	-1.76	
			4.0	-9.46	3.37	-1.78	-3.54	
	13	-.26						.47
			.0	41.39	-57.10	1.30	-3.59	
			1.0	30.82	-20.73	1.80	-1.77	
			2.0	17.44	3.04	1.80	.01	
			3.0	5.29	14.64	1.80	1.81	
			4.0	-4.06	19.13	1.80	3.61	
	14	26.06						-2.69
			.0	24.00	-9.41	-1.00	1.84	
			1.0	13.44	9.58	-1.00	.82	
			2.0	.06	16.46	-1.00	-.17	
			3.0	-12.09	10.16	-1.00	-1.17	
			4.0	-21.44	-6.72	-1.00	-2.17	
	15	29.84						-1.32
			.0	25.62	-12.26	.07	-.32	
			1.0	15.06	8.25	.07	-.24	
			2.0	1.68	16.75	.07	-.17	
			3.0	-10.47	12.09	.07	-.10	
			4.0	-19.82	-3.19	.07	-.02	
	16	-27.02						-3.40
			.0	45.35	-72.94	-.27	.66	
			1.0	34.79	-32.60	-.27	.39	
			2.0	21.41	-4.38	-.27	.11	
			3.0	9.26	10.69	-.27	-.16	
			4.0	-.10	15.13	-.27	-.43	
	17	-23.24						-1.03
			.0	46.97	-73.89	.80	-1.49	
			1.0	36.41	-33.94	.80	-.69	
			2.0	23.02	-4.09	.80	.11	
			3.0	10.87	12.60	.80	.91	
			4.0	1.52	18.66	.80	1.71	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
842								
	1	46.87						7.95
			.0	81.77	-51.98	-4.23	3.40	
			.5	65.84	-15.03	-4.23	1.29	
			1.0	49.70	13.85	-4.23	-.82	
			1.5	33.57	34.67	-4.23	-2.94	
			2.0	17.43	47.42	-4.23	-3.05	
	2	62.55						-7.32
			.0	23.27	7.65	-12.35	18.46	
			.5	12.59	16.61	-12.35	12.29	
			1.0	1.92	20.24	-12.35	6.11	
			1.5	-8.75	18.54	-12.35	-.06	
			2.0	-19.42	11.49	-12.35	-6.24	
	3	11.48						18.50
			.0	49.09	-23.32	3.07	-12.25	
			.5	38.41	-1.45	3.07	-10.72	
			1.0	27.74	15.09	3.07	-9.18	
			1.5	17.07	26.29	3.07	-7.65	
			2.0	6.40	32.16	3.07	-6.12	
	4	51.12						-7.16
			.0	60.25	-46.42	-8.88	16.91	
			.5	49.57	-18.97	-8.88	12.47	
			1.0	38.90	3.13	-8.88	8.03	
			1.5	28.23	19.93	-8.88	3.60	
			2.0	17.56	31.38	-8.88	-.84	
	5	.05						18.04
			.0	86.07	-77.39	6.54	-13.80	
			.5	75.39	-37.03	6.54	-10.53	
			1.0	64.72	-2.00	6.54	-7.26	
			1.5	54.06	27.69	6.54	-3.99	
			2.0	43.38	52.05	6.54	-.73	
	6	62.55						-7.32
			.0	23.27	7.65	-12.35	18.46	
			.5	12.59	16.61	-12.35	12.29	
			1.0	1.92	20.24	-12.35	6.11	
			1.5	-8.75	18.54	-12.35	-.06	
			2.0	-19.42	11.49	-12.35	-6.24	
	7	11.48						18.50
			.0	49.09	-23.32	3.07	-12.25	
			.5	38.41	-1.45	3.07	-10.72	
			1.0	27.74	15.09	3.07	-9.18	
			1.5	17.07	26.29	3.07	-7.65	
			2.0	6.40	32.16	3.07	-6.12	
	8	51.12						-7.18
			.0	60.25	-46.42	-8.88	16.91	
			.5	49.57	-18.97	-8.88	12.47	
			1.0	38.90	3.13	-8.88	8.03	
			1.5	28.23	19.93	-8.88	3.60	
			2.0	17.56	31.38	-8.88	-.84	
	9	.05						18.04
			.0	86.07	-77.39	6.54	-13.80	
			.5	75.39	-37.03	6.54	-10.53	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			1.0	64.72	-2.00	6.54	-7.26	
			1.5	54.05	27.69	6.54	-3.99	
			2.0	43.38	52.05	6.54	-.73	
	10	51.40						-6.98
			.0	2.27	25.04	-11.02	15.88	
			.5	-5.11	24.33	-11.02	10.37	
			1.0	-12.49	19.93	-11.02	4.86	
			1.5	-19.87	11.84	-11.02	-.65	
			2.0	-27.25	.06	-11.02	-6.16	
	11	7.60						15.16
			.0	24.42	-1.52	2.20	-10.47	
			.5	17.04	8.84	2.20	-9.37	
			1.0	9.66	15.32	2.20	-8.27	
			1.5	2.28	18.50	2.20	-7.17	
			2.0	-5.10	17.79	2.20	-6.06	
	12	36.10						-6.79
			.0	51.80	-47.37	-6.37	13.80	
			.5	44.42	-23.32	-6.37	10.61	
			1.0	37.04	-2.96	-6.37	7.43	
			1.5	29.65	13.72	-6.37	4.24	
			2.0	22.27	24.70	-6.37	1.06	
	13	-7.71						15.76
			.0	73.74	-77.91	6.85	-12.33	
			.5	66.56	-38.81	6.85	-7.12	
			1.0	59.18	-7.37	6.85	-3.29	
			1.5	51.80	20.37	6.85	-2.37	
			2.0	44.42	44.43	6.85	1.16	
	14	55.92						.54
			.0	-47.73	100.19	-11.82	9.08	
			.5	-55.11	74.48	-11.82	3.17	
			1.0	-62.49	45.08	-11.82	-2.74	
			1.5	-69.87	11.99	-11.82	-8.64	
			2.0	-77.25	-24.79	-11.82	-14.55	
	15	40.77						7.19
			.0	-41.08	92.22	-7.85	1.18	
			.5	-48.46	69.83	-7.85	-2.75	
			1.0	-55.84	43.75	-7.85	-6.67	
			1.5	-63.22	13.99	-7.85	-10.60	
			2.0	-70.61	-19.47	-7.85	-14.52	
	16	2.92						1.19
			.0	117.30	-141.11	3.68	2.13	
			.5	109.92	-84.31	3.68	3.99	
			1.0	102.54	-31.20	3.68	5.84	
			1.5	95.16	18.23	3.68	7.68	
			2.0	87.78	67.96	3.68	9.52	
	17	-10.22						7.83
			.0	127.34	-149.08	7.65	-3.75	
			.5	116.56	-88.96	7.65	-1.93	
			1.0	109.18	-32.52	7.65	1.90	
			1.5	101.80	20.23	7.65	5.72	
			2.0	94.42	69.29	7.65	9.55	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
865								
	1	34.04						46.30
			.0	-69.68	126.41	-2.93	4.08	
			.6	-85.82	79.92	-2.93	2.32	
			1.2	-105.24	22.77	-2.93	.56	
			1.8	-124.65	-46.36	-2.93	-1.20	
			2.4	-140.78	-126.15	-2.93	-3.95	
	2	-.49						51.88
			.0	-108.48	109.81	18.07	-17.81	
			.6	-119.87	41.21	18.07	-6.67	
			1.2	-133.39	-34.66	18.07	4.47	
			1.8	-146.91	-118.86	18.07	15.61	
			2.4	-158.29	-210.32	18.07	25.65	
	3	3.41						12.49
			.0	-73.62	98.42	-27.12	27.76	
			.6	-87.01	49.73	-27.12	11.09	
			1.2	-100.33	-6.42	-27.12	-5.18	
			1.8	-114.05	-70.90	-27.12	-21.45	
			2.4	-125.43	-142.86	-27.12	-37.72	
	4	43.44						51.87
			.0	-18.78	79.81	23.00	-21.67	
			.6	-30.16	64.23	23.00	-7.67	
			1.2	-43.69	42.18	23.00	7.33	
			1.8	-57.20	11.81	23.00	19.73	
			2.4	-68.39	-26.03	23.00	33.33	
	5	47.34						12.54
			.0	14.08	67.62	-22.19	23.20	
			.6	2.69	72.76	-22.19	9.39	
			1.2	-10.83	70.42	-22.19	-3.42	
			1.8	-24.35	59.76	-22.19	-16.73	
			2.4	-35.73	41.63	-22.19	-30.06	
	6	-.49						51.88
			.0	-108.48	109.81	18.07	-17.81	
			.6	-119.87	41.21	18.07	-6.67	
			1.2	-133.39	-34.66	18.07	4.47	
			1.8	-146.91	-118.86	18.07	15.61	
			2.4	-158.29	-210.32	18.07	25.65	
	7	3.41						12.49
			.0	-73.62	98.42	-27.12	27.76	
			.6	-87.01	49.73	-27.12	11.09	
			1.2	-100.33	-6.42	-27.12	-5.18	
			1.8	-114.05	-70.90	-27.12	-21.45	
			2.4	-125.43	-142.86	-27.12	-37.72	
	8	43.44						51.87
			.0	-18.78	79.81	23.00	-21.67	
			.6	-30.16	64.23	23.00	-7.67	
			1.2	-43.69	42.18	23.00	7.33	
			1.8	-57.20	11.81	23.00	19.73	
			2.4	-68.39	-26.03	23.00	33.33	
	9	47.34						12.54
			.0	14.08	67.62	-22.19	23.20	
			.6	2.69	72.76	-22.19	9.39	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			1.2	-10.83	70.42	-22.19	-3.42	
			1.8	-24.35	59.76	-22.19	-16.73	
			2.4	-35.73	41.63	-22.19	-30.05	
								40.22
	10	-14.27						
			.0	-107.55	90.11	14.57	-14.29	
			.6	-115.92	23.14	14.57	-5.65	
			1.2	-125.73	-49.28	14.57	3.09	
			1.8	-135.53	-127.73	14.57	11.84	
			2.4	-143.89	-211.63	14.57	20.38	
								6.43
	11	-10.92						
			.0	-79.37	80.51	-24.19	24.10	
			.6	-87.73	30.45	-24.19	9.59	
			1.2	-97.54	-25.06	-24.19	-4.93	
			1.8	-107.35	-86.60	-24.19	-19.44	
			2.4	-115.71	-157.59	-24.19	-33.96	
								40.28
	12	44.56						
			.0	12.08	48.86	21.18	-19.96	
			.6	4.22	53.97	21.18	-7.26	
			1.2	-5.59	53.63	21.18	3.45	
			1.8	-15.40	47.26	21.18	16.16	
			2.4	-23.76	35.44	21.18	30.86	
								6.49
	13	47.91						
			.0	40.76	79.26	-17.38	18.33	
			.6	32.40	61.28	-17.38	7.98	
			1.2	22.39	37.85	-17.38	-2.37	
			1.8	12.78	88.39	-17.38	-13.12	
			2.4	4.42	93.48	-17.38	-23.67	
								28.53
	14	-81.71						
			.0	-237.78	174.34	-6.70	3.38	
			.6	-246.14	-10.26	-6.70	1.56	
			1.2	-250.95	-160.81	-6.70	-1.46	
			1.8	-265.76	-317.40	-6.70	-3.48	
			2.4	-274.12	-479.14	-6.70	-10.59	
								18.19
	15	-80.70						
			.0	-129.32	131.96	-18.33	17.13	
			.6	-237.68	-8.06	-18.33	6.13	
			1.2	-247.50	-157.05	-18.33	-4.87	
			1.8	-257.30	-305.06	-18.33	-15.87	
			2.4	-269.66	-462.02	-18.33	-26.87	
								28.51
	16	114.34						
			.0	162.53	-2.60	15.32	-12.99	
			.6	154.17	92.49	15.32	-3.80	
			1.2	144.36	182.12	15.32	7.39	
			1.8	134.55	265.72	15.32	14.56	
			2.4	126.19	343.87	15.32	23.77	
								18.38
	17	115.35						
			.0	170.99	-3.48	3.69	-1.44	
			.6	162.63	94.68	3.69	.77	
			1.2	152.82	189.39	3.69	2.98	
			1.8	143.01	278.06	3.69	5.20	
			2.4	134.65	361.29	3.69	7.41	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
870								
	1	72.97						8.85
			.0	-12.43	104.67	.00	-1.80	
			1.5	-37.31	169.30	.00	-.91	
			3.0	-96.46	73.95	.00	.17	
			4.5	-133.89	-70.04	.00	1.46	
			6.0	-160.10	-317.72	.00	3.14	
	3	46.32						21.06
			.0	-9.45	100.40	4.83	-14.18	
			1.5	-29.43	78.34	4.83	-6.93	
			3.0	-62.33	10.03	4.83	.32	
			4.5	-95.21	-108.70	4.83	7.57	
			6.0	-118.07	-268.46	4.83	14.82	
	3	60.98						-8.79
			.0	-33.33	184.32	-1.37	3.33	
			1.5	-53.31	121.43	-1.37	3.30	
			3.0	-86.24	17.29	-1.37	.24	
			4.5	-119.09	-137.26	-1.37	-1.71	
			6.0	-139.92	-332.85	-1.37	-4.06	
	4	42.17						21.23
			.0	17.19	104.74	2.42	-7.23	
			1.5	-2.80	117.62	2.42	-4.02	
			3.0	-33.72	89.26	2.42	-.79	
			4.5	-68.87	10.48	2.42	3.24	
			6.0	-88.40	-109.33	2.42	6.87	
	5	86.79						-8.61
			.0	-6.70	187.66	-3.98	11.87	
			1.5	-26.68	160.71	-3.98	5.90	
			3.0	-59.60	96.37	-3.98	-.07	
			4.5	-92.46	-18.08	-3.98	-6.04	
			6.0	-112.39	-173.72	-3.98	-12.01	
	6	46.32						21.09
			.0	-9.45	100.40	4.83	-14.18	
			1.5	-29.43	78.34	4.83	-6.93	
			3.0	-62.33	10.03	4.83	.32	
			4.5	-95.21	-108.70	4.83	7.57	
			6.0	-118.07	-268.46	4.83	14.82	
	7	60.98						-8.79
			.0	-33.33	184.32	-1.37	3.33	
			1.5	-53.31	121.43	-1.37	3.30	
			3.0	-86.24	17.29	-1.37	.24	
			4.5	-119.09	-137.26	-1.37	-1.71	
			6.0	-139.92	-332.85	-1.37	-4.06	
	8	42.17						21.23
			.0	17.19	104.74	2.42	-7.23	
			1.5	-2.80	117.62	2.42	-4.02	
			3.0	-33.72	89.26	2.42	-.79	
			4.5	-68.87	10.48	2.42	3.24	
			6.0	-88.40	-109.33	2.42	6.87	
	9	86.79						-8.61
			.0	-6.70	183.66	-3.98	11.87	
			1.5	-26.68	160.71	-3.98	5.90	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ		
			3.0	-59.60	96.52	-3.98	-.07			
			4.5	-92.46	-18.08	-3.98	-6.04			
			6.0	-112.29	-173.72	-3.98	-12.01			
	10	34.42						17.22		
			.0	-13.06	72.79	4.65	-10.52			
			1.5	-28.46	43.01	4.65	-3.34			
			3.0	-32.24	-17.26	4.65	.43			
			4.5	-76.16	-114.00	4.65	7.41			
			6.0	-91.47	-241.08	4.65	14.38			
	11	46.99						-8.37		
			.0	-33.35	140.49	-.84	3.27			
			1.5	-48.96	79.97	-.84	1.97			
			3.0	-72.83	-11.03	-.84	.71			
			4.5	-96.64	-138.50	-.84	-.55			
			6.0	-111.96	-296.31	-.84	-1.81			
	12	28.80						17.47		
			.0	22.61	71.91	1.42	-4.77			
			1.5	7.19	35.62	1.42	-2.65			
			3.0	-16.07	88.34	1.42	-.57			
			4.5	-40.49	45.60	1.42	1.51			
			6.0	-55.81	-97.99	1.42	3.74			
	13	41.36						-6.13		
			.0	2.12	179.20	-4.07	11.97			
			1.5	-13.30	132.85	-4.07	5.87			
			3.0	-37.16	75.08	-4.07	-.24			
			4.5	-60.98	21.11	-4.07	-6.38			
			6.0	-76.30	-37.21	-4.07	-12.46			
	14	45.36						7.98		
			.0	-61.82	97.82	6.50	-17.85			
			1.5	-77.24	-5.40	6.50	-8.10			
			3.0	-101.10	-138.81	6.50	1.64			
			4.5	-124.91	-308.69	6.50	11.39			
			6.0	-140.23	-508.90	6.50	21.13			
	15	49.13						.29		
			.0	-67.97	117.84	4.85	-12.32			
			1.5	-83.38	5.69	4.85	-5.83			
			3.0	-107.25	-136.34	4.85	1.73			
			4.5	-131.06	-316.04	4.85	9.00			
			6.0	-146.38	-525.48	4.85	16.27			
	16	26.66						8.80		
			.0	37.03	94.36	-4.27	11.28			
			1.5	41.61	169.90	-4.27	4.87			
			3.0	17.75	214.75	-4.27	-1.53			
			4.5		4.3	-6.07	223.13		-4.27	-7.34
			6.0	-21.39	201.19	-4.27	-14.35			
	17	30.43						1.12		
			.0	50.88	114.87	-5.92	16.31			
			1.5	33.46	180.99	-5.92	7.43			
			3.0	11.60	216.63	-5.92	-1.45			
			4.5	-12.22	215.79	-5.92	-10.33			
			6.0	-27.54	184.62	-5.92	-19.21			

PORTAL TIGA DIMENSI - UNITS: KN - M

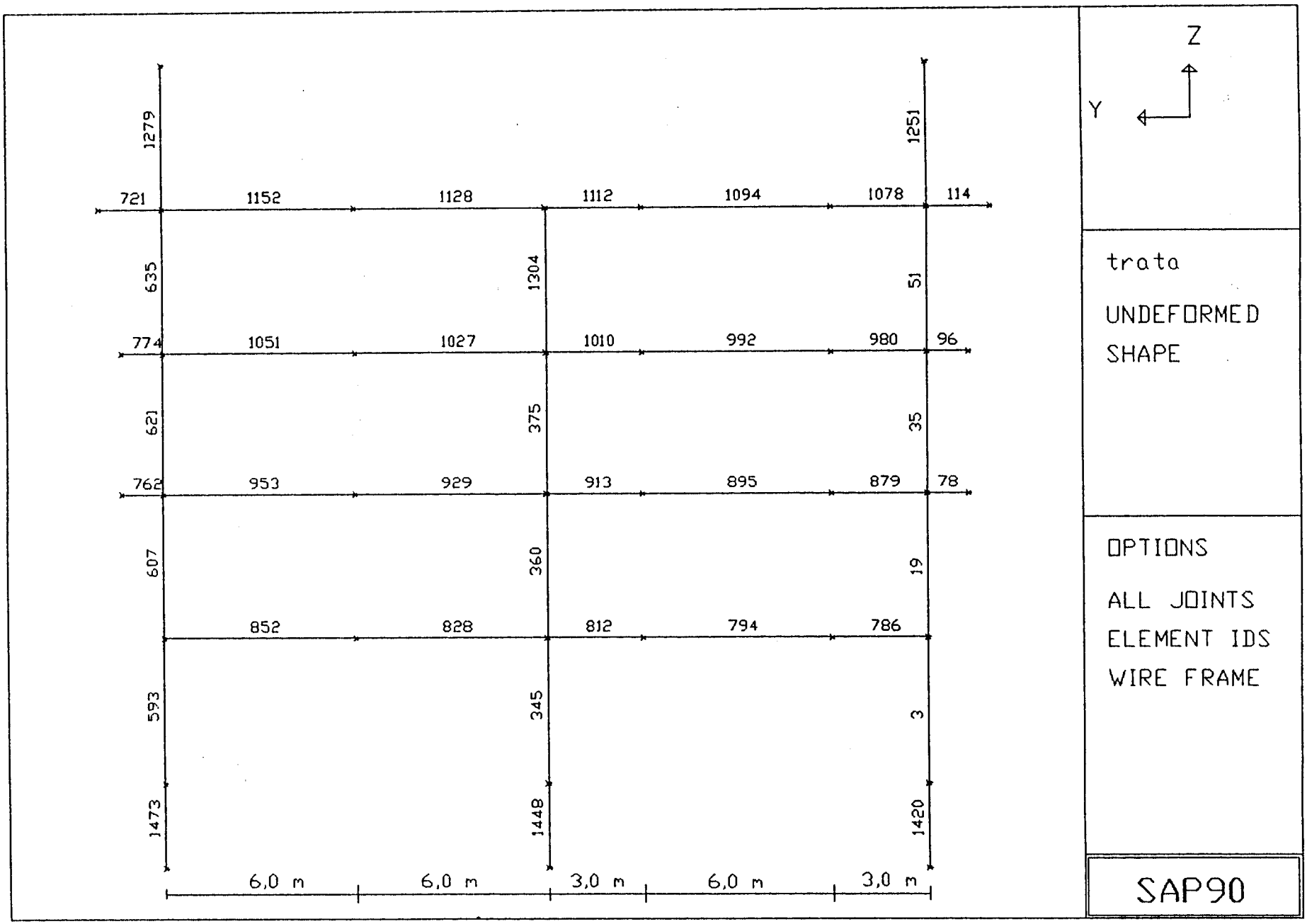
F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
871								
	1	-2.97						1.80
			.0	63.79	-63.81	.39	-1.12	
			1.5	39.13	17.13	.39	-.83	
			3.0	-3.92	14.06	.39	.05	
			4.5	-46.90	5.38	.39	.64	
			6.0	-71.27	-87.06	.39	1.22	
	2	-13.41						.10
			.0	28.96	-1.43	2.86	-8.36	
			1.5	10.95	30.97	2.86	-4.07	
			3.0	-18.48	25.62	2.86	.22	
			4.5	-47.88	-24.46	2.86	4.52	
			6.0	-63.76	-112.17	2.86	8.81	
	3	-23.80						2.26
			.0	26.46	3.24	-.86	3.09	
			1.5	8.45	34.99	-.86	1.71	
			3.0	-20.98	25.39	-.86	.47	
			4.5	-50.38	-27.94	-.86	-.87	
			6.0	-68.26	-119.40	-.86	-3.16	
	4	18.35						.21
			.0	62.83	-64.60	1.36	-4.47	
			1.5	44.84	-11.36	1.36	-2.38	
			3.0	15.41	24.13	1.36	-.24	
			4.5	-13.99	34.87	1.36	1.70	
			6.0	-31.87	-2.00	1.36	3.77	
	5	7.97						3.37
			.0	60.33	-86.83	-2.36	6.95	
			1.5	42.34	-7.34	-2.36	3.40	
			3.0	12.91	24.40	-2.36	-.14	
			4.5	-16.49	31.39	-2.36	-3.69	
			6.0	-34.37	-8.23	-2.36	-7.24	
	6	-13.41						.10
			.0	28.96	-1.43	2.86	-8.36	
			1.5	10.95	30.97	2.86	-4.07	
			3.0	-18.48	25.62	2.86	.22	
			4.5	-47.88	-24.46	2.86	4.52	
			6.0	-63.76	-112.17	2.86	8.81	
	7	-23.80						2.26
			.0	26.46	3.24	-.86	3.09	
			1.5	8.45	34.99	-.86	1.71	
			3.0	-20.98	25.39	-.86	.47	
			4.5	-50.38	-27.94	-.86	-.87	
			6.0	-68.26	-119.40	-.86	-3.16	
	8	18.35						.21
			.0	62.83	-64.60	1.36	-4.47	
			1.5	44.84	-11.36	1.36	-2.38	
			3.0	15.41	24.13	1.36	-.24	
			4.5	-13.99	34.87	1.36	1.70	
			6.0	-31.87	-2.00	1.36	3.77	
	9	7.97						3.37
			.0	60.33	-86.83	-2.36	6.95	
			1.5	42.34	-7.34	-2.36	3.40	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			3.0	12.71	34.40	-2.36	-.14	
			4.5	-16.49	31.39	-2.36	-3.89	
			6.0	-34.37	-4.22	-2.36	-7.24	
	10	-19.21						-.11
			.0	10.98	27.22	2.77	-7.98	
			1.5	-2.67	35.13	2.77	-3.63	
			3.0	-27.68	10.33	2.77	.72	
			4.5	-44.67	-35.91	2.77	4.48	
			6.0	-58.24	-114.77	2.77	8.64	
	11	-28.12						1.74
			.0	8.83	33.39	-.42	1.77	
			1.5	-4.82	38.57	-.42	1.13	
			3.0	-25.33	15.76	-.42	.39	
			4.5	-46.81	-38.90	-.42	-.14	
			6.0	-65.28	-120.97	-.42	-.77	
	12	23.33						.63
			.0	76.36	-97.00	.76	-1.79	
			1.5	42.71	-21.86	.76	-1.57	
			3.0	21.70	36.92	.76	-.47	
			4.5	.72	43.66	.76	.70	
			6.0	-12.25	32.73	.76	1.84	
	13	14.42						1.88
			.0	34.22	-90.68	-3.44	7.03	
			1.5	40.37	-18.12	-3.44	3.39	
			3.0	19.36	37.13	-3.44	-.26	
			4.5	-1.42	40.57	-3.44	-3.91	
			6.0	-17.00	26.27	-3.44	-7.57	
	14	-71.94						.37
			.0	-42.70	177.65	4.00	-10.77	
			1.5	-56.35	102.44	4.00	-4.77	
			3.0	-77.26	7.33	4.00	1.27	
			4.5	-78.34	-129.62	4.00	7.27	
			6.0	-111.91	-288.39	4.00	13.27	
	15	-74.61						.42
			.0	-43.74	177.05	3.84	-7.81	
			1.5	-56.99	103.48	3.84	-3.24	
			3.0	-78.00	2.40	3.84	1.32	
			4.5	-98.98	-130.52	3.84	5.88	
			6.0	-112.76	-290.35	3.84	10.45	
	16	89.82						.85
			.0	108.34	-240.71	-2.71	6.27	
			1.5	94.89	-86.47	-2.71	2.81	
			3.0	73.88	40.28	-2.71	-1.25	
			4.5		1.5	52.89	130.18	-2.71	-5.22
			6.0	39.32	202.66	-2.71	-9.38	
	17	67.19						1.40
			.0	107.69	-238.71	-3.67	9.80	
			1.5	94.24	-85.43	-3.67	4.70	
			3.0	73.24	40.35	-3.67	-1.20	
			4.5	52.25	134.28	-3.67	-6.71	
			6.0	38.68	200.80	-3.67	-12.21	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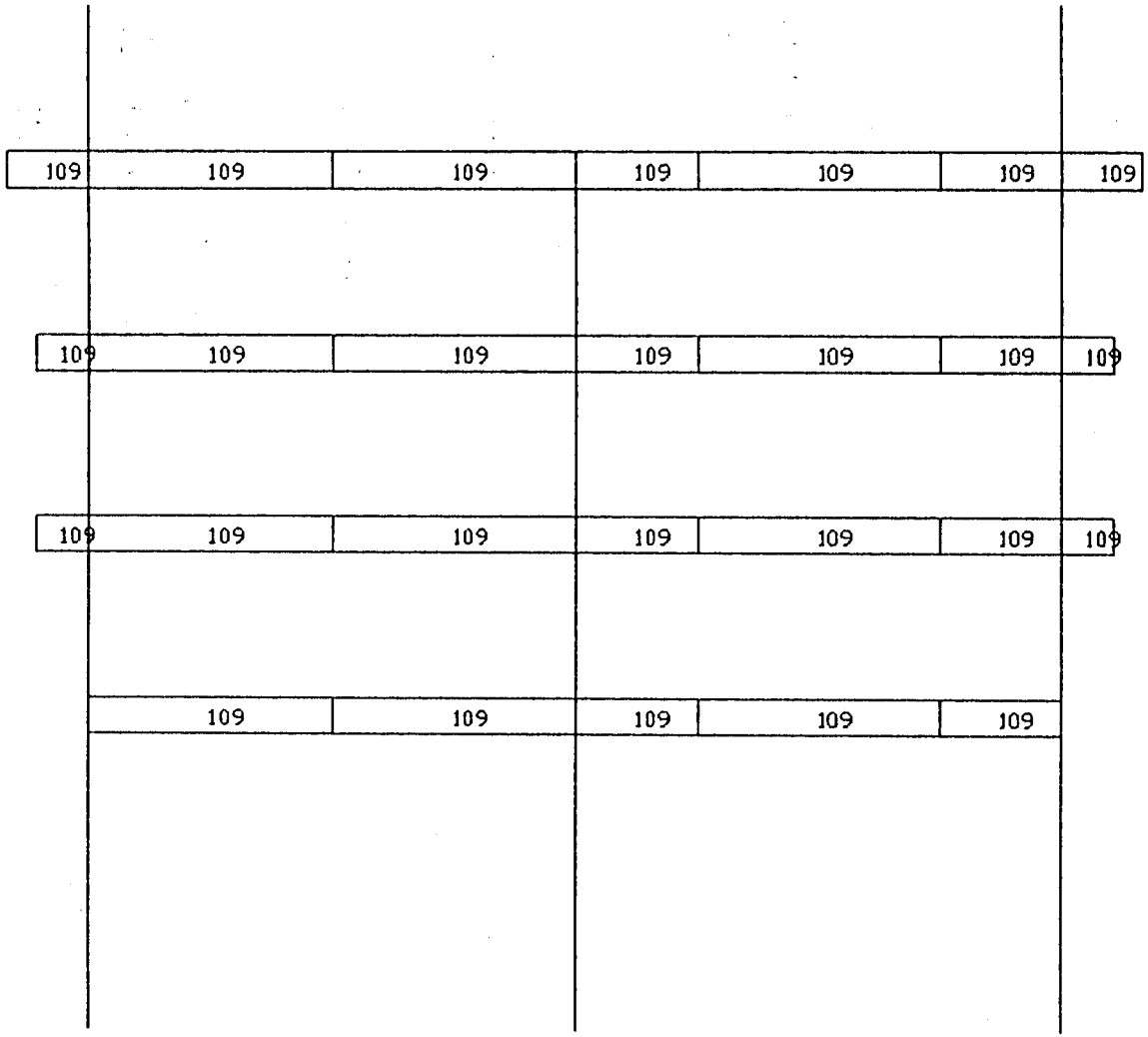

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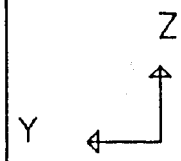

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FRAME

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P .0000E+00

MAXIMA

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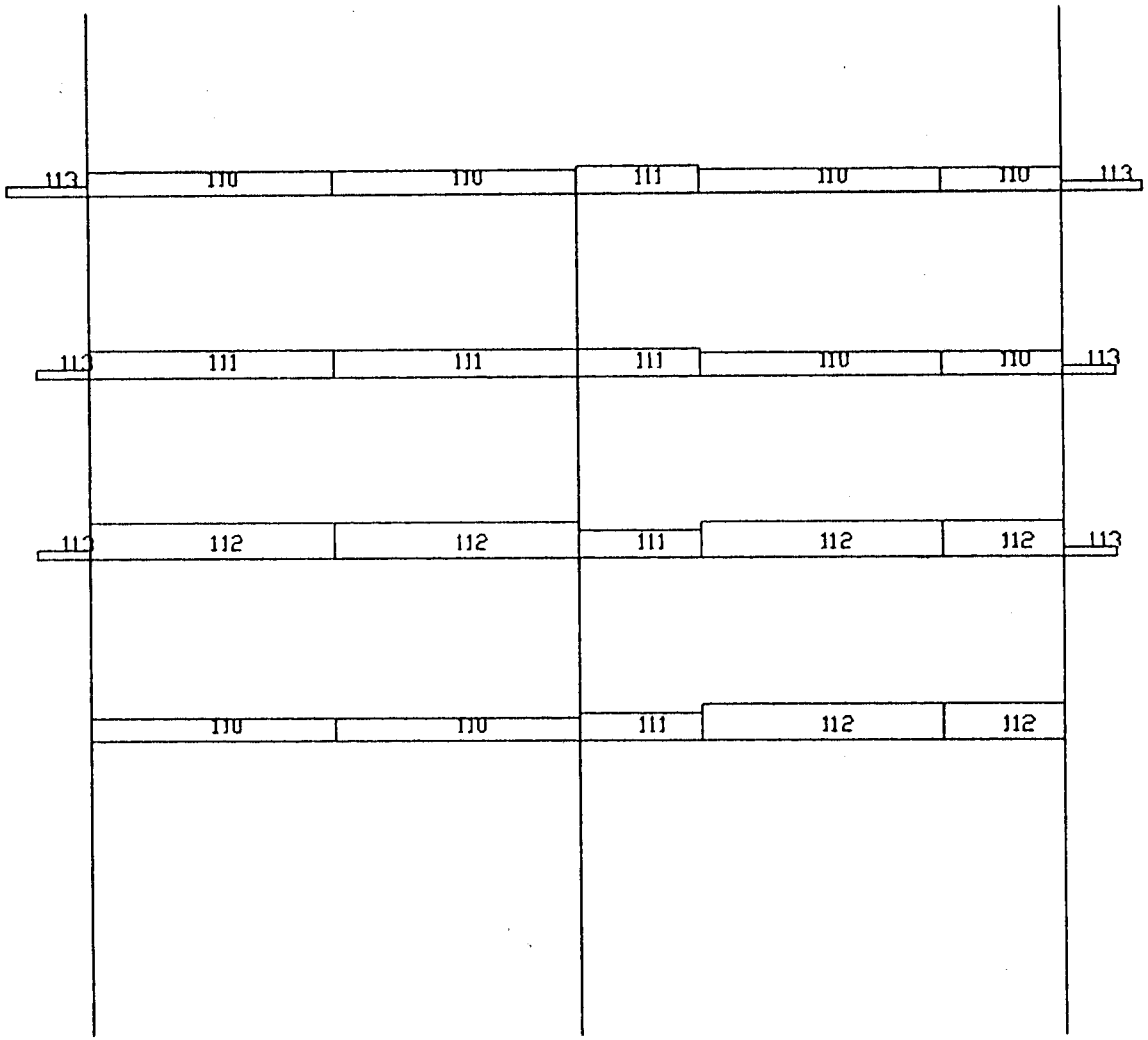
P .0000E+00

SAP90



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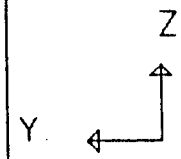

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FRAME

LOADS

LOAD 3

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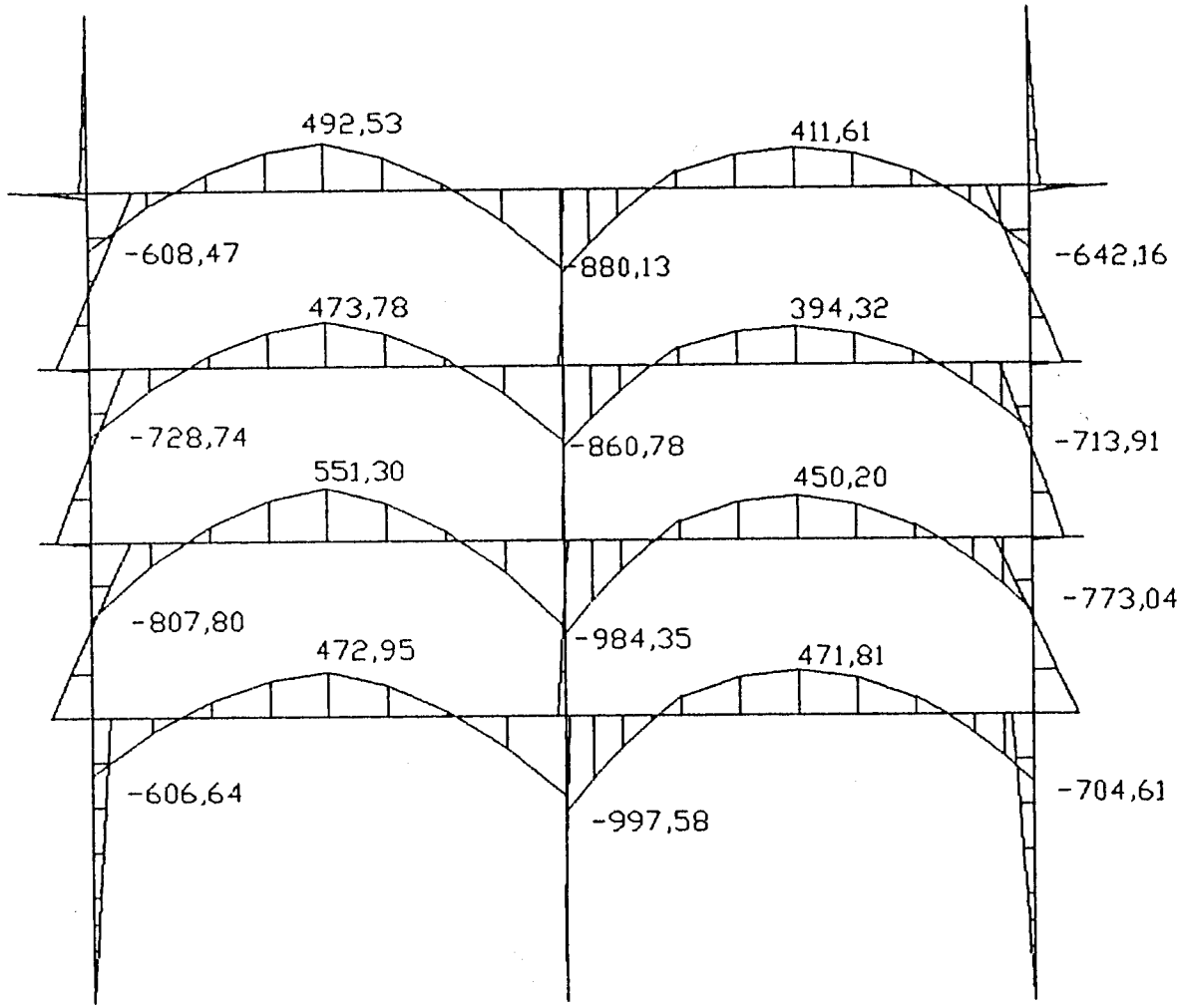
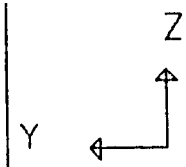
112 = 8 KN/m
113 = 2 KN/m

SAP90



GAMBAR MOMEN AKIBAT BEBAN TETAP



trata

FRAME

OUTPUT M33

LOAD 1

ENVELOPES

MIN < 812>

-.9976E+03

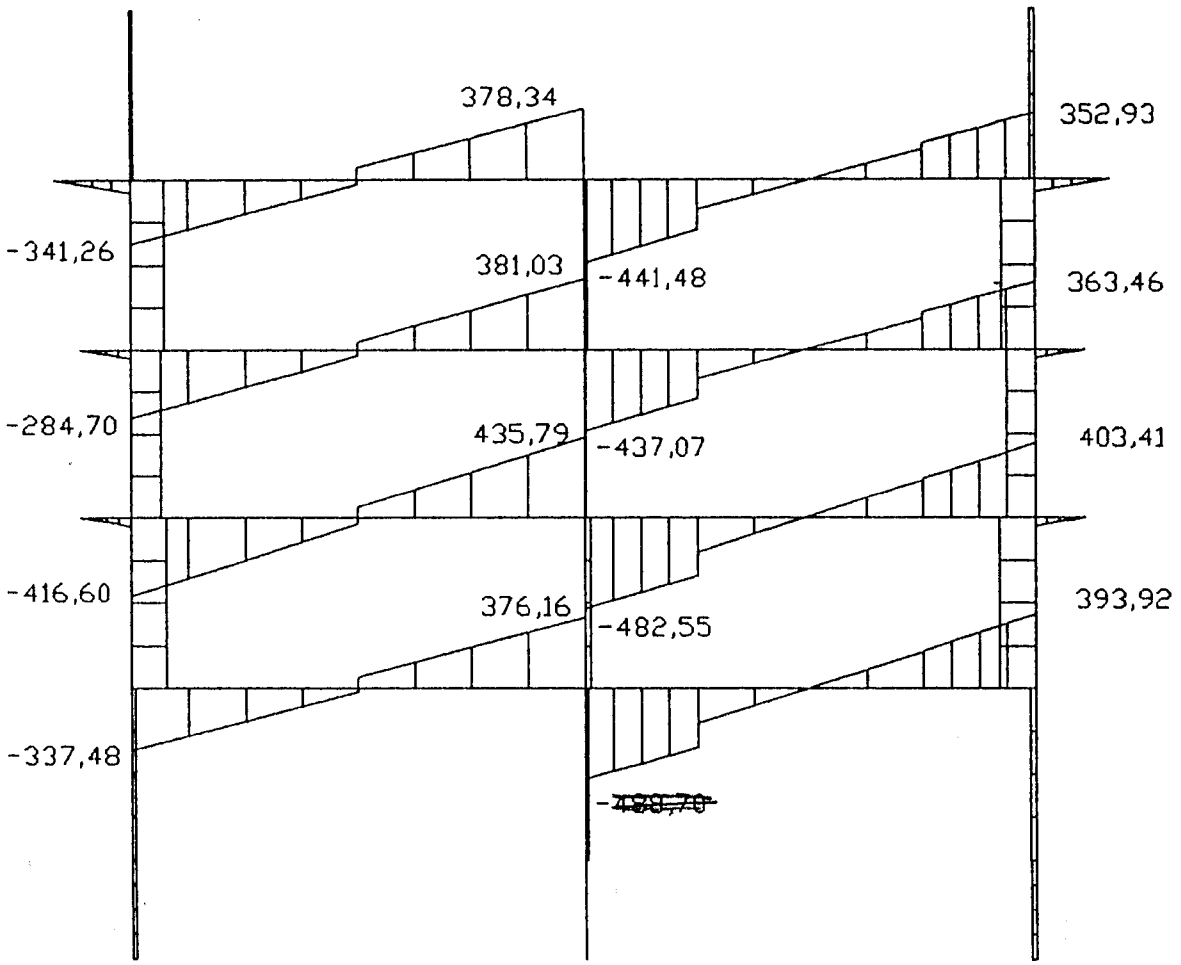
AT 3.00

MAX < 929>

.5513E+03

AT 6.00

SAP90



GAMBAR GAYA GESER AKIBAT BEBAN TETAP

Z
Y

TRATA

FRAME
OUTPUT V22

LOAD 1

ENVELOPES

MIN < 812>
-.4887E+03
AT 3.00
MAX < 929>
.4358E+03
AT .00

SAP90

ORTAL TIGA DIMENSI - UNITS: KN - M

R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
786								
	1	164.11						-54.52
			.0	393.92	-704.61	-7.65	12.18	
			.8	345.57	-427.31	-7.65	6.44	
			1.5	297.21	-186.27	-7.65	.71	
			2.3	249.86	18.51	-7.65	-5.03	
			3.0	200.50	187.02	-7.65	-10.77	
794								
	1	165.61						-3.71
			.0	196.17	173.42	1.13	-2.28	
			1.5	99.46	395.15	1.13	-.59	
			3.0	2.76	471.81	1.13	1.10	
			4.5	-93.95	403.41	1.13	2.79	
			6.0	-190.66	189.95	1.13	4.49	
812								
	1	167.44						65.49
			.0	-316.88	210.79	-12.96	17.23	
			.8	-359.84	-42.98	-12.96	7.31	
			1.5	-402.79	-328.96	-12.96	-2.22	
			2.3	-445.75	-647.17	-12.96	-11.94	
			3.0	-488.70	-997.58	-12.96	-21.66	
828								
	1	156.83						-.53
			.0	376.16	-837.45	-.09	.16	
			1.5	297.28	-332.37	-.09	.04	
			3.0	218.40	54.39	-.09	-.11	
			4.5	139.52	322.83	-.09	-.25	
			6.0	60.64	472.95	-.09	-.39	
852								
	1	158.69						.69
			.0	-21.97	471.71	-1.89	5.80	
			1.5	-100.85	379.59	-1.89	2.97	
			3.0	-179.73	169.17	-1.89	.13	
			4.5	-258.60	-159.58	-1.89	-2.71	
			6.0	-337.48	-606.64	-1.89	-5.55	
879								
	1	-43.96						-31.67
			.0	403.41	-773.04	1.06	-1.65	
			.8	355.06	-488.61	1.06	-.85	
			1.5	306.71	-240.45	1.06	-.05	
			2.3	258.35	-28.55	1.06	.75	
			3.0	210.00	147.08	1.06	1.55	
895								
	1	-47.84						-3.17
			.0	202.26	133.54	.10	-.30	
			1.5	105.33	364.41	.10	-.15	
			3.0	8.84	450.20	.10	-.01	
			4.5	-87.86	390.94	.10	.14	
			6.0	-184.57	186.61	.10	.29	
913								
	1	-43.41						60.91
			.0	-310.74	205.59	.62	-1.35	

PORTAL TIGA DIMESNSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			.8	-353.69	-43.57	.62	-.89	
			1.5	-396.65	-324.95	.62	-.42	
			2.3	-439.60	-638.54	.62	.04	
			3.0	-482.55	-984.33	.62	.51	
929								
	1	-24.88						-.22
			.0	435.79	-922.50	.05	-.12	
			1.5	340.71	-340.13	.05	-.04	
			3.0	245.63	99.63	.05	.04	
			4.5	150.55	396.77	.05	.12	
			6.0	55.48	551.30	.05	.20	
953								
	1	-24.60						.66
			.0	-36.28	550.84	.48	-1.32	
			1.5	-131.36	425.11	.48	-.60	
			3.0	-226.44	156.76	.48	.12	
			4.5	-321.52	-254.21	.48	.84	
			6.0	-416.60	-807.80	.48	1.56	
980								
	1	27.98						-38.02
			.0	363.46	-713.91	3.51	-8.56	
			.8	323.21	-456.41	3.51	-5.93	
			1.5	282.95	-229.10	3.51	-3.29	
			2.3	242.70	-31.98	3.51	-.66	
			3.0	202.44	134.95	3.51	1.98	
992								
	1	27.84						-7.78
			.0	168.03	131.76	.41	-.47	
			1.5	87.52	323.42	.41	.15	
			3.0	7.01	394.32	.41	.77	
			4.5	-73.50	344.45	.41	1.38	
			6.0	-154.01	173.82	.41	2.00	
1010								
	1	27.52						36.60
			.0	-265.25	192.69	3.16	-5.31	
			.8	-308.20	-22.36	3.16	-2.94	
			1.5	-351.16	-269.61	3.16	-.57	
			2.3	-394.11	-549.09	3.16	1.81	
			3.0	-437.07	-860.78	3.16	4.18	
1027								
	1	20.09						.04
			.0	381.03	-801.10	.79	-2.19	
			1.5	296.75	-292.76	.79	-1.00	
			3.0	212.47	89.16	.79	.19	
			4.5	128.20	344.67	.79	1.37	
			6.0	43.92	473.75	.79	2.56	
1051								
	1	19.36						.24
			.0	-31.86	473.78	1.94	-5.33	
			1.5	-116.14	362.78	1.94	-2.42	
			3.0	-200.42	125.36	1.94	.49	
			4.5	-284.70	-238.48	1.94	3.41	

PORTAL TIGA DIMENSI - UNITS: KN - M

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
			6.0	-368.98	-726.74	1.94	6.32	
1078								
	1	-161.50						-40.47
			.0	352.93	-642.16	12.65	-28.05	
			.8	312.68	-392.56	12.65	-18.56	
			1.5	272.42	-173.15	12.65	-9.07	
			2.3	232.17	16.08	12.65	.42	
			3.0	191.91	175.11	12.65	9.91	
1094								
	1	-162.11						-6.55
			.0	160.49	171.65	-.93	4.10	
			1.5	79.99	352.01	-.93	2.70	
			3.0	-.52	411.61	-.93	1.30	
			4.5	-81.03	350.45	-.93	-.10	
			6.0	-161.54	168.52	-.93	-1.50	
1112								
	1	-165.83						55.17
			.0	-269.67	186.60	13.60	-22.04	
			.8	-312.62	-31.76	13.60	-11.84	
			1.5	-355.58	-282.34	13.60	-1.65	
			2.3	-398.53	-565.12	13.60	8.55	
			3.0	-441.48	-880.13	13.60	18.75	
1128								
	1	-153.23						-.02
			.0	378.34	-829.77	1.46	-3.38	
			1.5	299.46	-321.42	1.46	-1.20	
			3.0	220.58	68.61	1.46	.99	
			4.5	141.70	340.32	1.46	3.18	
			6.0	62.82	493.71	1.46	5.37	
1152								
	1	-157.29						1.02
			.0	-25.74	492.53	3.71	-10.30	
			1.5	-104.62	394.76	3.71	-4.74	
			3.0	-183.50	178.67	3.71	.82	
			4.5	-262.38	-155.74	3.71	6.38	
			6.0	-341.26	-608.47	3.71	11.94	

HITUNGAN SAPCON STRUKTUR TIGA DIMENSI

FLEXURAL AND SHEAR DESIGN OF BEAM-TYPE ELEMENTS

ELEM ID	SECTION SIZE DEPTH x WIDTH	STATN LOC	REQUIRED REINFORCING TOP	<LC>	BOT	<LC>	SHR	<LC>	DESIGN -M33	FORCES +M33	V22
78	.70 X .10										
		.0	2.20	<15>	2.20	<16>	10.49	< 1>	7	4	102
		.3	2.20	< 1>	2.20	<17>	10.99	< 1>	7	4	107
		.6	2.20	< 1>	2.20	<17>	11.49	< 1>	7	4	112
		1.0	2.20	< 1>	2.20	<17>	12.00	< 1>	17	4	117
		1.3	2.20	< 1>	2.20	<17>	12.50	< 1>	30	15	122
96	.70 X .10										
		.0	2.20	< 1>	2.20	<16>	10.49	< 1>	7	4	102
		.3	2.20	< 1>	2.20	<17>	10.99	< 1>	7	4	107
		.6	2.20	< 1>	2.20	<17>	11.49	< 1>	7	4	112
		1.0	2.20	< 1>	2.20	<17>	12.00	< 1>	17	4	117
		1.3	2.20	< 1>	2.20	<17>	12.50	< 1>	30	15	122
114	.70 X .10										
		.0	2.20	<14>	2.20	<17>	8.33	< 1>	18	9	81
		.5	2.20	< 1>	2.20	<17>	9.10	< 1>	18	9	89
		1.0	2.20	< 1>	2.20	<17>	9.87	< 1>	18	9	96
		1.5	2.20	< 1>	2.20	<17>	10.64	< 1>	39	9	104
		2.0	3.26	< 1>	2.20	<17>	11.41	< 1>	70	35	111
762	.70 X .10										
		.0	2.20	< 1>	2.20	<16>	10.49	< 1>	7	4	102
		.3	2.20	< 1>	2.20	<17>	10.99	< 1>	7	4	107
		.6	2.20	< 1>	2.20	<17>	11.49	< 1>	7	4	112
		1.0	2.20	< 1>	2.20	<17>	12.00	< 1>	17	4	117
		1.3	2.20	< 1>	2.20	<17>	12.50	< 1>	30	15	122
774	.70 X .10										
		.0	2.20	< 1>	2.20	<15>	10.49	< 1>	7	4	102
		.3	2.20	< 1>	2.20	<17>	10.99	< 1>	7	4	107
		.6	2.20	< 1>	2.20	<17>	11.49	< 1>	7	4	112
		1.0	2.20	< 1>	2.20	<17>	12.00	< 1>	17	4	117
		1.3	2.20	< 1>	2.20	<17>	12.50	< 1>	30	15	122
721	.70 X .10										
		.0	2.20	<17>	2.20	< 1>	8.33	< 1>	18	9	81
		.5	2.20	< 1>	2.20	<17>	9.10	< 1>	18	9	89
		1.0	2.20	< 1>	2.20	<17>	9.87	< 1>	18	9	96
		1.5	2.20	< 1>	2.20	<17>	10.64	< 1>	39	9	104
		2.0	3.26	< 1>	2.20	<17>	11.41	< 1>	70	35	111
786	.80 X .40										
		.0	30.17	< 1>	14.06	<14>	51.19	< 1>	705	332	578
		.8	17.29	< 1>	10.17	<14>	49.68	< 1>	427	88	561
		1.5	10.19	<16>	10.17	<15>	48.16	< 1>	259	101	543
		2.3	10.17	<16>	10.17	<15>	46.65	< 1>	176	160	526
		3.0	10.17	<16>	10.17	<15>	45.13	< 1>	176	203	509
794	.80 X .40										
		.0	10.17	<16>	10.17	<15>	16.79	< 1>	53	205	188
		1.5	10.17	<16>	15.89	< 1>	13.67	< 1>	13	355	154
		3.0	10.17	<16>	19.23	< 1>	10.64	< 1>	13	472	120
		4.5	10.17	<15>	16.25	< 1>	13.43	< 1>	13	4	

			6.0	10.17 (15)	10.17 (1)	16.46 (1)	15	150	166
812	.80 X	.40							
			.0	10.17 (15)	10.17 (1)	59.95 (1)	249	211	449
			.8	10.17 (15)	10.17 (16)	61.46 (1)	249	125	467
			1.5	13.07 (1)	10.17 (16)	62.98 (1)	329	125	484
			2.3	27.36 (1)	10.17 (16)	64.49 (1)	647	125	501
			3.0	46.02 (1)	20.46 (16)	66.01 (1)	998	499	518
828	.95 X	.30							
			.0	30.26 (1)	13.97 (15)	33.28 (1)	837	419	452
			1.5	11.47 (16)	9.18 (15)	30.88 (1)	348	118	419
			3.0	9.18 (16)	9.18 (15)	28.48 (1)	209	157	387
			4.5	9.18 (16)	10.60 (1)	26.08 (1)	209	323	354
			6.0	9.18 (14)	15.92 (1)	23.68 (1)	209	473	322
852	.95 X	.30							
			.0	9.18 (14)	15.88 (1)	18.83 (1)	152	472	256
			1.5	9.18 (15)	12.58 (1)	21.23 (1)	152	380	288
			3.0	9.18 (15)	9.18 (16)	23.63 (1)	152	230	321
			4.5	9.61 (15)	9.18 (16)	26.03 (1)	294	140	353
			6.0	20.92 (1)	9.93 (16)	28.43 (1)	607	303	386
879	.80 X	.40							
			.0	33.63 (1)	15.52 (14)	54.12 (1)	773	387	611
			.8	20.00 (1)	10.17 (14)	52.60 (1)	489	97	594
			1.5	10.17 (1)	10.17 (15)	51.09 (1)	240	97	576
			2.3	10.17 (16)	10.17 (15)	49.57 (1)	193	97	559
			3.0	10.17 (16)	10.17 (1)	48.06 (1)	193	147	542
895	.80 X	.40							
			.0	10.17 (16)	10.17 (15)	17.02 (1)	34	145	192
			1.5	10.17 (16)	14.57 (1)	13.98 (1)	8	364	158
			3.0	10.17 (16)	18.29 (1)	10.95 (1)	8	450	124
			4.5	10.17 (14)	15.71 (1)	13.12 (1)	8	391	148
			6.0	10.17 (15)	10.17 (1)	16.15 (1)	8	187	182
913	.80 X	.40							
			.0	10.17 (15)	10.17 (1)	59.06 (1)	246	206	666
			.8	10.17 (15)	10.17 (16)	60.57 (1)	246	123	683
			1.3	12.90 (1)	10.17 (16)	62.09 (1)	325	123	701
			2.3	26.95 (1)	10.17 (16)	63.60 (1)	639	123	718
			3.0	45.24 (1)	20.16 (16)	65.12 (1)	984	492	735
929	.95 X	.30							
			.0	33.97 (1)	13.30 (15)	35.48 (1)	923	461	482
			1.5	11.20 (1)	9.18 (15)	33.08 (1)	340	136	449
			3.0	9.18 (16)	9.18 (15)	30.68 (1)	231	138	417
			4.5	9.18 (16)	13.19 (1)	28.28 (1)	231	397	384
			6.0	9.18 (15)	18.82 (1)	25.88 (1)	231	551	351
953	.95 X	.30							
			.0	9.18 (15)	18.80 (1)	23.57 (1)	202	351	320
			1.5	9.18 (15)	14.20 (1)	25.97 (1)	202	426	353
			3.0	9.18 (15)	9.18 (16)	28.37 (1)	202	162	385
			4.5	9.18 (15)	9.18 (16)	30.77 (1)	258	136	416
			6.0	29.00 (1)	13.44 (16)	33.17 (1)	808	404	450
980	.80 X	.40							
			.0	30.63 (1)	14.25 (14)	52.28 (1)	714	357	590
			.8	18.56 (1)	10.17 (14)	50.76 (1)	456	89	573
			1.5	10.17 (1)	10.17 (15)	49.25 (1)	229	89	556
			2.3	10.17 (16)	10.17 (15)	47.73 (1)	178	89	539
			3.0	10.17 (16)	10.17 (1)	46.22 (1)	178	135	521
992	.80 X	.40							
			.0	10.17 (16)	10.17 (1)	16.88 (1)	0	132	190
			1.5	10.17 (16)	12.84 (1)	13.85 (1)	0	323	156
			3.0	10.17 (16)	15.85 (1)	10.81 (1)	0	394	122
			4.5	10.17 (14)	13.72 (1)	13.26 (1)	0	344	150
			6.0	10.17 (15)	10.17 (1)	16.29 (1)	0	174	184

1010	.80 X	.40									
			.0	10.17 <15>	10.17 < 1>	54.68 < 1>	215	193	617
			.8	10.17 <15>	10.17 <16>	56.20 < 1>	215	108	634
			1.5	10.60 < 1>	10.17 <16>	57.71 < 1>	270	108	651
			2.3	22.74 < 1>	10.17 <16>	59.23 < 1>	549	108	668
			3.0	38.26 < 1>	17.42 <16>	60.74 < 1>	861	430	685
1027	.95 X	.30							
			.0	28.72 < 1>	13.32 <15>	32.32 < 1>	801	401	439
			1.5	9.57 < 1>	9.18 <15>	29.92 < 1>	293	118	406
			3.0	9.18 <16>	9.18 <15>	27.53 < 1>	200	118	374
			4.5	9.18 <16>	11.36 < 1>	25.13 < 1>	200	345	341
			6.0	9.18 <15>	15.95 < 1>	22.73 < 1>	200	474	309
1051	.95 X	.30							
			.0	9.18 <15>	15.95 < 1>	21.04 < 1>	182	474	286
			1.5	9.18 <15>	11.99 < 1>	23.44 < 1>	182	363	318
			3.0	9.18 <15>	9.18 <16>	25.84 < 1>	182	136	351
			4.5	9.18 < 1>	9.18 <16>	28.23 < 1>	236	118	383
			6.0	25.74 < 1>	12.05 <16>	30.63 < 1>	729	364	416
1078	.80 X	.40							
			.0	27.12 < 1>	12.74 <15>	49.35 < 1>	642	321	557
			.8	15.78 < 1>	10.17 <15>	47.83 < 1>	393	80	540
			1.5	10.17 < 1>	10.17 <15>	46.32 < 1>	173	80	523
			2.3	10.17 <16>	10.17 <15>	44.80 < 1>	161	80	506
			3.0	10.17 <16>	10.17 < 1>	43.29 < 1>	161	173	488
1094	.80 X	.40							
			.0	10.17 <16>	10.17 < 1>	16.71 < 1>	0	172	189
			1.5	10.17 <16>	14.05 < 1>	13.68 < 1>	0	352	154
			3.0	10.17 <17>	16.60 < 1>	10.65 < 1>	0	412	120
			4.5	10.17 <15>	13.98 < 1>	13.42 < 1>	0	350	151
			6.0	10.17 <15>	10.17 < 1>	16.45 < 1>	0	169	186
1112	.80 X	.40							
			.0	10.17 <15>	10.17 < 1>	55.33 < 1>	220	187	624
			.8	10.17 <15>	10.17 <16>	56.84 < 1>	220	110	641
			1.5	11.13 < 1>	10.17 <16>	58.36 < 1>	282	110	658
			2.3	23.46 < 1>	10.17 <16>	59.87 < 1>	565	110	676
			3.0	39.31 < 1>	17.84 <17>	61.39 < 1>	880	440	693
1128	.95 X	.30							
			.0	29.93 < 1>	13.87 <15>	33.48 < 1>	830	415	455
			1.5	10.55 < 1>	9.18 <15>	31.08 < 1>	321	123	422
			3.0	9.18 <16>	9.18 < 1>	28.68 < 1>	207	123	389
			4.5	9.18 <16>	11.21 < 1>	26.28 < 1>	207	340	357
			6.0	9.18 <14>	16.68 < 1>	23.88 < 1>	207	494	324
1152	.95 X	.30							
			.0	9.18 <14>	16.84 < 1>	19.35 < 1>	152	493	263
			1.5	9.18 <14>	13.12 < 1>	21.75 < 1>	152	395	295
			3.0	9.18 <14>	9.18 < 1>	24.15 < 1>	152	179	328
			4.5	9.18 < 1>	9.18 <17>	26.55 < 1>	156	123	360
			6.0	20.99 < 1>	9.96 <17>	28.94 < 1>	608	304	393

LAMPIRAN 4. GAMBAR BANGUNAN