TUGAS AKHIR

RESPON DINAMIK STRUKTUR SETBACK SECARA VERTIKAL

(SEISMIC RESPONSE OF VERTICALLY VARIATIONS OF SETBACK STRUCTURES)

Disusun oleh :

1. Herdina Widyastuti (01 511 003)

2. Feri Noviantoro (01 511 202)

JURUSAN TEKNIK SIPIL

FAKULTAS TEKNIK SIPIL DAN PERENCANAAN

UNIVERSITAS ISLAM INDONESIA

JOGJAKARTA

2006

LEMBAR PENGESAHAN

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(SEISMIC RESPONSE OF VERTICALLY VARIATIONS OF SETBACK STRUCTURES)

Diajukan sebagai salah satu syarat untuk memperoleh gelar Sarjana Strata 1 (S1) pada Jurusan Teknik Sipil Fakultas Teknik Sipil dan Perencanaan Universitas Islam Indonesia Yogyakarta

Disusun oleh:

HERDINA WIDYASTUTI	**01 511 003**
FERI NOVIANTORO	**01 511 202**

Telah diperiksa dan disetujui oleh,

Prof. Ir. H. Widodo, MSCE, Ph.D.
Dosen Pembimbing

Tgl. 8/5/06

KATA PENGANTAR

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Assalamu'alaikum Warahmatullah Wabarakatuh

Alhamdulillah, Puji syukur kami panjatkan kehadirat Allah SWT yang senantiasa melimpahkan nikmat, karunia dan rahmat-Nya kepada kita semua, khususnya kepada kami sehingga dapat menyelesaikan Tugas Akhir ini. Tidak lupa sholawat dan salam senantiasa kami haturkan kepada junjungan Nabi Muhammad SAW beserta keluarga, sahabat serta pengikutnya sampai akhir jaman.

Penelitian kami ini dengan judul **Respon Dinamik Struktur Setback Secara Vertikal** diajukan sebagai syarat untuk menyelesaikan pendidikan pada jenjang Strata Satu(S1), pada Jurusan Teknik Sipil Fakultas Teknik Sipil Dan Perencanaan Universitas Islam Indonesia.

Penyusun menyadari bahwa dalam penulisan tugas akhir ini tidak lepas dari sumbangan pemikiran dari berbagai pihak yang sangat membantu, sehingga penulis dapat menyelesaikan semua hambatan yang terjadi selama penyusunan hingga terselesaikannya penelitian ini. Pada kesempatan ini dengan penuh rasa hormat dan kerendahan hati, penyusun mengucapkan banyak terima kasih kepada pihak – pihak yang telah membantu, yaitu :

1. Bapak DR. Ir. H. Ruzardi, MS, selaku Dekan Fakultas Teknik Sipil dan Perencanaan Universitas Islam Indonesia
2. Bapak Prof. Ir. H. Widodo, MSCE, Ph.D, selaku Dosen Pembimbing dalam penelitian ini.
3. Bapak Ir. H. Suharyatmo, MT, selaku Dosen Penguji.
4. Bapak Ir. H. A Kadir Aboe, MS, selaku Dosen Penguji.
5. Bapak Ir. H. Munadhir, MS, selaku Ketua Jurusan Teknik Sipil, Fakultas Teknik Sipil dan Perencanaan, Universitas Islam Indonesia.
6. Kedua orang tua kami dan saudara – saudara kami yang telah banyak memberikan bantuan dan dorongan, baik moral maupun material dalam penyusunan Tugas Akhir ini.
7. Teman - teman ***Civil Dept*** seperjuanganku yang tidak bisa kami sebut satu persatu, terima kasih atas segala dukungan, informasi, dan segala perhatiannya.
8. Seluruh pihak yang telah membantu baik secara langsung maupun tidak langsung.

Semoga seluruh amal dan kebaikan yang diberikan dapat diterima dan mendapatkan ridho dari Allah SWT, *amiin.*

Penyusun menyadari bahwa penulisan penelitian ini masih jauh dari sempurna, mengingat keterbatasan ilmu, kemampuan dan pengalaman kami dalam penelitian dan penulisan. Oleh karena itu saran dan kritik yang bersifat membangun sangat kami harapkan guna perbaikan dan pengembangan selanjutnya.

Akhir kata, penyusun berharap semoga penelitian ini bermanfaat dan memberikan tambahan ilmu bagi kita semua. Semoga Allah SWT meridhoi kita semua, *amiin*.

Wassalamu'alaikum Warahmatullah Wabarakatuh

Jogjakarta, Mei 2006

Penyusun,

Feri Mengucapkan Terima Kasih Untuk:

Allah SWT, Yang Maha Pengasih dan Penyayang, yang telah menuntunku ke jalan yang benar, dan sebagai tempat meminta dan memohon atas segala pintaku.

Rasulullah SAW, sebagai tuntunan dan tauladan dalam hidupku.

Kedua Orang Tuaku, Ibu dan Bapak, yang telah mendidik dan mendoakanku, terima kasih atas segala daya upaya dan kasih sayang semenjak aku kecil hingga aku menjadi seperti sekarang ini,

Bapak Dosen Pembimbing (**Prof. Ir. H. Widodo, MSCE, Ph.D**), terima kasih atas segala ilmu yang telah diberikan kepada kami serta kesabaran dan keramahan sewaktu kami konsultasi, kami memang tidak salah memilih Pak Wid.

Bapak Dosen Penguji **Ir. H. A Kadir Aboe, MS** dan **Ir. H. Suharyatmo, MT,** terima kasih atas masukkan selama sidang dan pendadaran, sehinnga sidang dan pendadaran kami menjadi lebih berkesan.

Untuk rekanku seperjuangan **Herdina Widyastuti, ST,** akhirnya kita jadi insinyur juga ya Din? Thank's atas semua nasihat – nasihatnya ya yang membuatku lebih dewasa dalam berfikir (iyee...), Din doakan aku agar cepet ketemu dambaan hati ya..??????

Untuk adikku **Edwin**, belajar yang rajin ya, semoga dapat Universitas Favoritmu..

Buat **Winda**.. Terima kasih kadang – kadang menemaniku Ngerjain TA ini ya.. & ngobrolin "seseorang" (jangan bilang – bilang ya..??), Pokoke kamu tu Asyik Kalo diajak ngobrol, pokoke terima kasih banyak atas bantuan dan dukungan ya...

Untuk **Devi,ST** dan Mas **Aris UGM**, makasih atas bantuanya selama ini ya...

Eyang Kos, dan **temen - temen kostku** semua (Andi, Daffi, Azis, Mas Agung dan semua) akhirnya aku wisuda juga ya.. Maaf ya klo aku sering ngalahin main bolanya ya...??Peace..

Teman - teman ***Civil Dept*** seperjuanganku yang tidak bisa kami sebut satu persatu, terima kasih atas segala dukungan, informasi, dan segala perhatiannya

Teman– teman maen Bang Didi, Ashrofi, Mamok, Farid, Mamok, Agung, sukses buat kalian semua ya..

Untuk para **programmer** Visual Basic didunia, hei.. aku gabung ya..!!??

Mungkin banyak yang gak bisa aku sebutin satu per satu, aku cuma bisa bilang makasih atas semua dukungannya. Semoga kebaikan kalian semua mendapat balasan yang lebih baik dari Allah SWT. Amin...

My Special Thanks to:

- , Dzat yang Maha Pengasih dan Maha Penyayang atas semua rahmat dan hidayah-Mu hamba bisa menyelesaikan ini

- Bapak, Ibu tercinta atas semua doa, cinta dan kasih sayang serta dukungan yang dicurahkan tanpa pamrih dan tiada henti kepadaku. Matur Nuwun sedoyo pangestunipun Pak-Bu. Herdin Sayang Bapak-Ibu

- My Lovely Family, Sist Nen's, Windut, Ditya atas doa dan support kalian aku bisa melewati segala susah senangku. I love you all...

- Kekasihku, **Muhammad Avif Maulana**, thanks for your spirits, love and attentions. Makasih dah mau jadi temen dalam susah dan senengku (semoga...). Walau selama ini kita dipisahkan oleh jarak tapi aku tau doa dan support untukku selalu ada. Thanks for everythings...

- Bapak Prof. **Ir. H. Widodo, MSCE, Ph.D**, terimakasih atas bimbingan, kesabaran serta ilmu yang diberikan kepada kami. Semoga dapat kami pergunakan dengan benar

- Bapak **Ir. H. A. Kadir Aboe, MS** dan Bapak **Ir. H. Suharyatma, MT**, terimakasih atas pertanyaan dan bimbingannya. Sidang dan Pendadarannya asyik banget pak..

- Temen Garap Tugas Akhir ini, , Alhamdulillah yo fer akhirnya kita selesai juga! Hehehe... piye, dah ketemu dambaan hatimu blom?? semoga ke depannya kamu bisa sukses ya. Amin...

- Temen-temen baikku, **Ima, Ida, Rina, Eka, Estu, Yunan, Raven, Erwan, Doni, Fuad, Yoga, David**, aku seneng banget punya temen baik seperti kalian semua. Makasih atas kebersamaan kita sejak semester 1 mpe sekarang. Aku berharap pertemanan kita ini tetep terjaga mpe selamanya. Amin...

- **Andreo Marza dan Inu**, thanks for all guys.. aku seneng banget bisa kenal orang sebaik dan setulus seperti kalian. Cepetan lulus juga ya.. Percaya deh, kalian bisa berdiri dengan kaki sendiri tanpa bersandar di bahuku kok. Maaf klo aku pernah buat salah, semoga kalian bisa mendapatkan yang lebih baik

- **Devi**, dev aku nyusul koe jadi tukang insinyur neh. Makasih atas kerjasamanya selama ini ya...

- Teman - teman ***Civil Dept*** seperjuanganku yang tidak bisa aku sebut satu persatu, terima kasih atas segala dukungan, informasi, dan perhatiannya.

- Bapak, ibu, dan temen-temen kostku semua (**Mba Egi, Mba Irma, Mba Ida, Mba Ana, Irma arsitek, Risa, Ratna arsitek, mba Erlin, Yuyun, mba Ila, Wati, Ratna Informatika juga alm. Elin**), freind.. akhirnya aku wisuda juga. Maaf ya klo aku pernah ngrepotin kalian..

- Mas **Aris UGM**, makasih dah bantuin kami ya mas, maaf klo selalu ngrepotin.

Mungkin banyak yang gak bisa aku sebutin satu per satu, aku cuma bisa bilang makasih atas semua dukungannya. Semoga kebaikan kalian semua mendapat balasan yang lebih baik dari Allah SWT. Amin...

DAFTAR ISI

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بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

Merenung Sejenak

" Dan Barangsiapa yang dihinakan Allah, maka tidak seorangpun yang akan memuliakannya " (Al-Hajj[22]: 18)

" Janganlah kamu bersikap lemah, dan janganlah (pula) kamu bersedih hati. " (Ali-Imran[3]: 139)

"Boleh jadi kamu membenci sesuatu, padahal ia amat baik bagimu" (Al-Baqarah [2]: 216)

Rasulullah SAW. Bersabda:
"Cintailah orang yang engkau cintai secukupnya, karena bisa jadi pada suatu saat engkau akan membencinya. Dan bencilah seseorang yang kamu benci ala kadarnya, sebab suatu saat engkau akan mencintainya. "

Rasulullah SAW. Bersabda:
" Kenalkanlah dirimu dengan Allah di waktu senang, maka Allah akan mengenalmu di waktu sulit "

Kebodohan adalah tanda kematian hati nurani dan jiwa, terbunuhnya kehidupan, dan membusuknya umur.

Lebih Baik Anda Tahu Bahwa Anda Tidak Tahu, Daripada Anda Tidak Tahu Bahwa Anda Tidak Tahu

Kita Semua Suka Pada Yang Kalah, Kalau Bukan Kita Yang Mengalami

Tumbuhkanlah Kesadaran Bahwa: " Setiap Awal Pasti Sulit "

Seseorang tidak bisa sukses hanya dengan membuat orang lain bahagia dengan cara mengorbankan kebahagiannya sendiri

Sebuah gunung tidak akan bertambah tinggi dengan adanya sebuah batu, dan tidak akan berkurang dengan hilangnya sebuah batu

Kehidupan Ini Memiliki 2 Pilihan :
Menjadi Petualang yang Menegangkan,
atau Bukan Menjadi Apa - Apa Sama Sekali

DAFTAR GAMBAR

ABSTRAKSI

Gempa bumi merupakan fenomena alam yang sering membuat kerusakan, baik kerusakan struktur tanah maupun struktur bangunan. Sehingga hal yang dapat dilakukan adalah cara mengantisipasi atau paling tidak bisa memperkecil kerusakan yang mungkin terjadi akibat gempa bumi yang akan terjadi. Karena sebagian besar dari buku serta literatur yang ada hanya membahas struktur bangunan berbentuk tipikal dan sangat sedikit yang membahas mengenai struktur bangunan setback vertikal. Tapi pada kenyataannya banyak sekali kita jumpai bangunan-bangunan yang menggunakan bentuk struktur setback vertikal. Untuk itu kami mencoba meneliti tentang respon dinamik pada struktur setback vertikal.

Penelitian mengenai stback vertikal ini menggunakan struktur beton dengan variasi tingkat, yaitu tingkat 7, 10, 15 dan 20. Struktur tersebut mengalami pengurangan muka lantai secara vertikal (setback vertikal). Beban-beban dinamik berupa beban gempa diberikan dengan mevariasikan 4 beban gempa yaitu gempa Koyna yang mempunyai frekuensi tinggi, gempa Gilroy yang mempunyai frekuensi tinggi, gempa Elcentro yang mempunyai frekuensi sedang dan gempa Bucharest yang mempunyai frekuensi rendah. Perlakuan struktur yang diberikan akan diketahui perbedaan respons dari struktur bangunan tipikal dengan bangunan setback vertikal tentang berbagai pola/ragam goyangan (mode shape), simpangan, simpangan antar tingkat (interstorey drift), gaya horisontal tingkat, gaya horisontal tingkat kumulatif (gaya geser), momen guling, Modal Effective Weight dan Modal Effective Mass.

Hasil dari penelitian dan perlakuan struktur dapat diketahui bahwa pada struktur bangunan yang mengalami *pengurangan muka lantai secara vertikal (setback vertikal) akan cenderung mempunyai pola goyangan (mode shape) yang semakin mengecil pada mode di atasnya. Nilai simpangan dan simpangan antar tingkat(Interstorey Drift) akan semakin besar pada bangunan bertingkat yang semakin tinggi karena semakin tinggi suatu bangunan maka akan semakin fleksibel. Pada struktur tipikal sampai setback vertikal yang paling kritis nilai Gaya Horisontal Tingkat, Gaya Geser dan Momen Guling semakin mengecil karena terdapat pengurangan nilai massa dan kekakuan kolom.*

Modal Effective pada setback vertkal sangat fluktuatif karena dipengaruhi oleh spektrum respon yang sangat fluktuatif pula, dimana pada periode getar (T) yang semakin besar belum tentu mempunyai nilai spektrum respon yang semakin besar secara regular maupun mengecil secara regular. Bangunan tinggi/fleksibel berfrekuensi rendah jika dibebani oleh gempa berfrekuensi tinggi (Koyna) maka menghasilkan respon kecil. Begitu sebaliknya, jika bangunan tinggi dibebani oleh gempa berfrekuensi rendah menghasilkan respon struktur cukup besar. Demikian sebaliknya untuk bangunan tingkat rendah/kaku yang berfrekuensi tinggi.

Dari perbandingan antara respon dinamik dengan statik ekivalen tampak bahwa pengaruh dinamik lebih dominan pada bangunan tinggi. Sebaliknya, pada bangunan tingkat rendah perhitungan secara statik akan lebih besar dari dinamik.

BAB I

PENDAHULUAN

1.1 Latar Belakang

Gempa bumi merupakan fenomena alam yang sering membuat kerusakan, baik kerusakan struktur tanah maupun struktur bangunan. Kejadian gempa tersebut dapat dijadikan suatu pelajaran sekaligus sebagai tantangan. Mengapa? Gempa sebagai pelajaran karena dengan menyelidiki penyebab terjadinya, tempat kejadian, karakteristik, dan akibat yang ditimbulkan oleh gempa tersebut dapat dianalisis dan dievaluasi kelemahan dan kekurangan yang terjadi mulai dari antisipasi lokasi-lokasi kejadian gempa, ukuran gempa dan sejenisnya. Gempa dikatakan sebagai tantangan sebab para ilmuwan serta *engineers* dituntut untuk dapat menjelaskan dengan lebih baik lagi mengenai prediksi terjadinya gempa serta desain bangunan yang relative dapat berperilaku baik terhadap beban gempa, karena energi mekanik akibat rusaknya struktur batuan pada peristiwa gempa bumi selanjutnya akan diubah menjadi energi gelombang yang menggetarkan batuan sekelilingnya dan kemudian diteruskan oleh media tanah hingga ke permukaan tanah. Tanah yang bergetar menyebabkan bangunan yang berada di atas tanah ikut bergetar.

Negara Indonesia termasuk daerah yang rawan gempa, karena dilalui oleh dua jalur gempa, yaitu: *"Circum Pasific Earthquake Belt"* yang melalui Sulawesi Utara, Kepulauan Maluku dan Irian Jaya; serta *"Trans Asiatic Earthquake Belt"* yang melalui Sumatra, Jawa, Nusa Tenggara dan Irian Jaya. Selain itu Indonesia

juga terletak pada tiga pertemuan plat-plat tektonik, yaitu: *lempeng Indo Australia, lempeng Eurasia, lempeng Pasifik.* Akibat dari tumbukan antara lempeng-lempeng tersebut maka wilayah Indonesia sering terjadi gempa bumi. Energi gempa yang terakumulasi akan dilepaskan ke segala arah dalam bentuk energi gelombang gempa yang merambat dari *focus* (tempat terjadinya pusat gempa karena tumbukan antar lempeng tektonik) menuju ke situs atau *site effect* yang melalui media tanah hingga ke *base rock* (lapisan tanah keras).

Gempa bumi bersifat *inpredictable* maksudnya adalah sulit untuk diprediksikan kapan gempa akan terjadi. Sehingga hal yang dapat dilakukan adalah cara mengantisipasi atau paling tidak bisa memperkecil kerusakan yang mungkin terjadi akibat gempa bumi yang akan terjadi. Untuk tujuan antisipasi kejadian serta akibat dari gempa yang akan terjadi tersebut maka akhir-akhir ini banyak dikembangkan penelitian mengenai bangunan tahan gempa. Terdapat tiga prinsip utama agar dapat membuat bangunan yang tahan gempa, yaitu: memperkuat bangunan, memperingan bangunan ataupun dengan memberikan peredam pada bangunan tersebut.

Kerusakan bangunan sangat dipengaruhi oleh beberapa faktor, diantaranya adalah perbedaan percepatan gempa rencana dengan gempa yang terjadi karena gempa sangat sulit untuk diprediksikan, bentuk struktur bangunan yang cukup kompleks, struktur bangunan yang terlalu tinggi karena dalam satu tingkat selain berkemungkinan terjadi perbedaan pola goyangan juga terjadi perbedaan besar/arah goyangan, bangunan dengan bentuk *setback* yaitu bentuk bangunan yang mempunyai bentuk struktur yang tidak sama dari atas ke bawah, misalnya

bangunan yang mengecil pada bagian atas. Sebagai contoh bangunan seperti candi.

Bangunan setback merupakan bangunan yang mengalami loncatan muka lantai. Maka untuk struktur bangunan setback vertikal berarti struktur bangunan yang terdapat loncatan/pengurangan muka lantainya secara vertikal. Pada bagian lantai yang mengalami loncatan muka tersebut mempunyai nilai kekakuan (k) dan massa struktur (m) yang akan mengalami perubahan jika dibandingkan dengan bangunan tipikal. Dengan adanya perubahan nilai kekakuannya itu maka diperkirakan juga akan merubah mode - mode yang dihasilkan. Selain itu divariasikan lagi dengan menggunakan riwayat gempa *(time history)* yang memiliki variasi kandungan frekuensi yang berbeda yaitu antara lain gempa Bucharest, El Centro, Gilroy serta Koyna; struktur bangunan menggunakan struktur beton bertingkat dengan variasi tingkat 7, 10, 15 dan 20; bangunan menggunakan struktur setback yang berubah - ubah secara vertikal; kemudian dibandingkan antara respon struktur bangunan setback vertikal dengan bangunan tipikal serta antara respon dinamik dengan statik ekivalen. Perubahan nilai mode serta variasi - variasi tersebut akan sangat berpengaruh terhadap nilai *simpangan, interstorey drift, gaya horisontal tingkat, gaya geser* serta *momen guling* pada bangunan tersebut. Seberapa besar pengaruhnya? Hal tersebut lah yang akan kami ambil sebagai pokok bahasan pada tugas akhir kami ini dengan menggunakan program *Microsoft Visual Basic* 6.0 untuk mendukung perhitungan dalam penelitian ini.

Karena sebagian besar dari buku serta literatur yang ada hanya membahas struktur bangunan berbentuk tipikal dan sangat sedikit yang membahas mengenai struktur bangunan setback vertikal. Untuk itu kami mencoba meneliti tentang respon dinamik pada struktur setback vertikal. Dalam penelitian ini kami membandingkan perbedaan yang terjadi antara bangunan setback dengan bangunan tipikal. Seberapa besar pengaruh perubahan massa dan kekakuan pada struktur bangunan setback vertikal terhadap ragam / pola goyangan(*mode shape*), simpangan, simpangan antar tingkat *(interstorey drift)*, gaya horisontal tingkat, gaya geser serta momen guling.

1.2 Rumusan Masalah

Berdasarkan latar belakang tersebut diatas, maka dapat dirumuskan suatu permasalahan yang akan menjadi obyek dari penelitian ini, yaitu:

1. Seberapa besar pengaruh setback vertikal terhadap respons struktur bangunan beton bertingkat banyak dibandingkan dengan bangunan tipikal ditinjau dari *mode shape, simpangan, interstorey drift, gaya horisontal tingkat, gaya geser* serta *momen guling.*
2. Seberapa besar pengaruh setback vertikal terhadap *modal effective weight* maupun *modal effective mass.*
3. Untuk mengetahui pada mode yang keberapa pada bangunan setback vertikal yang diperhitungkan dengan mengacu pada Peraturan Bangunan Tahan Gempa yaitu akumulasi *modal effective weight* dan *modal effective mass* harus lebih besar 90% dari energi gempa..

4. Seberapa besar pengaruh penggunaan parameter gerakan tanah, yaitu frekuensi dan percepatan akibat gempa terhadap waktu periode getar (T).
5. Bagaimana hubungan antara respon dinamik jika dibandingkan dengan statik ekivalen.

1.3 Tujuan Penelitian

Berdasarkan perumusan masalah tersebut, maka penelitian yang kami lakukan ini bertujuan sebagai berikut :

1. Untuk mengetahui pengaruh penggunaan setback yang berubah-ubah secara vertikal pada suatu struktur bangunan beton bertingkat banyak terhadap respons gempa dibandingkan dengan bangunan tipikal.
2. Untuk mengetahui seberapa besar pengaruh setback vertikal terhadap *modal effective weight* dan *modal effective mass.*
3. Untuk mengetahui pada mode yang keberapa pada bangunan setback vertikal yang diperhitungkan dengan mengacu pada Peraturan Bangunan Tahan Gempa yaitu akumulasi *modal effective weight* dan *modal effective mass* harus lebih besar 90% dari energi gempa..
4. Untuk mengetahui pengaruh penggunaan parameter gerakan tanah, yaitu frekuensi ,percepatan akibat gempa terhadap waktu periode getar (T).
5. Untuk mengetahui perbandingan antara respon dinamik dengan statik ekivalen.

1.4 Manfaat Penelitian

Manfaat dari penelitian ini adalah mengharapkan agar setelah penelitian ini selesai dapat menjadi bahan pertimbangan untuk mengetahui seberapa besar pengaruh perubahan mode - mode pada bangunan setback vertikal jika dibandingkan dengan bangunan tipikal terhadap besarnya *simpangan, interstorey drift, gaya horisontal tingkat, gaya geser* serta *momen guling*. Selain itu kita dapat mengetahui pada mode yang keberapa yang diperhitungkan sehingga kontribusi mode 90% terpenuhi. Maka diharapkan hal ini dapat menjadi referensi dalam perencanaan pembangunan suatu bangunan.

1.5 Lingkup Penelitian

Untuk dapat memberikan hasil penelitian yang optimal serta kemudahan dalam perencanaan penelitian ini, maka diambil batasan - batasan sebagai berikut:

1. Analisa diambil dari struktur rangka beton bertingkat banyak yaitu : 7, 10, 15 dan 20 tingkat.
2. Massa struktur diambil dari penelitian Joni Irawan (2001).
3. Analisa massa struktur menggunakan sistem massa dianggap menggumpal pada satu titik *(lumped mass)*.
4. Perhitungan kekakuan kolom struktur berdasarkan prinsip *Shear Building*.
5. Besarnya redaman diabaikan.
6. Percepatan tanah diambil dari data gempa yang sudah ada antara lain gempa Bucharest, Elcentro, Gilroy dan Koyna.
7. Analisa dan perhitungan struktur menggunakan model bangunan dua dimensi.

8. Perhitungan struktur menggunakan integrasi secara langsung menurut Prinsip Metode Modal Analis (*Central Difference*).
9. Pembuatan program dengan menggunakan *Microsoft Visual Basic 6.0*

BAB II

TINJAUAN PUSTAKA

2.1 Tinjauan Penelitian Terdahulu

Untuk menunjang penelitian ini kami memerlukan referensi - referensi untuk dapat menambah pandangan tentang judul penelitian yang kami ambil.

Penelitian - penelitian mengenai variasi setback pada bangunan mungkin tidak terlalu banyak. Sebagai referensi kami, sebagian data diambil dari penelitian-penelitian terdahulu kemudian kami variasikan pada bangunan yang menggunakan struktur setback. Penelitian-penelitian yang kami jadikan tinjauan pustaka adalah sebagai berikut :

1. **Joni Irawan (2001) : "Investigasi Derajat Kontribusi Mode Pada Bangunan Bertingkat Banyak "**(Tugas Akhir Jurusan Teknik Sipil FTSP UII)

   Meneliti mengenai besar jumlah mode yang diperlukan agar skala *modal effective mass* mencapai 90% terhadap bangunan regular ataupun bervariasi. Model struktur yang digunakan adalah gedung bertingkat yang mempunyai derajat kebebasan banyak, minimal 6 tingkat. Dengan analisis struktur menggunakan program Visual Basic 6.0 bertujuan untuk menganalisis apakah pada bangunan bertingkat dengan kekakuan yang berbeda-beda, akan menghasilkan prosentase *Modal Effective Mass* yang lebih besar dibandingkan dengan bangunan yang mempunyai kekakuan yang pada seluruh tingkatnya sama.

Dari penelitiannya tampak bahwa pada bangunan bertingkat dengan kekakuan yang berbeda-beda, akan menghasilkan prosentase *Modal Effective Mass* yang lebih besar dibandingkan dengan bangunan yang mempunyai kekakuan yang seluruh tingkatnya sama. Prosentase kekakuan berbeda-beda antara 37% - 50%, grafiknya mulai dari bangunan 6 tingkat sampai 100 tingkat menurun. Prosentase *Modal Effective Mass* tergantung besarnya kekakuan dan variasi kekakuan untuk masing-masing tingkat.

Namun, masih terdapat nilai koefisien C yang menyimpang dan pada struktur 20 sampai 50 grafiknya tidak beraturan (fluktuatif) naik turun di bawah nilai 0,06.

2. **Dian Fizaily dan Widyastuti (2002) : " Perletakan Sendi Plastis pada Struktur Beton dengan Analisis beban Statik Ekivalen pada Bangunan Bertingkat Sembilan dengan Dua Bentang yang Menggunakan Base Isolation *(Rubber Bearing)* "**(Tugas Akhir Jurusan Teknik Sipil FTSP UII)

   Penelitian ini membahas mengenai perilaku dan perletakan sendi plastis pada suatu struktur beton bertulang diperlukan suatu analisis sebagai system control untuk mereduksi efek gempa. Dengan analisis struktur menggunakan program *SAP 2000* bertujuan mengidentifikasi letak sendi plastis pada struktur bangunan bertingkat banyak tahan gempa yang menggunakan *base isolation* berupa *rubber bearing*. Struktur yang digunakan sebagai model adalah beton bertulang bertingkat sembilan, dua dimensi (portal bidang) terdiri dari dua bentang dengan panjang bentang

sembilan meter dan berada pada daerah gempa III, dengan kondisi tanah lunak. Perencanaan beban gempa yang digunakan adalah analisis beban statik ekivalen, bangunan berdaktilitas penuh, direncanakan tanpa menggunakan dinding geser, dianggap tidak terjadi efek torsi dan efek *P-delta* pada bangunan, *seismic control* dengan *base isolation* menggunakan control redaman pasif berupa *rubber bearing* yang ditempatkan pada dasar kolom lantai pertama *(first story columns)*. Dari analisis mereka dapat diketahui lokasi sendi pada setiap balok dari lantai satu sampai dengan lantai sembilan yaitu berada di luar jarak 2h dari muka tumpuan. Akan tetapi ada beberapa hal yang belum dilakukan pada penelitian ini, yaitu bangunan terletak pada daerah gempa III dengan kondisi tanah lunak sehingga hasilnya tidak berlaku untuk semua jenis tanah; tidak memperhitungkan beban angin, padahal pada praktek di lapangan beban angin sangat berpengaruh pada $q_{ultimit}$.

3. **Imam dan Hafizh (2003) : " Pengaruh Penggunaan Pengaku (Bracing) Terhadap Respon Elastik Struktur Baja Bertingkat dengan Memperhitungkan Rotasi Pondasi "** (Tugas Akhir Jurusan Teknik Sipil FTSP UII)

   Pada penelitian ini yang dibahas adalah bahwa pondasi bangunan pada umumnya dianggap didukung oleh sistem sendi. Akan tetapi, anggapan tersebut tidaklah tepat karena secara umum tanah bukanlah suatu material yang dapat menjepit secara kaku kolom dari suatu bangunan. Pada *Lumped Parameter Model* kekakuan dan redaman interaksi antara tanah dengan

pondasi dimodel sebagai pegas dan *dashpot* (model redaman). Yang menjadi masalah adalah bahwa pemakaian *bracing* akan membuat struktur lebih kaku, sedangkan pada struktur yang kaku, penyaluran gaya horizontal akibat gempa oleh struktur ke pondasi menjadi lebih sempurna. Akibatnya potensi pondasi untuk berotasi menjadi lebih besar. Analisis dan perhitungan struktur, diambil dari struktur yang sudah ada (*open frame* dengan penambahan pengaku tipe X dan tipe V), analisis massa struktur menggunakan system massa dianggap menggumpal pada satu titik *(lumped mass)*, kekakuan kolom struktur berdasarkan prinsip *Shear Building*, nilai redaman horizontal tanah (ch) dan redaman putar tanah (cr) ditetapkan sebesar ch=7264400 kg.dt/m, cr=17878000 kg.dt/rad, dan kekakuan horizontal tanah (kh)=2,0420E+25 kg/m dan 2,0420E+08 kg/m : kekakuan putar tanah (kr)=1,1932E+25 kg/rad dan 1,19325E+09 kg/rad, sedangkan kekakuan vertical tanah diabaikan. Besarnya redaman menggunakan analisis redaman proporsional terhadap massa dan kekakuan *(mass and stiffness proportional damping)*, percepatan tanah diambil dari data gempa Bucharest, El centro, Koyna pada kondisi *Code Level Limit State* dengan percepatan maksimum 70,4 cm/det^2. Analisa dan perhitungan struktur menggunakan model bangunan dua dimensi dengan meninjau momen inersia berdasarkan sumbu terkuat, perhitungan struktur menggunakan integrasi secara langsung menurut *β-Newmark* dengan formulasi untuk analisis linear elastic, dan menggunakan program *Microsoft Visual Basic 6.0*

Dari penelitian ini mereka menjelaskan bahwa gempa dengan frekuensi rendah dalam hal ini gempa Bucharest dengan A/V rasio 0,30595 g/m/dt cenderung menyebabkan respon struktur lebih besar jika dibandingkan gempa El Centro (gempa sedang) dengan A/V rasio 1,04385 g/m/dt, serta gempa Koyna (gempa kuat) dengan A/V rasio 3,46774 g/m/dt. Tapi ada hal yang belum diteliti yaitu bangunan hanya menggunakan bracing (pengaku struktur) tanpa *Base Isolation* yang sebenarnya membuat penyaluran gaya horizontal ke pondasi semakin sempurna, sehingga terjadi rotasi pondasi.

4. **Ardy Nugroho dan Didik Wahyu Asmara (2004) :" Pengaruh Penggunaan Isolasi Dasar (Base Isolation) Terhadap Respon Seismik Struktur Rangka Baja Bertingkat Banyak "**(Tugas Akhir Jurusan Teknik Sipil FTSP UII)

   Pada penelitian ini mengkaji mengenai perbandingan antara bangunan yang menggunakan base isolation dengan bangunan tanpa base isolation, dengan meninjau respon keefektifan bangunan. Data struktur mengambil dari data yang sudah ada kemudian dihitung keefektifan bangunannya, dengan membandingkan bangunan menggunakan base isolation dan bangunan tanpa base isolation. Dari penelitian ini dapat diketahui bahwa pada struktur dengan menggunakan base isolation mempunyai dominasi pada mode pertama yang lebih kecil, sebab jika menggunakan base isolation akan relative lebih fleksibel. Simpangan antar tingkat *(interstorey drift)*. Struktur dengan menggunakan base isolation pada lantai satu lebih

besar daripada struktur yang ada diatasnya. Base isolation sangat cocok dipakai pada gempa dengan frekuensi tinggi dan pada kondisi tanah yang keras. Ada hal yang belum diteliti yaitu pada bangunan dengan tingkat di atas 20, program tidak dapat terdefinisi. Oleh karena itu program hanya dipakai untuk jumlah tingkat 20 ke bawah.

Dari penelitian-penelitian yang sudah dilakukan sebelumnya tersebut kami kumpulkan dan kami kembangkan yaitu dengan mengambil data dari penelitian terdahulu kemudian mengambil langkah-langkah pada penelitian yang dilakukan tersebut lalu mangkombinasikan dengan menggunakan struktur setback.

2.2 Keaslian Penelitian

Berdasarkan penelitian-penelitian tersebut diatas maka pada penelitian selanjutnya akan mengkombinasikan data-data dari penelitian sebelumnya dengan struktur setback ,diantaranya :

1. Dalam analisis dipakai beberapa riwayat gempa *(time history)*, seperti gempa Bucharest, gempa El Centro, gempa Gilroy dan gempa Koyna. Hal tersebut dilakukan karena masing-masing gempa memiliki variasi kandungan frekuensi yang berbeda.
2. Pemilihan struktur bangunan menggunakan struktur beton bertingkat 7, 10, 15 dan 20 lantai.
3. Bangunan menggunakan struktur setback yang berubah-ubah secara vertikal.
4. Membandingkan antara respon struktur bangunan setback vertikal dengan bangunan tipikal.

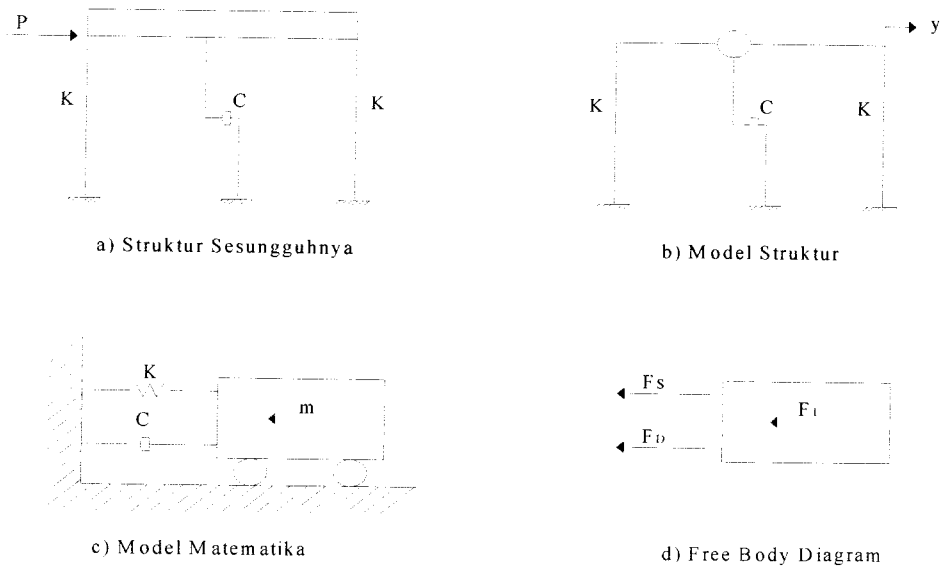
5. Membandingkan antara respon dinamik dengan statik ekivalen.
6. Untuk mendukung perhitungan dalam penelitian ini kami menggunakan program *Microsoft Visual Basic* 6.0.

BAB III

LANDASAN TEORI

3.1 Struktur (SDOF) Akibat Gerakan Tanah

Indonesia merupakan wilayah yang sering terjadi gempa sehingga kita sebagai sipil engineer harus memperhitungkan pengaruh gempa dalam mendisain suatu bangunan. Gempa bumi menyebabkan permukaan tanah ikut bergetar dan getaran tersebut akan diteruskan ke semua benda yang dilaluinya termasuk struktur bangunan. Untuk menyatakan persaman gerakan massa akibat gerakan tanah khususnya pada struktur derajat kebebasan tunggal maka diambil notasi m, c, k dan y berturut-turut adalah masssa, koefisien redaman, kekakuan kolom, dan simpangan. Sedangkan notasi F_I, F_D, F_S berturut-turut adalah gaya momen inersia, gaya redaman dan gaya pegas, maka struktur SDOF akibat gerakan tanah dapat dimodelkan sebagai berikut :



Gambar 3.1 Pemodelan Struktur SDOF

Berdasarkan *free body diagram* seperti gambar diatas maka persamaan differensial gerakan tanah adalah :

$$m.\ddot{y}_1 + c.\dot{y}_1 + k.y_1 \qquad (3.1)$$

Yang mana $\ddot{y}$, $\dot{y}$ dan y adalah simpangan , kecepatan dan percepatan

Untuk mengkombinasikan persamaan differensial gerakan massa akibat gerakan tanah ada dua alternatif, salah satunya dengan hubungan antara kecepatan dan simpangan absolut dengan kecepatan dan simpangan relatif :

$$\ddot{y}_1 = \ddot{y}_b + \ddot{y}_1 \qquad \dot{y}_1 = \dot{y}_b + \dot{y} \qquad y_1 = y_b + y \qquad (3.2)$$

dimana y_b, $\dot{y}_b$, $\ddot{y}_b$ adalah simpangan, kecepatan, percepatan tanah.

Dengan mendistribusikan persamaan di atas maka akan diperoleh :

$$m.(\ddot{y}_b + \ddot{y}) + c.(\dot{y}_b + \dot{y}) + k.(y_b + y) \qquad (3.3)$$

$$m.\ddot{y}_1 + c.\dot{y} + k.y = -m.\ddot{y}_b - c.\dot{y}_b - k.y_b$$

Pada kondisi antara tanah dan lantai belum terjadi perbedaan simpangan maka peristiwa tersebut dinamakan *rigid body motion* dan persamaannya dapat ditulis sebagai berikut :

$$m.\ddot{y} + c.\dot{y} + k.y = -m.\ddot{y}_b \qquad (3.4)$$

Dari rumus-rumus di atas maka diperoleh hubungan rumus-rumus sebagai berikut:

$$\frac{k}{m} = \omega^2 \qquad \frac{c}{m} = 2\xi\omega$$

$$\omega = \sqrt{\frac{k}{m}}\ (\text{rad/dt}) \qquad T = \frac{2\pi}{\omega}\ (\text{dt}) \qquad (3.5)$$

dimana : ξ = damping ratio (rasio redaman)

ω = angular frekuensi (kecepatan sudut)

T = Periode getar struktur

3.2 Massa Struktur

Struktur bangunan yang tinggi dapat saja terdiri atas struktur bangunan gedung bertingkat banyak. Masing-masing struktur tersebut mempunyai distribusi massa yang berbeda-beda. Pada struktur bangunan gedung, beban struktur lebih banyak terkonsentrasi pada masing-masing tingkat dan hanya relative sedikit/kecil beban yang secara langsung membebani kolom pada antar tingkat. Apabila terdapat beberapa derajat kebebasan pada setiap massa, maka secara teoritis struktur seperti itu akan mempunyai derajat kebebasan yang tak terhingga banyaknya atau disebut massa yang kontinyu sehingga pada struktur dengan derajat kebebasan banyak memerlukan penyederhanaan.

Terdapat dua pendekatan pokok yang umumnya dilakukan untuk mendeskripsikan massa struktur. Pendekatan pertama adalah system diskretisasi massa yaitu massa dianggap menggumpal pada tempat-tempat tertentu. Apabila prinsip bangunan geser *(shear building)* dipakai maka setiap massa hanya akan bergerak secara horizontal. Karena percepatan hanya terjadi pada struktur yang mempunyai massa maka matriks massa merupakan matriks diagonal.

Pendekatan yang kedua adalah menurut prinsip *consistent mass matrix* yang mana elemen struktur akan berdeformasi menurut bentuk fungsi *(shape function)* tertentu. Apabila tiga derajat kebebasan (horizontal, vertical, dan rotasi) diperhitungkanpada setiap node maka standar *consistent mass matrix* dapat

diperoleh dengan *off-diagonal* matriks tidak sama dengan nol sebagaimana terjadi pada prinsip *lumped mass.*

Untuk menghitung massa baik yang *single lumped mass* maupun *multiple lumped mass* maka dapat dipakai formulasi sederhana (Respon Dinamik Struktur Elastis, Widodo, 2001) yaitu :

$$m = \frac{W}{g} \tag{3.6}$$

yang mana W adalah berat dan g adalah percepatan gravitasi.

3.3 Kekakuan Struktur

Kekakuan adalah salah satu dinamik karakteristik struktur bangunan yang sangat penting disamping massa bangunan. Antara massa dan kekakuan struktur akan mempunyai hubungan yang unik yang umumnya disebut karakteristik diri atau *Eigenproblem* . Hubungan tersebut akan menentukan nilai frekuensi sudut ω_i dan periode getar struktur T_i. Kedua nilai ini merupakan parameter yang sangat penting dan sangat mempengaruhirespon dinamik struktur. Oleh karena itu pemodelan struktur dalam menghitung kekakuan tingkat sangat diperlukan.

Pada prinsip bangunan geser *(shear building)* balok lantai tingkat dianggap tetap horizontal baik sebelum maupun setelah terjadi penggoyangan. Adanya plat lantai yang menyatu secara kaku dengan balok diharapkan dapat membantu kekakuan balok sehingga anggapan tersebut tidak terlalu kasar. Plat dan balok lantai yang kaku dan tetap horizontal sebelum dan sesudah penggoyangan juga berarti bahwa balok mempunyai kekakuan tak terhingga . Pada prinsip desain bangunan tahan gempa dikehendaki agar kolom lebih kuat

dibanding dengan balok *(strong column weak beam)*, namun demikian rasio tersebut tidak selalu linier dengan kekakuannya . Dengan prinsip shear building maka dimungkinkan pemakaian *lumped mass model*. Pada prinsip ini, kekakuan setiap kolom dapat dihitung dengan rumus standar (Respon Dinamik Struktur Elastis, Widodo, 2001) sebagai berikut :

$$K = \frac{12EI}{H^3} \tag{3.7}$$

Dimana, K = kekakuan kolom (kg/cm)

E = Modulus Elastis (2.10^5 kg/cm^2)

I = Momen Inersia (cm^4)

H = tinggi tingkat (cm)

Dengan melihat data struktur maka kekakuan dihitung secara paralel yaitu kekakuan tiap tingkat (K_t) merupakan jumlah total dari kekakuan kolom tiap tingkat (K_c), secara matematis dapat ditulis sebagai berikut :

$$K_t = \sum K_c \tag{3.8}$$

Pada prinsipnya semakin kaku balok maka semakin besar kemampuannya dalam mengekang rotasi ujung kolom, sehingga akan menambah kekakuan kolom. Pada prinsip Muto (1975), kekakuan joint juga dapat diperhitungkan sehingga hitungan kekakuan baik kekakuan balok maupun kekakuan kolom akan menjadi lebih teliti.

3.4 Redaman Struktur

Redaman merupakan peristiwa pelepasan energi *(energy dissipation)* oleh suatu struktur akibat adanya berbagai macam sebab. Beberapa penyebab itu diantaranya adalah pelepasan energi oleh adanya gerakan antara molekul di dalam material, pelepasan energi oleh gesekan alat penyambung maupun sistem dukungan, pelepasan energi akibat gesekan dengan udara dan pada respon inelastik pelepasan energi juga terjadi karena adanya rotasi sendi plastis. Karena redaman berfungsi melepaskan energi, maka hal tersebut akan mengurangi respon struktur.

Untuk memodel kemampuan struktur melepaskan energi, maka besaran yang dipakai umumnya adalah rasio redaman *(damping ratio)* ξ. Nilai rasio redaman untuk berbagai macam material dan tingkat respon struktur seperti pada *Respon Dinamik Struktur* (Widodo,2001, sumber : Newmark N.M, Hall W. J 1982). Untuk memperoleh redaman ada tiga cara yang dapat digunakan, yaitu :

1. Redaman proporsional dengan massa *(mass proportional damping)*
2. Redaman proporsional dengan kekakuan *(stiffness proportional damping)*
3. Redaman proporsional dengan massa dan kekakuan *(mass and stiffness proportional damping)*.

Tetapi dalam penelitian ini, kami mengabaikan besarnya nilai redaman (c) namun tetap memperhitungkan nilai rasio redaman *(damping ratio)* ξ.

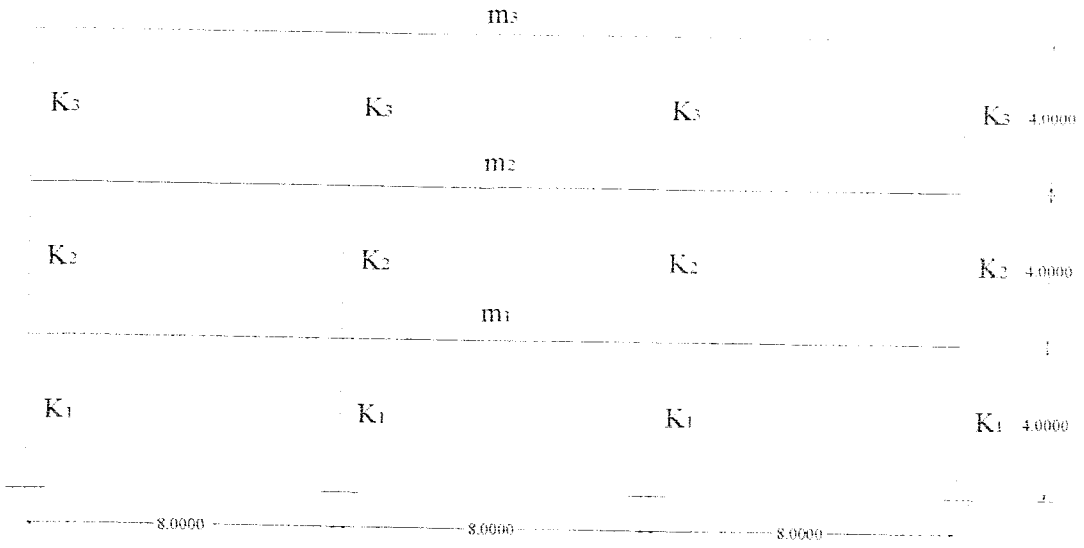
3.5 Struktur dengan Derajat Kebebasan Banyak (MDOF)

Pada kenyataan di lapangan tidak semua struktur dapat dinyatakan dalam system derajat kebebasan tunggal atau *Single Degree of Freedom* (SDOF). Banyak bangunan justru mempunyai derajat kebebasan banyak atau *Multi Degree of Freedom* (MDOF).

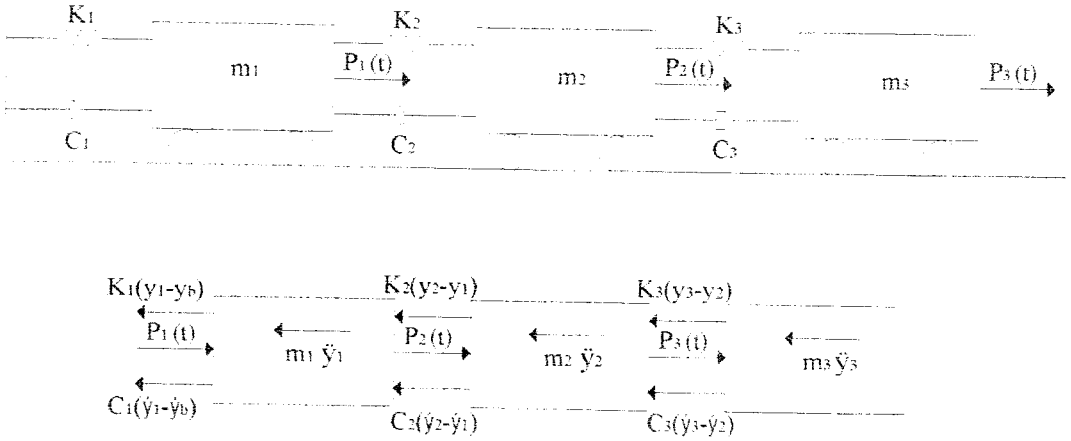
Dengan peningkatan jumlah derajat kebebasan dan peningkatan jumlah variable yang diakibatkan oleh koefisien dan suku-suku yang bersangkutan, sehingga hubungan persamaan-persamaan menjadi semakain tidak praktis. Untuk menyatakan persamaan differensial gerakan pada struktur dengan derajat kebebasan banyak maka dipakai anggapan dan pendekatan seperti pada struktur dengan derajat kebebasan tunggal (SDOF). Anggapan seperti prinsip *shear building* masih berlaku pada struktur dengan derajat kebebasan banyak (MDOF). Untuk memperoleh persamaan defferensial tersebut maka tetap dipakai prinsip keseimbangan dinamik *(dynamic equilibrium)* pada suatu massa yang ditinjau serta menggunakan pendekatan massa struktur yang digumpalkan pada setiap lantai *(lumped mass)*.

Untuk mendapatkan persamaan yang diinginkan tersebut maka diambil model struktur dengan derajat kebebasan banyak (MDOF). Model ini ada dua tipe yaitu struktur tipikal dan struktur dengan menggunakan setback.

Sebagai contoh kami ambil model struktur MDOF seperti gambar di bawah ini:



Gambar. 3.2 Struktur dengan 3 DOF



Gambar. 3.3 Free Body Diagram

Bangunan di atas mempunyai derajat kebebasan 3 karena sering kali derajat kebebasan dihubungkan secara langsung dengan jumlahnya tingkat. Persamaan differensial gerakan tersebut umumnya disusun berdasarkan atas goyangan struktur menurut first mode atau mode pertama. Berdasarkan pada keseimbangan dinamik pada *free body diagram* gambar 3.3 maka akan diperoleh :

$$\begin{aligned} &m_1\ddot{y}_1 + k_1 y_1 + c_1\dot{y}_1 - k_2(y_2 - y_1) - c_2(\dot{y}_2 - \dot{y}_1) - P_1(t) = 0 \\ &m_2\ddot{y}_2 + k_2(y_2 - y_1) + c_2(\dot{y}_2 - \dot{y}_1) - k_3(y_3 - y_2) - c_3(\dot{y}_3 - \dot{y}_2) - P_2(t) = 0 \\ &m_3\ddot{y}_3 + k_3(y_3 - y_2) + c_3(\dot{y}_3 - \dot{y}_2) - P_1(t) = 0 \end{aligned} \qquad (3.9)$$

Pada persamaan-persamaan diatas tampak bahwa keseimbangan dinamik suatu massa yang ditunjau ternyata dipengaruhi oleh kekakuan, redaman, dan simpangan massa sebelum dan sesudahnya. Persamaan dengan sifat seperti itu disebut *coupled equation* Karena persamaan-persamaan tersebut akan bergantung satu sama lain. Penyelesaian dari persaman *coupled* harus dilakukan secara simultan yaitu dengan melibatkan semua persamaan yang ada. Pada struktur dengan derajat kebebasan banyak, persamaan differensial gerakannya merupakan persamaan *dependent* atau *coupled* antara satu dengan yang lain.

$$\begin{aligned} &m_1\ddot{y}_1 + (c_1 + c_2)\dot{y}_1 - c_2\dot{y}_2 + (k_1 + k_2)y_1 - k_2 y_2 = P_1(t) \\ &m_2\ddot{y}_2 - c_2\dot{y}_1 + (c_2 + c_3)\dot{y}_2 - c_3\dot{y}_3 - k_2 y_1 + (k_2 + k_3)y_2 - k_3 y_3 = P_2(t) \\ &m_3\ddot{y}_3 - c_3\dot{y}_2 + c_3\dot{y}_3 - k_3 y_2 + k_3 y_3 = P_3(t) \end{aligned} \qquad (3.10)$$

Persaman tersebut dapat ditulis dalam bentuk matriks sebagai berikut :

$$\begin{bmatrix} m_1 & 0 & 0 \\ 0 & m_2 & 0 \\ 0 & 0 & m_3 \end{bmatrix} \begin{Bmatrix} \ddot{y}_1 \\ \ddot{y}_2 \\ \ddot{y}_3 \end{Bmatrix} + \begin{bmatrix} c_1+c_2 & -c_2 & 0 \\ -c_2 & c_2+c_3 & -c_3 \\ 0 & -c_3 & c_3 \end{bmatrix} \begin{Bmatrix} \dot{y}_1 \\ \dot{y}_2 \\ \dot{y}_3 \end{Bmatrix} + \begin{bmatrix} k_1+k_2 & -k_2 & 0 \\ -k_2 & k_2+k_3 & -k_3 \\ 0 & -k_3 & k_3 \end{bmatrix} \begin{Bmatrix} y_1 \\ y_2 \\ y_3 \end{Bmatrix} = \begin{Bmatrix} P_1(t) \\ P_2(t) \\ P_3(t) \end{Bmatrix} \qquad (3.11)$$

3.6 Getaran Bebas pada Struktur Derajat Kebebasan Banyak

Secara umum gerakan massa suatu struktur dapat disebabkan oleh adanya gangguan beban dari luar, seperti angin, putaran mesin ataupun gempa. Peristiwa gerakan massa akibat adanya simpangan awal y_o (dapat juga kecepatan awal) seperti itu biasa disebut dengan getaran bebas *(free vibration system)*.

Membahas getaran bebas pada struktur derajat kebebasan banyak akan diperoleh beberapa karakter struktur yang penting dan sangat bermanfaat. Karakter-karakter itu adalah frekuensi sudut (ω), periode getar (T), frekuensi (f) *dan normal modes*. Pembahasan getaran bebas ini masih diikuti dengan penyederhanaan permasalahan yaitu menganggap struktur tidak mempunyai redaman *(undamped system)*. Dengan anggapan tersebut penyelesaian masalah menjadi lebih sederhana.

3.7 Nilai Karakteristik (*Eigen problem*)

Getaran bebas *(free vibration system)* pada kenyataannya jarang terjadi pada struktur MDOF, tetapi membahas jenis getaran ini akan diperoleh suatu besaran/karakteristik dari struktur yang bersangkutan yang selanjutnya akan sangat berguna untuk pembahasan-pembahasan respon struktur berikutnya. Besaran-besaran tersebut terutama adalah frekuensi sudut ω, periode getar T, frekuensi alam f dan normal medes.

Pada getaran bebas di struktur yang mempunyai derajat kebebasan banyak (MDOF), maka matriks persamaann diferensial gerakannya adalah sebagai berikut :

$$[M]\{\ddot{y}\}+[C]\{\dot{y}\}+[K]\{y\}=\{0\} \qquad (3.12)$$

Frekuensi sudut pada struktur dengan redaman *(damped ferkuensy)* ω_d nilanya hamper sama dengan frekuensi sudut pada sturktur yang dinggap redaman ω. Hal ini akan diperoleh apabila nilai damping ratio ξ relatif kecil. Apabila hal ini diadopsi untuk struktur dengan derajat banyak , maka untuk nilai c=0 sehingga persamaan menjadi :

$$[M]\{\ddot{y}\}+[K]\{y\}=\{0\} \tag{3.13}$$

Karena persamaan di atas adalah persamaan diferensial pada struktur MDOF yang dianggap tidak mempunyai redaman, maka sebagaimana penyelesaian persamaan diferensial yang sejenis persamaan tersebut diharapkan dalam fungsi harmonic menurut bentuk:

$$\begin{aligned} y &= \{\phi\}_i \sin(\omega t) \\ \dot{y} &= \omega\{\phi\}_i \cos(\omega t) \\ \ddot{y} &= -\omega^2\{\phi\}_i \sin(\omega t) \end{aligned} \tag{3.14}$$

Yang mana $\{\phi\}_i$ adalah suatu ordinat massa pada mode yang ke-i. Dengan mensubtitusi persamaan di atas maka diperoleh.

$$\begin{aligned} -\omega^2[M]\{\phi\}_i \sin(\omega t)+[K]\{\phi\}_i \sin(\omega t) &= 0 \\ \{[K]-\omega^2[M]\}\{\phi\}_i &= 0 \end{aligned} \tag{3.15}$$

Hasil di atas disebut *Eigenproblem* atau karakteristik problem atau ada juga yang menyebut eigenproblem / persamaan simultan yang harus dicari penyelesaiannya. Salah satu cara yang dapat dipakai untuk menyelesaikan persamaan simultan tersebut adalah dengan memakai dalil *Cramer*. Dalil tersebut menyatakan bahwa penyelesaian persamaan simultan yang homogen akan ada nilainya apabila

determinan dari matriks yang merupakan koefisien dari vektor $\{\phi\}_i$ adalah nol sehingga:

$$|[K]-\omega^2[M]| = 0 \qquad (3.16)$$

Jumlah mode pada struktur dengan derajat kebebasan banyak biasanya dapat dihubungkan dengan jumlah massa. Mode itu senidiri adalah jenis/pola/ragam getaran/goyangan suatu struktur bangunan. Mode ini hanya merupakan fungsi dari property dinamik dari struktur yang bersangkutan (dalam hal ini adalah hanya massa dan kekakuan tingkat) dan bebas dari pengaruh waktu dan frekuensi getaran.

3.8 Normal Modes

Setiap struktur yang dibebani dengan beban dinamik akan mengalami goyangan. *Normal modes* adalah ragam/pola goyangan

Untuk struktur bangunan gedung yang hanya mempunyai 2 tingkat atau struktur yang memiliki 2 derajat kebebasan maka dalam menghitung ordinat-ordinat normal modes masih dapat dicari dengan menggunakan determinan (*metode Crammer*),karena matriks 2x2 masih dapat dihitung dengan mudah. Namun untuk bangunan yang lebih tinggi akan mengalami kesulitan dalam menghitung nilai determinan tersebut (secara manual).

Untuk mencari nilai-nilai ordinat di dalam normal modes ini menggunakan metode Polinomial.

3.8.1 Metode Polinomial

Metode ini pada dasarnya masih menggunakan persamaan eigenproblem. Untuk mencari /menghitung eigenvalues(nilai-nilai frekuensi sudut)tidak lagi dipakai cara determinan. Cara yang dipakai adalah dengan menstransfer persamaan simultan Eigen problem menjadi suatu persamaan polynomial berpangkat banyak. Akar-akar persamaan polynomial tersebut yang akan yang akan dicari yang seterusnya akan menghasilkan nilai-nilai Eigenvector.

Seperti sebelumnya maka persamaan diferensial gerakan dapat diperoleh dengan memperhatikan freebody diagram.

Berdasarkan keseimbangan gaya-gaya pada *free body diagram* maka dapat disusun persamaan diferensial simultan gerakan massa, yaitu :

$$\begin{aligned} &m_1\ddot{y}_1 + k_1 y_1 - k_2(y_2 - y_1) = 0 \\ &m_2\ddot{y}_2 + k_2(y_2 - y_1) - k_3(y_3 - y_2) = 0 \\ &m_3\ddot{y}_3 + k_3(y_3 - y_2) = 0 \end{aligned} \qquad (3.17)$$

Persamaan diatas dapat ditulis menjadi:

$$\begin{aligned} &m_1\ddot{y}_1 + (k_1 + k_2)y_1 - k_2 y_2 = 0 \\ &m_2\ddot{y}_2 - k_2 y_1 + (k_2 + k_3)y_2 - k_3 y_3 = 0 \\ &m_3\ddot{y}_3 - k_3 y_2 + k_3 y_3 = 0 \end{aligned} \qquad (3.18)$$

Dapat ditulis dalam bentuk matriks sebagai berikut :

$$\begin{bmatrix} m_1 & 0 & 0 \\ 0 & m_2 & 0 \\ 0 & 0 & m_3 \end{bmatrix} \begin{Bmatrix} \ddot{y}_1 \\ \ddot{y}_2 \\ \ddot{y}_3 \end{Bmatrix} + \begin{bmatrix} k_1 + k_2 & -k_2 & 0 \\ -k_2 & k_2 + k_3 & -k_3 \\ 0 & -k_3 & k_3 \end{bmatrix} \begin{Bmatrix} y_1 \\ y_2 \\ y_3 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \\ 0 \end{Bmatrix} \qquad (3.19)$$

$$\begin{bmatrix} (k_1+k_2)-\omega^2 m_1 & -k_2 & 0 \\ -k_2 & (k_2+k_3)-\omega^2 m_2 & -k_3 \\ 0 & -k_3 & k_3-\omega^2 m_3 \end{bmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \\ 0 \end{Bmatrix} \tag{3.20}$$

$$\begin{bmatrix} (k_1+k_2)-\dfrac{\omega^2}{k\ m_1} & -k_2 & 0 \\ -k_2 & (k_2+k_3)-\dfrac{\omega^2}{k\ m_2} & -k_3 \\ 0 & -k_3 & k_3-\dfrac{\omega^2}{k\ m_3} \end{bmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \\ 0 \end{Bmatrix} \tag{3.21}$$

Diambil suatu notasi bahwa,

$$\lambda = \frac{\omega^2}{\dfrac{k}{m}}$$

Maka persamaan (3.21) akan menjadi:

$$\begin{bmatrix} (k_1+k_2)-\lambda_1 & -k_2 & 0 \\ -k_2 & (k_2+k_3)-\lambda_2 & -k_3 \\ 0 & -k_3 & k_3-\lambda_3 \end{bmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \\ 0 \end{Bmatrix} \tag{3.22}$$

Persamaan (3.22) tersebut dapat disederhanakan menjadi 3 persemaan baru, yaitu:

$$\begin{aligned} &((k_1+k_2)-m_1\lambda)\phi_1 - k_2\phi_2 = 0 \\ &-k_2\phi_2 + ((k_2+k_3)-\lambda_1)\phi_2 - k_3\phi_3 = 0 \\ &-k_3\phi_2 + (k_3-\lambda_3)\phi_3 = 0 \end{aligned} \tag{3.23}$$

Dengan mengambil nilai ϕ_1=0 kemudian disubstitusikan ke dalam persamaan (3.23) maka akan mendapatkan 3 bentuk persamaan polinomial pangkat 3 atau pangkat n (n= jumlah tingkat). Dari akar-akar persamaan tersebut akan didapatkan nilai ω, ϕ dengan menggunakan rumus seperti di atas.

3.9 Hubungan Orthogonal

Mode shape seperti yang telah dibahas diperoleh dengan suatu anggapan bahwa struktur tidak mempunyai redaman atau *undamped free vibration system*. Padahal struktur yang sesungguhnya selalu mempunyai redaman walaupun nilainya relative kecil. Dengan demikian *mode shape* yang diperoleh merupakan suatu pendekatan. Namun demikian *mode shape* hasil pendekatan ini akan sangat bermanfaat terhadap penyelesaian problem analisis dinamik struktur selanjutnya.

Sebagaimana salah satu contoh ,manfaat yang diperoleh dengan diketahuinya *mode shape* adalah hubungan *orthogonal* ,yaitu hubungan unik yang sangat bermanfaat untuk menyelesaikan problema mendatang. Hubungan *orthogonal* tersebut dapat diketahui dengan menggunakan persamaan *eigenproblem* sebagai berikut :

$$\{[K]-\omega^2[M]\}\{\phi\}=0 \tag{3.24}$$

Orthogonalitas untuk redaman tidak banyak diketahui karena persoalan redaman memang masih relative rumit jika dibandingkan dengan massa struktur dan kekakuan tingkat. Karena keterbatasan tersebut maka diambil suatu asumsi bahwa redaman juga mempunyai sifat orthogonal sebagaimana massa dan kekakuan, sehingga:

$$\{\phi\}_r^T[C]\{\phi\}_s=0 \tag{3.25}$$

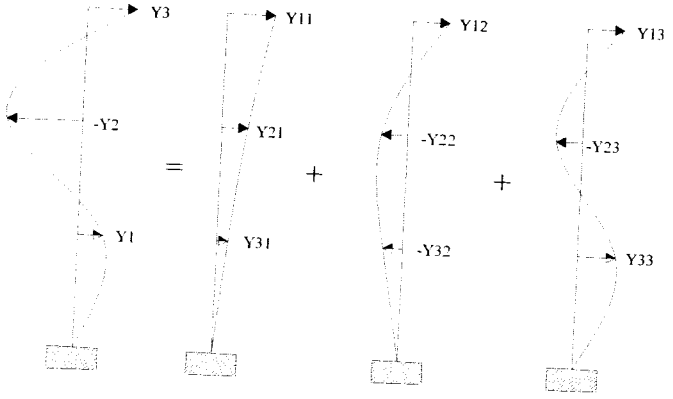
3.10 Modal Analisis (Mode Superposition Methods)

Modal analisis merupakan salah satu metode yang dapat dipakai untuk menyelesaikan persamaan diferensial gerakan pada struktur bangunan derajat kebebasan (MDOF). Metode ini digunakan khusus untuk menyelesaikan problem dinamik dengan beberapa syarat tertentu. Syarat-syarat tersebut diantaranya adalah bahwa respon struktur masih elastic dan struktur mempunyai standar *mode shape*. Respon elastikberarti bahwa tegangan bahan belum mencapai tegangan leleh dan implikasinya kekakuan struktur tidak mengalami perubahanselama pembebanan. Selain itu juga tidak mengalami perubahan massa dan koefisien redaman. Struktur yang mempunyai standar *mode shape* adalah struktur elastic dan struktur yang tidak memperhitungkan interaksi antara tanah dengan pondasi struktur. Ini berarti bahwa bangunan dianggap dijepit pada dasarnya

Penyelesaian persamaan diferensial gerakan struktur MDOF dengan cara ini, pertama-tama mencari nilai-nilai koordinat mode shape ϕ_{ij}. Dengan memakai prinsip-prinsip hubungan orthogonal maka persamaan diferensial *coupling* (*dependent*) dapat ditransfer menjadi persamaan diferensial yang *uncoupling* (*independent*). Maka penyelesaian persamaan akan lebih mudah karena setiap persamaan untuk massa dan mode tertentu akan saling independent terhadap persamaan yang lainnya.

Simpangan struktur total merupakan kontribusi dari respon setiap mode (*modal displacement*) yang dapat dihitung dengan integrasi numerikatas persamaan independent seperti yang telah disampaikan di atas. Apabila simpangan untuk setiap

$$[Y]=\begin{bmatrix} \phi_{11} & \phi_{12} & \phi_{13} & ..... & \phi_{1n} \\ \phi_{21} & \phi_{22} & \phi_{23} & ..... & \phi_{2n} \\ \phi_{31} & \phi_{32} & \phi_{33} & ..... & \phi_{3n} \\ ..... & ..... & ..... & ..... & ..... \\ \phi_{n1} & \phi_{n2} & \phi_{n3} & ..... & \phi_{nn} \end{bmatrix} \begin{Bmatrix} Z_1 \\ Z_2 \\ Z_3 \\ ... \\ Z_n \end{Bmatrix} \qquad (3.27)$$



$Y = \phi Z \quad Y_1 = \phi_1 Z_1 \quad Y_2 = \phi_2 Z_2 \quad Y_3 = \phi_3 Z_3$

Gambar 3.4 Prinsip Metode Superposisi

Suku pertama, kedua, ketiga dan seterusnya sampai suku ke-n pada ruas kanan pers. (3.26) di atas adalah kontribusi mode pertama, kedua, ketiga dan seterusnya sampai kontribusi mode ke-n. Sebagai perjanjian, massa struktur MDOF diberi indeks m_i dengan i = 1, 2, 3, ... m, sedangkan *mode* diberi indeks ϕ_j dengan j = 1, 2, 3, ... n. Dengan demikian notasi umum mode shape ϕ_{ij} adalah ordinat mode ke-j untuk massa ke-i.

Pers. (3.27) tersebut dapat ditulis dalam bentuk yang lebih sederhana,

$$\{Y\} = [\phi]\{Z\} \qquad (3.28)$$

Derivatif pertama dan kedua pers. (3.28) tersebut adalah,

$$\{\dot{Y}\} = [\phi]\{\dot{Z}\}$$
$$\{\ddot{Y}\} = [\phi]\{\ddot{Z}\} \qquad (3.29)$$

Substitusi pers. (3.28) dan (3.29) kedalam pers. (3.26), maka akan diperoleh,

$$[M][\phi]\{\ddot{Z}\} + [C][\phi]\{\dot{Z}\} + [K][\phi]\{Z\} = -[M]\{1\}\ddot{y}_t \qquad (3.30)$$

Pers (3.30) sebetulnya adalah 1 set persamaan simultan dependen non-homogen. Untuk dapat mentransfer persamaan dependen menjadi persamaan independent, maka pers. (3.30) di-premultiply dengan transpose suatu mode $\{\phi\}^T$ sehingga diperoleh,

$$\{\phi\}^T [M][\phi]\{\ddot{Z}\} + \{\phi\}^T [C][\phi]\{\dot{Z}\} + \{\phi\}^T [K][\phi]\{Z\} = -\{\phi\}^T [M]\{1\}\ddot{y}_t \qquad (3.31)$$

Untuk pembahasan awal akan ditinjau pengaruh mode ke-1 saja. Misalnya diambil struktur yang mempunyai 3 derajat kebebasan, maka perkalian suku pertama pers. (3.31) sebenarnya adalah berbentuk,

$$\{\phi_{11}\phi_{21}\phi_{31}\}\begin{bmatrix} m_1 & 0 & 0 \\ 0 & m_2 & 0 \\ 0 & 0 & m_3 \end{bmatrix}\begin{bmatrix} \phi_{11} & \phi_{12} & \phi_{13} \\ \phi_{21} & \phi_{22} & \phi_{23} \\ \phi_{31} & \phi_{32} & \phi_{33} \end{bmatrix}\begin{Bmatrix} \ddot{Z}_1 \\ \ddot{Z}_2 \\ \ddot{Z}_3 \end{Bmatrix} \qquad (3.32)$$

Menurut contoh sebelumnya telah terbukti bahwa hubungan orthogonal akan terbukti apabila i tidak sama dengan j. Dengan demikian untuk mode ke-1 pers. (3.32) akan menjadi,

$$\{\phi_{11}\phi_{21}\phi_{31}\}\begin{bmatrix} m_1 & 0 & 0 \\ 0 & m_2 & 0 \\ 0 & 0 & m_3 \end{bmatrix}\begin{Bmatrix} \phi_{11} \\ \phi_{21} \\ \phi_{31} \end{Bmatrix}\ddot{Z}_1 \qquad (3.33)$$

Untuk mode ke-j maka secara umum persamaan (3.33) juga dapat ditulis sebagai berikut,

$$\{\phi\}_j^T [M]\{\phi\}_j \ddot{Z}_j \qquad (3.34)$$

Cara seperti di atas juga berlaku untuk suku ke-2 dan ke-3 pada persamaan (3.29). Dengan demikian setelah diperhatikan hubungan orthogonal pers. (3.31) akan menjadi,

$$\{\phi\}_j^T [M]\{\phi\}_j \ddot{Z}_j + \{\phi\}_j^T [C]\{\phi\}_j \dot{Z}_j + \{\phi\}_j^T [K]\{\phi\}_j Z_j = - \{\phi\}_j^T [M]\{1\} \ddot{y}_j \qquad (3.35)$$

Persamaan (3.35) adalah persamaan deferensial yang bebas/*independent* antara satu dengan yang lainnya. Persamaan tersebut diperoleh setelah diterapkannya hubungan *orthogonal*, baik orthogonal untuk matriks massa, matriks redaman dan matriks kekakuan. Sekali lagi bahwa apabila i tidak sama dengan j maka perkalian suku-suku pada pers. (3.31) akan sama dengan nol, kecuali untuk i = j. Dengan demikian untuk n-derajat kebebasan dengan n-persamaan diferensial yang dahulunya bersifat *coupling* sekarang menjadi *independent uncoupling*. Dengan sifat-sifat seperti itu maka penyelesaian persamaan diferensial dapat diselesaikan untuk setiap pengaruh mode.

Berdasarkan pers. (3.35) maka dapat didefinisikan suatu generalisasi massa (*generalized mass*), redaman dan kekakuan sebagai berikut,

$$\begin{aligned} M_j^* &= \{\phi\}_j^T [M]\{\phi\}_j \\ C_j^* &= \{\phi\}_j [C]\{\phi\}_j \\ KC_j^* &= \{\phi\}_j^T [K]\{\phi\}_j \end{aligned} \qquad (3.36)$$

mode pada massa tertentu sudah diperoleh maka simpangan total massa yang bersangkutan merupakan superposisi atau penjumlahan dari simpangan tiap-tiap mode tersebut. Simpangan massa yang lain dapat dicari dengan cara yang sama.

3.10.1 Persamaan Diferensial Independen (*Uncoupling*)

Pada kondisi standar *shear building*, struktur yang mempunyai n-derajat kebebasan akan mempunyai n-*modes* atau n-pola/ragam goyangan. Pada prinsip ini, masing-masing *modes* akan memberikan kontribusi pada simpangan horizontal tiap-tiap massa seperti ditunjukkan secara visual pada gambar 3.4 Disamping itu, simpangan massa ke-i atau Y_i dapat diperoleh denagan menjumlahkan pengaruh atau kontribusi tiap-tiap *modes*. Kontribusi massa ke-j terhadap simpangan horizontal massa ke-i tersebut dinyatakan dalam produk antara ϕ_{ij} dengan suatu modal amplitude Z_j atau seluruh kontribusi tersebut kemudian dinyatakan dalam,

$$
\begin{aligned}
Y_1 &= \phi_{11}Z_1 + \phi_{12}Z_2 + \phi_{13}Z_3 + \ldots\ldots + \phi_{1n}Z_n \\
Y_2 &= \phi_{21}Z_1 + \phi_{22}Z_2 + \phi_{23}Z_3 + \ldots\ldots + \phi_{2n}Z_n \\
Y_3 &= \phi_{31}Z_1 + \phi_{32}Z_2 + \phi_{33}Z_3 + \ldots\ldots + \phi_{3n}Z_n \\
&\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
Y_n &= \phi_{n1}Z_1 + \phi_{n2}Z_2 + \phi_{n3}Z_3 + \ldots\ldots + \phi_{mn}Z_n
\end{aligned}
\qquad (3.26)
$$

dapat juga ditulis menjadi bentuk matrik sebagai berikut,

Misalnya bangunan bertingkat tiga (3), maka orde perkalian matriks pada pers. (3.36) adalah 1x3 x 3x3 x 3x1 = 1x1. Arti pers. (3.36) adalah satu persamaan independent untuk mode ke-j. Dengan demikian dengan memakai pers. (3.36) maka pers. (3.35) akan menjadi,

$$M_j^* \ddot{Z}_j + C_j^* \dot{Z}_j + K_j^* Z_j = -P_j^* \ddot{y}_t \qquad (3.37)$$

dengan, $$P_j^* = \{\phi\}_j^T [M]\{1\} \qquad (3.38)$$

Pada pembahasan sebelumnya diperoleh suatu hubungan bahwa,

$$\xi_j = \frac{C_j^*}{C_{cr}} = \frac{C_j^*}{2M_j^* \omega_j}, \text{ maka } \frac{C_j^*}{M_j^*} = 2\xi_j \omega_j$$

$$\omega_j^2 = \frac{K_j^*}{M_j^*} \text{ dan } \Gamma_j = \frac{P_j^*}{M_j^*} \qquad (3.39)$$

Dengan hubungan-hubungan seperti pada pers. (3.39) tersebut, maka pers. (3.37) akan menjadi,

$$\ddot{Z}_j + 2\xi_j \omega_j \dot{Z}_j + \omega_j^2 Z_j = -\Gamma_j \ddot{y}_t \qquad (3.40)$$

$$\Gamma_j = \frac{P_j^*}{M_j^*} = \frac{\{\phi\}_j^T [M]\{1\}}{\{\phi\}_j^T [M]\{\phi\}_j} = \frac{\sum_{i=1}^{m} \phi_j m_i}{\sum_{i=1}^{m} \phi_j^2 m_i} \qquad (3.41)$$

Pers. (3.41) sering disebut dengan partisipasi setiap mode atau *mode participation factor*. Selanjutnya pers. (3.40) juga dapat ditulis menjadi,

$$\frac{\ddot{Z}_j}{\Gamma_j} + 2\xi_j \omega_j \frac{\dot{Z}_j}{\Gamma_j} + \omega_j^2 \frac{Z_j}{\Gamma_j} = -\ddot{y}_t \qquad (3.42)$$

Apabila diambil suatu notasi bahwa,

$$\ddot{g}_j = \frac{\ddot{Z}_j}{\Gamma_j},\ \dot{g}_j = \frac{\dot{Z}_j}{\Gamma_j},\ \text{dan } g_j = \frac{Z_j}{\Gamma_j}, \tag{3.43}$$

Maka pers. (3.42) akan menjadi,

$$\ddot{g}_j + 2\xi_j\omega_j\dot{g}_j + \omega_j^2 g_j = -\ddot{y}_t \tag{3.44}$$

Pada integrasi numerik persamaan diferensial yang dimaksud adalah:

$$\ddot{y} + 2\xi\omega_j y + \omega_j^2 g_j = -\ddot{y}_t \tag{3.45}$$

Pers. (3.44) adalah persamaan diferensial yang *independent* karena persamaan tersebut hanya berhubungan dengan tiap-tiap mode. Pers. (3.44) adalah mirip dengan persamaan diferensial SDOF seperti yang telah dibahas sebelumnya.

Nilai yang dicari adalah nilai g_j yangmana j merupakan suatu mode. Untuk menyelesaikan persamaan differensial tersebut dipakai metode Central Difference, maka proses integrasinya adalah sebagai berikut,

$$\dot{g}_j = \frac{g_{j+1} - g_{j-1}}{2\Delta t} \quad \text{dan} \quad \ddot{g}_j = \frac{g_{j+1} - 2g_j + g_{j-1}}{(\Delta t)^2} \tag{3.46}$$

Substitusi persamaan (3.46) kedalam persamaan (3.45) akan diperoleh,

$$\frac{g_{i+1} - 2g_i + g_{i-1}}{(\Delta t)^2} + 2\xi\omega_i \frac{g_{i+1} - g_{i-1}}{2\Delta t} + \omega_i^2 g_i = -\ddot{y}_t \tag{3.47}$$

Persamaan (3.47) dapat ditulis menjadi,

$$\left[\frac{1}{(\Delta t)^2} + \frac{2\xi\omega_j}{2\Delta t}\right] g_{i+1} = -\ddot{y}_i - \left[\omega_j^2 - \frac{2}{(\Delta t)^2}\right] g_i - \left[\frac{1}{(\Delta t)^2} - \frac{2\xi\omega_j}{2\Delta t}\right] g_{i-1} \tag{3.48}$$

Persamaan (3.48) dapat ditulis menjadi

$$g_{i+1} = \frac{-\ddot{y}_i - a.g_i - b.g_{i-1}}{\hat{k}} \tag{3.49}$$

Dimana,

$$a = \left[\omega_j^2 - \frac{2}{(\Delta t)^2}\right]$$

$$b = \left[\frac{1}{(\Delta t)^2} - \frac{2\xi\omega_j}{2\Delta t}\right] \tag{3.50}$$

$$\hat{k} = \left[\frac{1}{(\Delta t)^2} + \frac{2\xi\omega_j}{2\Delta t}\right]$$

Nilai partisipasi setiap mode akan dapat dihitung dengan mudah setelah koordinat setiap mode ϕ_{ij} telah diperoleh. Nilai g_i, g_j dan g_j dapat dihitung dengan integrasi secara numerik. Apabila nilai tersebut telah diperoleh maka nilai Z_j dapat dihitung. Dengan demikian simpangan horizontal setiap tingkat akan dapat dihitung.

Untuk bangunan dengan struktur setback vertikal cara penyelesaiannya maupun rumus-rumus yang digunakan sama seperti di atas.

3.11 Pengertian Bangunan Setback

Bangunan dengan struktur setback adalah bangunan dengan bentuk tingkat atas dan tingkat di bawahnya tidak sama atau disebut juga loncatan bidang muka, misalnya bentuk tingkat bawah lebih besar daripada diatasnya. Pada bangunan setback berpengaruh pada kekakuan dan massanya, sehingga terdapat perbedaan antara bangunan setback dengan bangunan yang tipikal.

Perlakuan bangunan menggunakan setback memang jarang dibahas sehingga tidak ada peraturan yang mengaturnya.

3.12 Jenis-jenis Setback

Jenis-jenis bangunan setback ada dua macam yaitu : bangunan setback secara horizontal dan setback secara vertical. Pada dasarnya perbedaannya adalah loncatan muka lantainya, pada setback vertikal loncatan muka lantai juga secara vertikal sedangkan pada setback horizontal loncatan muka lantainya secara horizontal.

3.13 Prinsip Sistem Setback

Prinsip kerja pada bangunan setback memang sedikit dibahas. Pada bangunan setback terjadi loncatan muka lantai sehingga berpengaruh pada kekakuan bangunan. Karena kekakuan berubah tidak seperti bangunan tipikal maka ini juga akan berpengaruh pada respon struktur bangunan setback terhadap gempa.

Pada bangunan setback kekakuan antar tingkat berubah sehingga *mode-mode* yang terbentuk berbeda jika dibandingkan dengan bangunan tipikal.

3.14 Respons Struktur

Setiap struktur bangunan mempunyai respons struktur yang berbeda-beda dalam menerima getaran, baik itu getaran tanah akibat gempa maupun oleh benda-benda lainnya misalnya generator ataupun pemancangan suatu tiang-tiang pancang. Pada umumnya respons struktur tersebut digunakan sebagai tinjauan dalam menilai keefektifan suatu struktur bangunan. Respons-respons struktur bangunan tersebut

dapat berupa simpangan struktur, simpangan antar tingat (*Interstorey Drift*), gaya horizontal tingkat, gaya horizontal tingkat kumulatif serta momen guling.

3.14.1 Simpangan Struktur

Simpangan struktur yang terjadi ada 3 macam yaitu simpangan absolute, simpangan relative dan simpangan antar tingkat (*interstorey drift*). Simpangan yamg digunakan dalam penelitian ini adalah simpangan relative dan simpangan antar tingkat (*interstorey Irift*) adalah sebagai berikut :

a) Simpangan

Simpangan relative yang biasa disebut dengan nama simpangan saja pada setiap lantai menurut persamaan differensial independent (uncoupling) adalah simpangan suatu massa yang diperoleh dengan menjumlahkan pengaruh kontribusi tiap-tiap mode :

$$Y_j = \sum_{j=1}^{n} [\Phi_n Z_1] \qquad (3.51)$$

b) Simpangan Antar Tingkat (*Interstorey Drift*)

Untuk menghitung simpangan antar tingat (*Interstorey Drift*) pada struktur dengan cara mengurangi simpangan relative lantai atas terhadap lantai dibawahnya.

$$\Delta y = \frac{y_j(t) - y_{j-1}(t)}{h} \times 100\% \qquad (3.52)$$

3.14.2 Gaya Horizontal Tingkat (F) dan Gaya Horizontal Tingkat Kumulatif/Gaya Geser (V)

Gaya horizontal tingkat sering dipakai dalam analisis struktur, karena gaya horizontal tingkat akan meyebabkan rotasi pada penampang horizontal lantai yang nantinya akan berpengaruh pada besarnya gaya geser dasar dan momen guling struktur *(overturning moment)*. Gaya geser tingkat mode ke-j (Respon Dinamik Struktur Elastis, Widodo, 2001) adalah :

$$F_j = k_j y_j \tag{3.53}$$

Dimana rumus gaya geser total (V) adalah :

$$V_j = \sum_{j=1}^{n} F_j \tag{3.54}$$

3.14.3 Momen Guling *(Overturning Moment)*

Momen guling didapat denagn mengalikan gaya lantai yang terjadi pada setiap tingkat (F_j) dengan jarak (h_j), maka :

$$M_j = \sum_{j=1}^{n} F_j H_j \tag{3.55}$$

3.15 Struktur dengan Menggunakan Setback

Bangunan menggunakan setback adalah bangunan dengan loncatan bidang muka. Bentuk Bangunan setback sangat bervariasi karena setback terdapat dua macam yaitu setback secara horizontal dan setback vertikal . Namun pada penelitian ini kami mengkhususkan pembahasan pada bangunan setback vertikal.

Oleh karena pada bangunan setback terdapat loncatan muka lantai sehingga bagian lantai yang mengalami loncatan muka akan terjadi perubahan nilai kekakuan (k) serta massa struktur (m). Perubahan nilai kekakuan dan massa struktur tersebut akan sangat berpengaruh terhadap nilai *mode shape, simpangan relative, interstoreydrift, gaya geser tingkat* serta *momen guling*. Selain itu berpengaruh pula terhadap besarnya perubahan simpangan (y) yang tersebut pada persamaan (3.51), simpangan antar tingkat (*interstorey drift*) yang tersebut pada persamaan (3.52), gaya horizontal tingkat (F_j) seperti yang tersebut dalam persamaan (3.53), gaya geser (V) yang tersebut pada persamaan (3.54) dan momen guling (M) seperti yang tersebut pada persamaan (3.55), dan juga Modal Effective Weight (E_w) seperti yang tersebut pada persamaan (3.56) serta Modal Effective Mass (E_m) seperti yang tersebut pada persamaan (3.57).

Modal Effective Weight untuk mode ke-j (Ew_j) menurut buku Respon Dinamik Struktur Elastis (Widodo, 2001) dapat dinyatakan dalam,

$$Ew_j = \frac{\left\{\sum_{i=1}^{m} W_i \phi_{ij}\right\}^2}{\sum_{i=1}^{m} W_i \phi_{ij}^2} \qquad (3.56)$$

Modal Effective Mass mode ke-j (Em_j) dapat ditulis dengan persamaan sebagai berikut,

$$Em_j = \frac{\left\{\sum_{i=1}^{m} m_i \phi_{ij}\right\}^2}{\sum_{i=1}^{m} m_i \phi_{ij}^2} \qquad (3.57)$$

Modal Effective Weight (Ew_i) serta Modal Effective Mass (Em_i) merupakan suatu parameter untuk menentukan hanya berapa mode yang boleh dipakai pada analisis respon struktur akibat adanya beban gempa. Menurut buku "Peraturan Perencanaan Tahan Gempa Indonesia Untuk Gedung" (PPTGIUG) 1983, menyatakan bahwa jumlah mode minimum yang harus dipakai untuk menghitung respon struktur adalah paling tidak telah memberikan 90% dari energi gempa. Sebagaimana diketahui bahwa mode-mode yang lebih tinggi relatif sulit dicari tapi kontribusinya terhadap respon struktur relatif rendah. Oleh karena itu kontribusi mode-mode yang lebih tinggi dapat diabaikan asalkan secara keseluruhan paling sedikit 90% energi gempa telah diakomodasi.

Masalah yang muncul adalah, seberapa besar pengaruhnya? Hal tersebutlah yang akan kami ambil sebagai pokok bahasan pada tugas akhir kami ini.

3.15 Statik Ekivalen

Dalam menganalisis respons gempa terdapat dua cara, yaitu secara dinamik dan secara statik ekivalen. Analisis secara dinamik sudah dijelaskan seperti di atas. Sedangkan analisis secara statik hanya memperhitungkan mode yang pertama dan mode tersebut diasumsikan mempunyai bentuk yang linear.

Analisis statik dapat dihitung dengan menggunakan rumus berikut:

$$F = \frac{W_i \times H_i}{\Sigma W_i \times H_i} \times V \qquad (3.58)$$

Dimana $$V_i = \frac{C_i \times I}{R} \times W_t \qquad (3.59)$$

Dengan, F = Gaya horisontal tingkat (kg)

W_i = Berat tiap tingkat (kg)

H_i = Tinggi tingkat (cm)

V = Gaya geser (kg)

C_i = Koefisien Respon Spektrum

I = Faktor Keutamaan Bangunan

R = Faktor Reduksi

W = Berat total struktur

Untuk menguatkan hasil dari perhitungan secara dinamik kami membandingkannya dengan cara statik ekivalen.

BAB IV

METODOLOGI PENELITIAN

Metodologi penelitian adalah langkah-langkah atau urutan pelaksanakan penelitian dalam rangka mencari jawaban atau pemecahan dari pokok permasalahan yang diambil. Permasalahan yang kami bahas diuraikan secara terstruktur dan sistematis. Dalam menyelesaiakan masalah-masalah yang ada dalam penelitian kami ini mendasarkan pada teori-teori yang ada, begitu juga dalam menarik kesimpulan berdasarkan pada hasil yang kami dapat dalam penelitian ini.

Dalam tugas akhir ini ada beberapa tahapan :

1. Pengumpulan data
2. Pengolahan data
3. Analisis dan pembahasan
4. Penarikan kesimpulan

Untuk menunjang penelitian ini, kami menggunakan *Microsoft Visual Basic 6.0* agar dapat memudahkan kami dalam menyelesaikan permasalahan yang muncul.

4.1 Pengumpulan Data

Data-data yang kami ambil diantaranya adalah data struktur beton yang diambil dari penelitian terdahulu, data percepatan beban gempa yang diambil dari rekaman percepatan tanah akibat gempa yang berupa riwayat waktu (*time history* percepatan tanah).

Perincian data tersebut adalah sebagai berikut :

4.1.1 Pemodelan Bangunan dan Dimensi

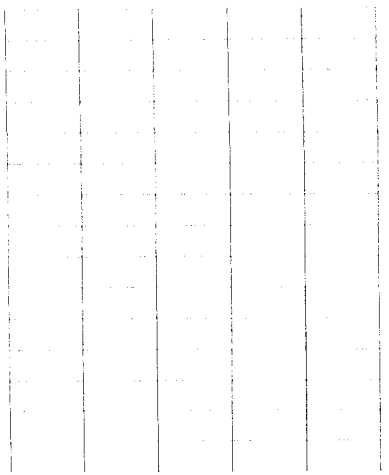
Data struktur beton yang diambil dengan variasi tingkat 7, 10, 15 dan 20 dengan jarak antar tingkat 4,0 m. Data-data dimensi diambil dari penelitian terdahulu. Untuk gambaran yang lebih jelas kami memberikan model struktur yang akan kami analisis, yaitu sebagai berikut :

Untuk variasi tingkat struktur bangunan

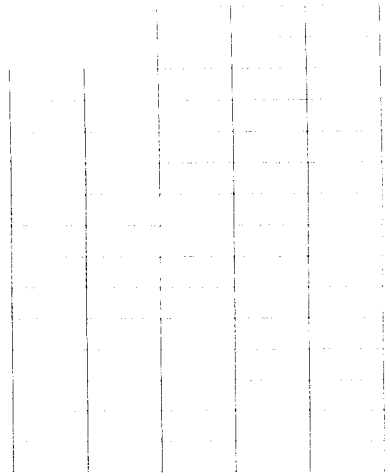
Struktur Tingkat	Tinggi antar Tingkat (m)	Jumlah Bentang	Jarak antar Bentang (m)	Dimensi Kolom (cm)	
				Kolom Tepi	Kolom Tengah
1-7	4,0	5	8,0	40 x 50	40 x 50
1-10	4,0	5	8,0	40 x 60	40 x 60
1-15	4,0	5	8,0	70 x 70	70 x 70
1-20	4,0	5	8,0	60 x 70	60 x 70

Data – data dan spesifikasi dari struktur beton adalah sebagai berikut:

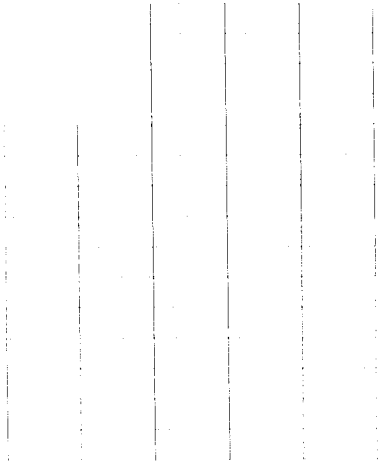
- Modulus Elastisitas Beton (E) : 2.10^5 kg/cm^2



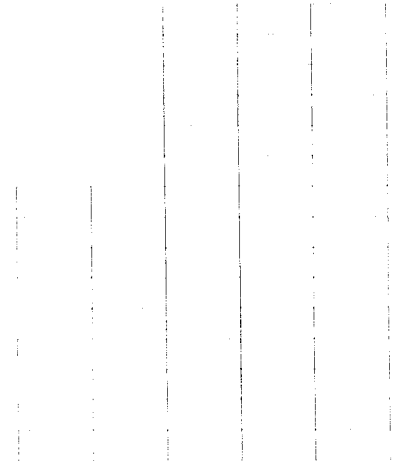
1) Pemodelan Struktur Tipikal Beton Bertulang



a) Pemodelan Struktur Setback 1 Beton Bertulang

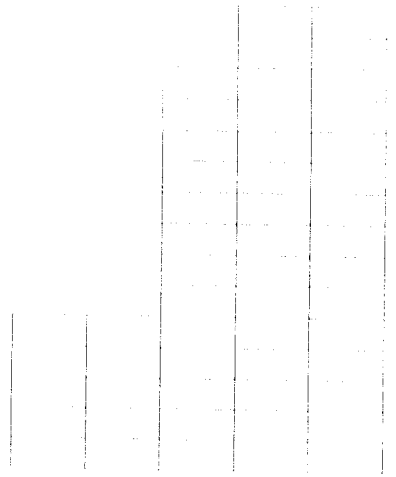


b) Pemodelan Struktur Setback 2 Beton Bertulang

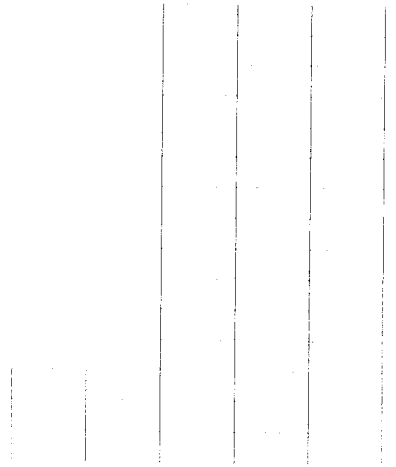


c) Pemodelan Struktur Setback 3 Beton Bertulang

d) Pemodelan Struktur Setback 4 Beton Bertulang

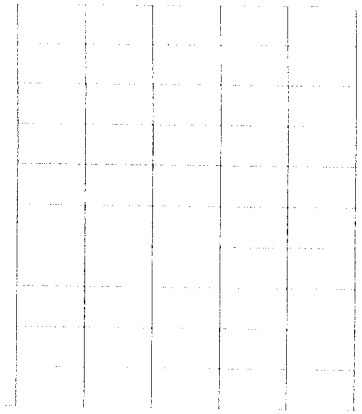


e) Pemodelan Struktur Setback 5 Beton Bertulang

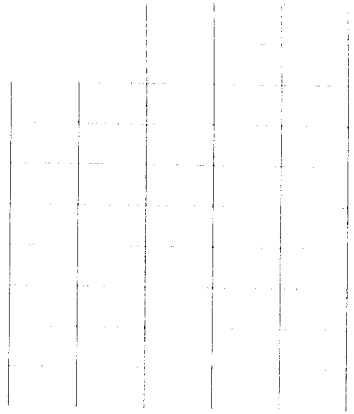


f) Pemodelan Struktur Setback 5 Beton Bertulang

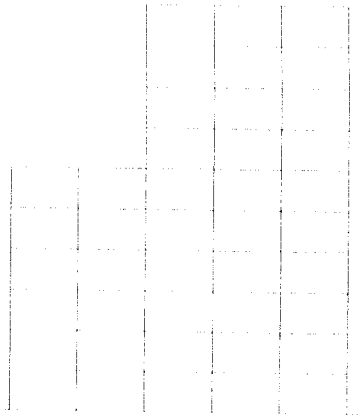
g) Pemodelan Struktur Setback 6 Beton Bertulang



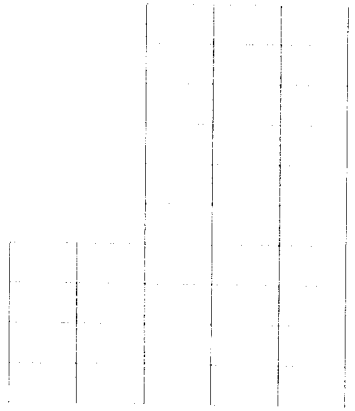
a) Pemodelan Struktur Tipikal Beton Bertulang



b) Pemodelan Struktur Setback 1 Beton Bertulang

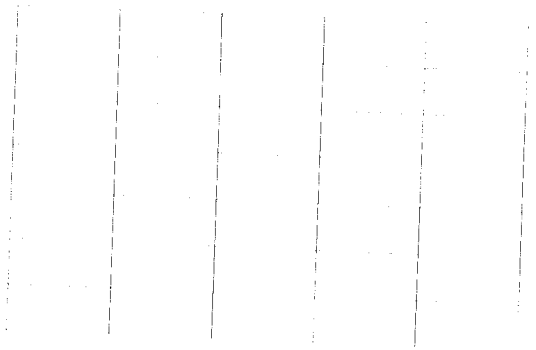


c) Pemodelan Struktur Setback 2 Beton Bertulang

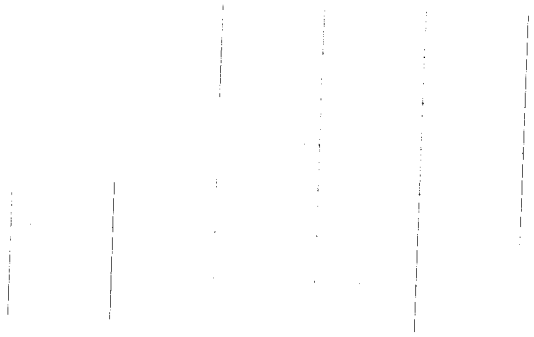


d) Pemodelan Struktur Setback 3 Beton Bertulang

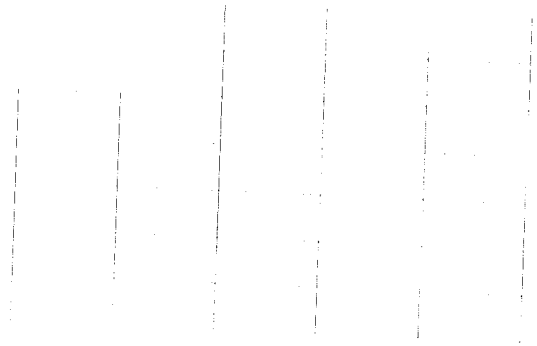
e) Pemodelan Struktur Setback 4 Beton Bertulang



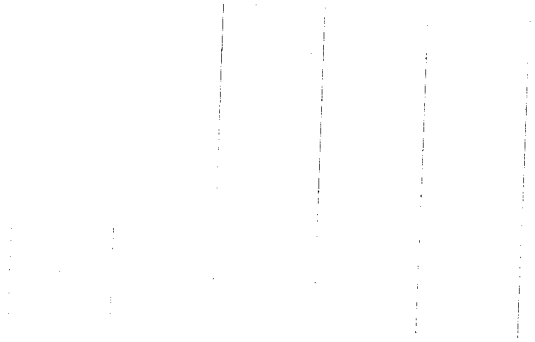
1) Pemodelan Struktur Tipikal Beton Bertulang



b) Pemodelan Struktur Setback 2 Beton Bertulang



a) Pemodelan Struktur Setback 1 Beton Bertulang



c) Pemodelan Struktur Setback 3 Beton Bertulang

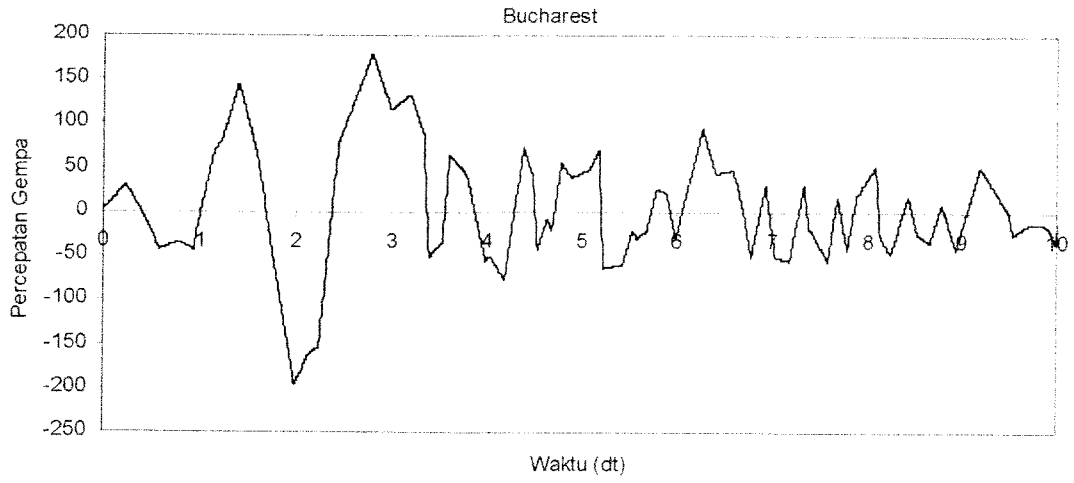
4.2.1 Data Gempa

Beban gempa yang dipergunakan pada tugas akhir ini diambil dari data beban gempa yang sudah ada. Pada riwayat gempa terdapat pengelompokkan jenis gempa, yaitu : gempa frekuensi tinggi, gempa frekuensi menengah, dan gempa frekuensi rendah. Pengelompokkan tersebut berdasarkan A/V rasio gempa (WK. Tso, T.J. Zhu dan A.C. Heidebrecht dalam "Jurnal Soil Dinamics and Earthquake Engineering (1992)" yang membahas "Engineering Implication of Ground Motion A/V Ratio") ,seperti di bawah ini :

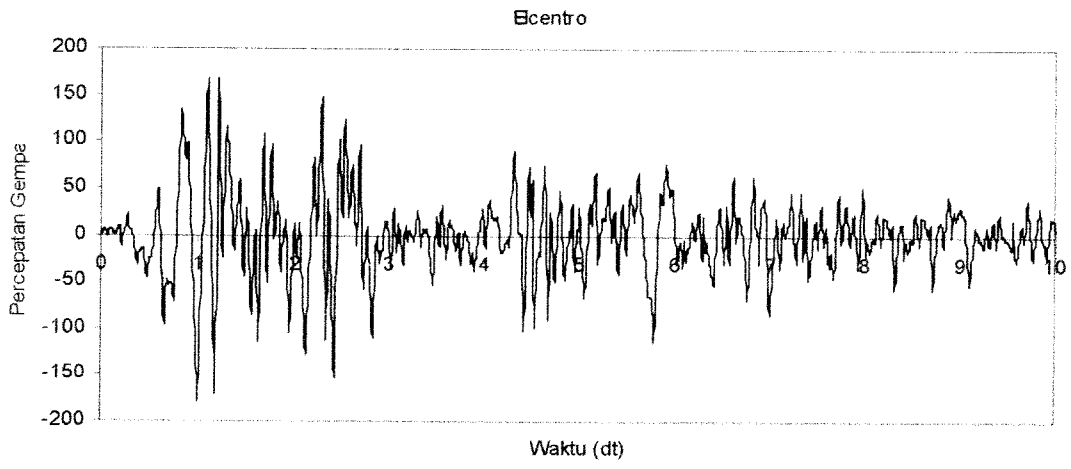
1. A/V > 1,2 Gempa Frekuensi Tinggi
2. 0,8 – 1,2 Gempa Frekuensi Menengah
3. < 0,8 Gempa Frekuensi Rendah

Analisis yang digunakan adalah pada riwayat gempa Bucharest, El Centro, Gilroy dan Koyna. Data kandungan frekuensi beban gempa (A/V rasio) merupakan perbandingan antara percepatan maksimum (A maks) dengan kecepatan maksimum (V maks) gerakan tanah akibat gempa. Data A/V rasio dapat dilihat pada table di bawah ini:

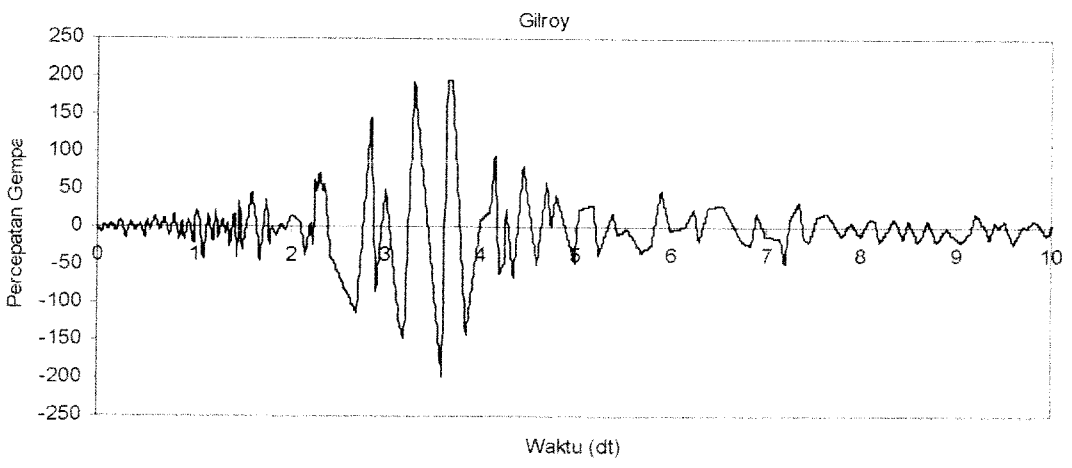
No.	Beban gempa	A maks (cm/dt^2)	V maks (cm/dt)	A/V rasio (sat/dt)	Keterangan
1	Bucharest	225.40	75.10	0.306	dari data
2	Elcentro	342.02	33.40	1.044	dari data
3	Gilroy	401.80	20.56	1.992	dari data
4	Koyna India	548.79	16.13	3.468	dari data



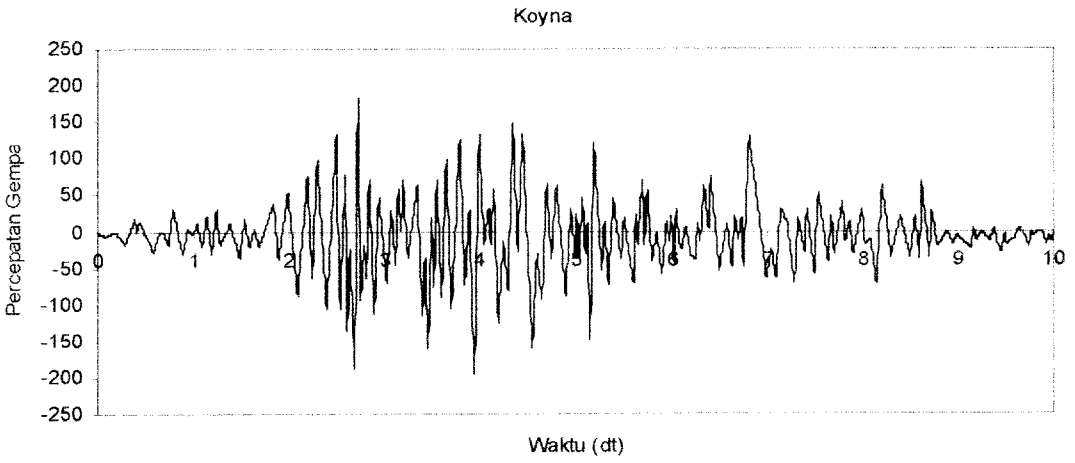
Gambar 4.16 Plot Percepatan Gempa Bucharest Normalisasi



Gambar 4.17 Plot Percepatan Gempa Elcentro Normalisasi



Gambar 4.18 Plot Percepatan Gempa Gilroy Normalisasi



Gambar 4.19 Plot Percepatan Gempa KoynaNormalisasi

4.2 Tahapan Analisa Dinamik

1. Menghitung massa dengan prinsip *Lumped Mass* sesuai persamaan (3.6)
2. Menghitung nilai kekakuan dengan prinsip *Shear Building* sesuai persamaan (3.7) dan (3.8)
3. Menyusun matriks [M] dan [K]
4. Menghitung *Mode Shape* sesuai persamaan (3.20) sampai dengan (3.23)
5. Menghitung frekuensi sudut ω sesuai persamaan (3.5)
6. Koreksi *Mode Shape* dengan Metode hubungan *orthogonal* sesuai persamaan (3.25)
7. Menghitung variable a, b dan $\hat{k}$ dengan metode *Central Difference* sesuai persamaan (3.50)
8. Menghitung *Modal Effective Weight* dan *Modal Effective Mass* sesuai persamaan (3.56) dan (3.57)
9. Menghitung *partisipasi* tiap mode (Γ) sesuai persamaan (3.41)

10. Menghitung Z, g sesuai persamaan (3.43) dan (3.49)
11. Menghitung simpangan struktur (y) sesuai persamaan (3.51)
12. Menghitung simpangan antar tingkat (*Interstorey Drift*) sesuai persamaan (3.52)
13. Menghitung gaya horizontal tingkat (F) sesuai persamaan (3.53)
14. Menghitung gaya horizontal tingkat komulatif / Gaya Geser (V) sesuai persamaan (3.54)
15. Menghitung momen guling (M) sesuai persamaan (3.55)
16. Membandingkan hasil penelitian antara bangunan setback vertikal dengan bangunan tipikal
17. Membandingkan respon secara dinamik dengan statik ekivalen sesuai persamaan (3.58)

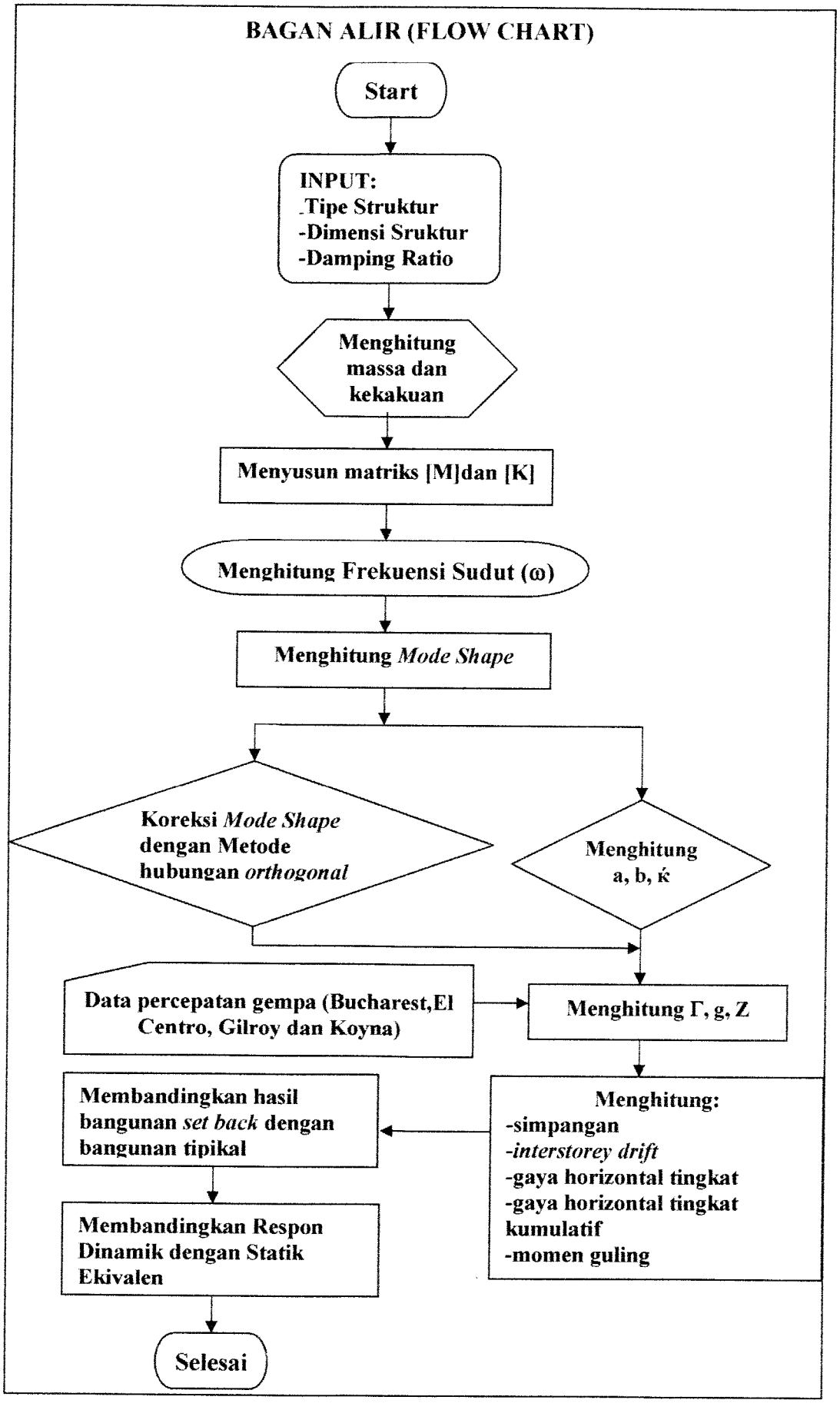
4.3 Perbandingan antara Respon Struktur Setback Vertikal dengan Statik Ekivalen

Suatu struktur selain diperhitungkan secara dinamik juga dihitung secara statik. Statik Ekivalen merupakan analisis yang hanya memperhitungkan mode pertama saja dan diasumsikan bahwa mode tersebut linear. Setelah mendapatkan hasik secara statik maka gaya horisontal tingkat, gaya geser serta momen guling yang dihitung secara dinamik dibandingkan dengan statik ekivalen.

4.4 Alat yang Dipakai

Untuk Mendukung analisis penelitian kami ini maka kami menggunakan program "PROGSIP 2006 RESPON DINAMIK STRUKTUR SETBACK

SECARA VERTIKAL". Program ini merupakan hasil revisi dari program-program sebelumnya dan karena dalam suatu kegiatan bersama dengan program "PROGSIP 2006 ANALISA STRUKTUR BANGUNAN SETBACK HORISONTAL TERHADAP RESPON DINAMIK PADA STRUKTUR BETON BERTINGKAT BANYAK" maka dari itu digunakan program komputer yang sama pula, hanya saja data input yang dimasukkan berbeda. Program ini dibuat dengan menggunakan bahasa visual basic yang menggunakan Ms. Visual Basic 6.0 (Hartanto (2002), Yanuar Supardi (2002), Irawan Sardi (2003), Nalwan (2004), Putra dan Indra (2004)). Bahasa dalam program dapat dilihat selengkapnya pada lampiran.


BAGAN ALIR (FLOW CHART)
Start
INPUT:
-Tipe Struktur
-Dimensi Sruktur
-Damping Ratio
Menghitung massa dan kekakuan
Menyusun matriks [M]dan [K]
Menghitung Frekuensi Sudut (ω)
Menghitung Mode Shape
Koreksi Mode Shape dengan Metode hubungan orthogonal
Menghitung a, b, ќ
Data percepatan gempa (Bucharest,El Centro, Gilroy dan Koyna)
Menghitung Γ, g, Z
Membandingkan hasil bangunan set back dengan bangunan tipikal
Menghitung:
-simpangan
-interstorey drift
-gaya horizontal tingkat
-gaya horizontal tingkat kumulatif
-momen guling
Membandingkan Respon Dinamik dengan Statik Ekivalen
Selesai

BAB V

HASIL ANALISIS DAN PEMBAHASAN

5.1 Pendahuluan

Dalam menganalisis penelitian ini kami menggunakan program PROGSIP 2006 yang merupakan modifikasi dari PROGSIP 2004 dari penelitian Tugas Akhir Terdahulu. Program ini merupakan program yang dibuat dengan bahasa *Microsoft Visual Basic 6.0* merupakan salah satu alat bantu untuk mempermudah perhitungan. Program ini mengaplikasikan hitungan manual yang telah dijelaskan pada landasan teori. Input dalam ProgSip 2006 berupa massa, jumlah bentang, skala gempa, lebar bentang tepi dan bentang tengah, jarak antar tingkat, ukuran kolom tepi dan tengah, data percepatan gempa, dumping rasio, dan file tempat menyimpan hasil. Perhitungan analisa dinamik pertama adalah menghitung kekakuan dan *mode shape*, selanjutnya setelah *mode shape* didapatkan kemudian dilanjutkan dengan menghitung simpangan netto, simpangan antar tingkat *(Interstorey Drift)*, Gaya horizontal tingkat (F), gaya horizontal tingkat kumulatif (V) dan momen guling yang semuanya itu merupakan respon struktur akibat beban dinamik berupa percepatan tanah (gempa). Setelah perhitungan selesai, lalu dibuat grafik.

Hal di atas dihitung dengan memvariasikan dari data yang sudah ada. Variasi-variasi perhitungan dalam tugas akhir ini terdiri dari variasi beban gempa, yaitu variasi beban gempa Bucharest, gempa Elcentro, gempa Gilroy dan gempa Koyna. Variasi yang lainnya adalah dengan memvariasikan tinggi tingkat struktur

yaitu dengan mengambil struktur 7 tingkat, struktur 10 tingkat, struktur 15 tingkat dan struktur 20 tingkat. Sedangkan struktur tersebut di atas dibedakan menjadi beberapa jenis struktur setback sesuai dengan banyaknya pengurangan muka lantainya.

Dalam menganalisis kami membandingkan hasil perhitungan secara manual dengan hasil perhitungan yang menggunakan program PROGSIP 2006. Dari hasil perbandingan kita dapat mencari tingkat ketelitian dari masing-masing cara perhitungan. Analisis ini juga membandingan hasil perhitungan bangunan tipikal dengan bangunan setback.

5.2 Perhitungan Massa dan Kekakuan Struktur

Dalam perhitungan diperlukan penyederhanaan-penyederhanaan sehingga muncul asumsi/anggapan-anggapan. Anggapan yang dipakai dalam penelitian ini adalah *lumped mass* dan *shear building*. Dengan anggapan tersebut maka massa dihitung pada tiap tingkat dan menggumpal di tengah bentang. Sedangkan kekakuan dihitung dengan prinsip *Shear Building* (secara parallel) dimana kekakuan tiap tingkat merupakan penjumlahan dari kekakuan tiap kolom.

Data massa struktur diambil dari penelitian Tugas Akhir Joni Irawan (2001). Adapun hasil perhitungan massa dapat dilihat pada table 5.1 di bawah ini:

Tabel 5.1 Hasil perhitungan massa

- Struktur bangunan **tingkat 7**

No	Tingkat	Massa (kg.dt^2/cm)
1	1, 2, 3, 4, 5, 6	64,5351
2	7	31,3866

- Struktur bangunan **tingkat 10**

No	Tingkat	Massa (kg.dt^2/cm)
1	1	97,27216
2	2, 3, 4	100,38139
3	5, 6, 7, 8, 9	97,27216
4	10	60,59232

- Struktur bangunan **tingkat 15**

No	Tingkat	Massa (kg.dt^2/cm)
1	1	129,71625
2	2, 3, 4, 5	136,20506
3	6, 7, 8, 9	129,71625
4	10, 11, 12, 13, 14	122,14596
5	15	80,32943

- Struktur Bangunan **tingkat 20**

No	Tingkat	Massa (kg.dt^2/cm)
1	1	648,5813
2	,2, 3, 4, 5, 6, 7, 8, 9	681,0253
3	10, 11, 12, 13, 14	648,5813
4	15, 16, 17, 18, 19	610,7298
5	20	401,6472

Perhitungan kekakuan menggunakan prinsip *shear building* dimana kolom tidak dipengaruhi oleh balok yang menghubungkan kolom-kolom yang ada. Kekakuan kolom dapat dihitung dengan persamaan (3.7). Berdasarkan persamaan tersebut maka kekakuan dapat dihitung sebagai berikut,

$$K = \frac{12EI}{H^3} \qquad \text{dan} \qquad I = \frac{1}{12} * b * h^3$$

Dengan nilai E = $2{,}0x10^5$ kg/cm^2 dan H = 400 cm

$$K_{tepi} = \frac{12 * 2.0x10^5 * 4{,}167x10^5}{(400)^3} = 15625 \text{ kg/cm}$$

$$K_{tengah} = \frac{12 * 2.0x10^5 * 4,167x105}{(400)^3} = 15625 \text{ kg/cm}$$

$$K_{total} = \Sigma K_{tepi} + \Sigma K_{tengah} = 78125 \text{ kg/cm}$$

Hasil perhitungan tentang kekakuan disajikan pada tabel 5.2 berikut,

Tabel 5.2 Hasil perhitungan kekakuan struktur

- Struktur **tingkat 7**

Tipe Struktur	Tingkat	Kekakuan (kg/cm)
Tipikal	1 - 7	78125
Setback 1	1 - 7	78125
Setback 2	1 - 7	78125
Setback 3	1 - 7	78125

- Struktur **tingkat 10**

Tipe Struktur	Tingkat	Kekakuan (kg/cm)
Tipikal	1 - 10	135000
Setback 1	1 - 10	135000
Setback 2	1 - 10	135000
Setback 3	1 - 10	135000
Setback 4	1 - 10	135000

- Struktur **tingkat 15**

Tipe Struktur	Tingkat	Kekakuan (kg/cm)
Tipikal	1 - 15	375156.25
Setback 1	1 - 15	375156.25
Setback 2	1 - 15	375156.25
Setback 3	1 - 15	375156.25
Setback 4	1 - 15	375156.25
Setback 5	1 - 15	375156.25
Setback 6	1 - 15	375156.25

- Struktur **tingkat 20**

Tipe Struktur	Tingkat	Kekakuan (kg/cm)
Tipikal	1 - 20	321562.5
Setback 1	1 - 20	321562.5
Setback 2	1 - 20	321562.5
Setback 3	1 - 20	321562.5
Setback 4	1 - 20	321562.5
Setback 5	1 - 20	321562.5
Setback 6	1 - 20	321562.5
Setback 7	1 - 20	321562.5
Setback 8	1 - 20	321562.5
Setback 9	1 - 20	321562.5

5.3 Analisis Respon Struktur Akibat Beban Gempa

Analisis respon struktur akibat beban gempa merupakan plot nilai-nilai yang dihasilkan oleh program PROGSIP 2006 yang sudah dimasukkan data percepatan gempa. Data percepatan gempa yang digunakan dalam penelitian ini adalah gempa Bucharest mewakili gempa dengan frekuensi rendah, gempa El Centro dan gempa Gilroy mewakili gempa dengan frekuensi sedang, dan gempa Koyna mewakili gempa dengan frekuensi tinggi.

Analisa pada penelitian ini ditinjau dari kontribusi perhitungan *mode shape*, simpangan struktur, simpangan antar tingkat, gaya horizontal tingkat, gaya horizontal tingkat kumulatif dan momen guling.

5.4 Pembahasan

Pada pembahasan akan ditinjau lebih jauh mengenai hal-hal yang didapatkan pada analisa respon struktur akibat beban gempa yang merupakan plot dari nilai-nilai yang dihasilkan oleh program PROGSIP 2006. Sejauh mana tingkat toleransi bangunan setback dengan acuan bangunan tipikal terhadap percepatan gempa. Dengan menggunakan parameter respons struktur yaitu *mode*

shape, simpangan netto, simpangan antar tingkat*(interstorey drif)*, gaya horizontal tingkat, gaya geser tingkat dan momen guling. Selain itu juga terhadap percepatan gempa yang berbeda. gempa yang dipakai dalam penelitian ini adalah gempa *Bucharest*, gempa *El Centro*, gempa *Gilroy* dan gempa *Koyna*. Gempa-gempa tersebut adalah perwakilan dari gempa rendah, sedang dan tinggi.

5.4.1 Kontribusi Mode Shape, Partisipasi Mode, Modal Effective(Ew dan Em)

a. Mode Shape

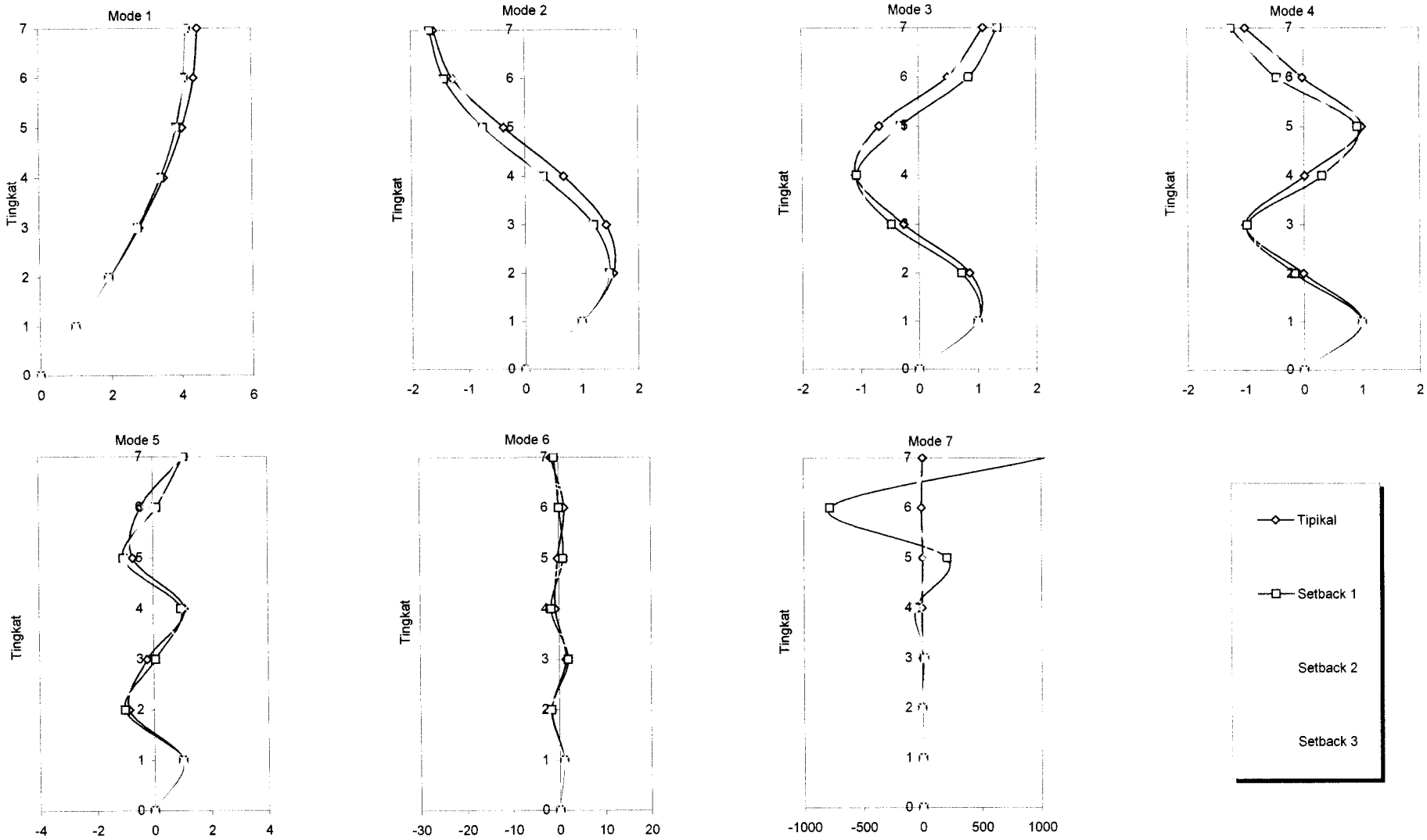
Mode shape merupakan ragam pola goyangan dari suatu struktur dan digunakan sebagai salah satu parameter dalam membandingkan bangunan tipikal dengan bangunan setback vertikal. Dihitung berdasarkan atas persamaan (3.20) sampai dengan persamaan (3.23).

Dalam program PROGSIP 2006 ini, sebagai langkah awal adalah menghitung mode shape. Mode shape struktur tingkat 7, 10, 15 dan 20 disajikan pada Gambar 5.1 sampai dengan Gambar 5.4. Dari hasil grafik mode shape pada Gambar 1 sampai dengan Gambar 10, tampak bahwa kecenderungan nilai mode-mode dari struktur bangunan tipikal sampai setback yang paling kritis semakin mengecil baik untuk bangunan tingkat 7, 10, 15 dan 20, hal ini dipengaruhi karena adanya pengurangan muka lantai secara vertikal (setback vertikal). Pada bangunan bertingkat 7, setback 1 mempunyai mode shape paling besar sehingga kemungkinan terjadinya kerusakan juga semakin besar.

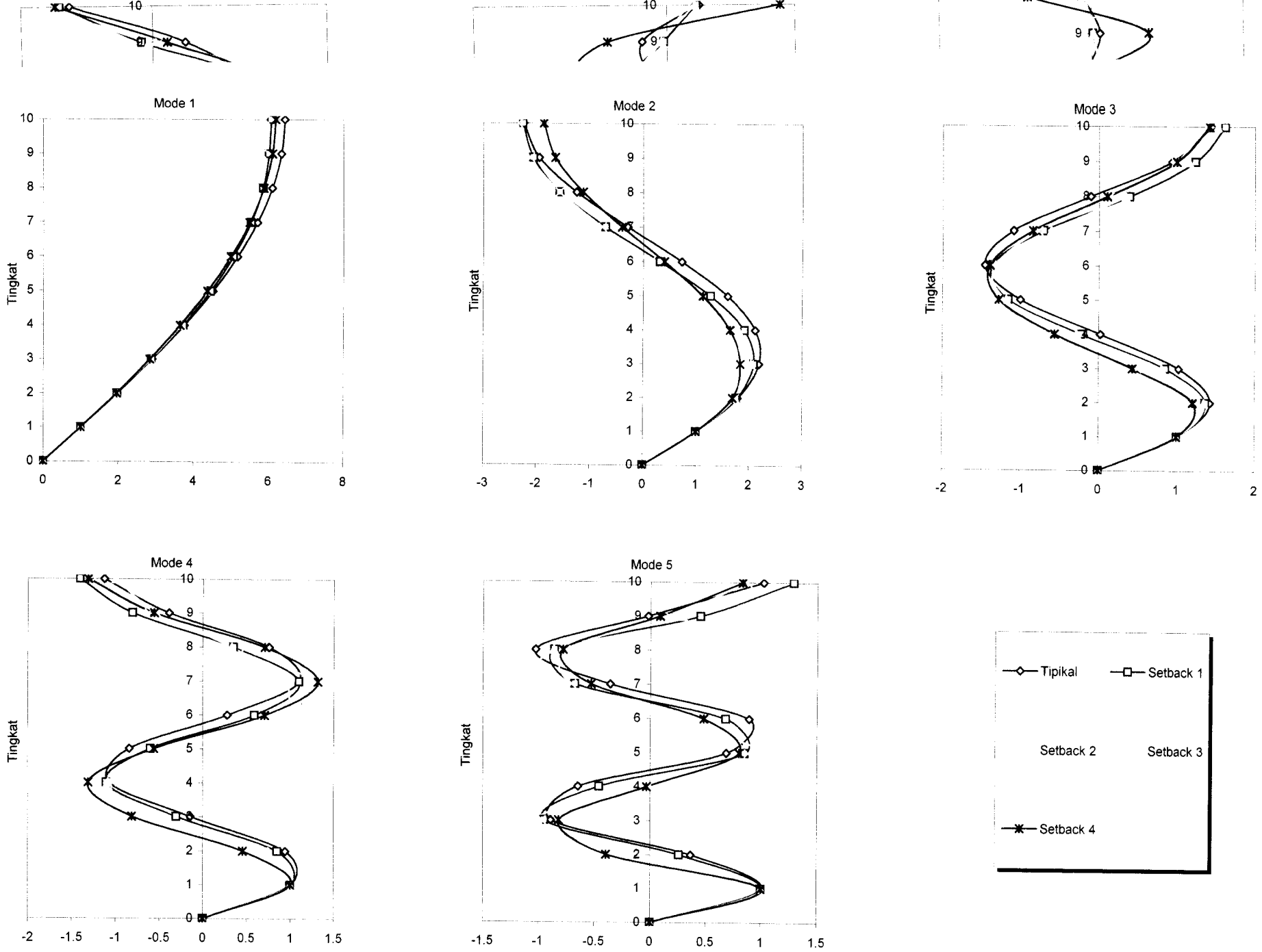
Dengan tinjauan tersebut maka nilai mode shape sesudah adanya setback vertikal nilainya akan semakin mengecil. Pada mode kedua dan seterusnya hal serupa juga terjadi.

Pada tingkat dimana terjadi pengurangan muka lantai dan secara tidak langsung nilai massa dan kekakuan kolomnya juga akan berkurang (pada tingkat tersebut) maka nilai mode shape menjadi tidak teratur. Dengan kata lain, nilai massa dan kekakuan kolom menentukan variasi pola/ragam goyangan (*mode shape*) struktur.

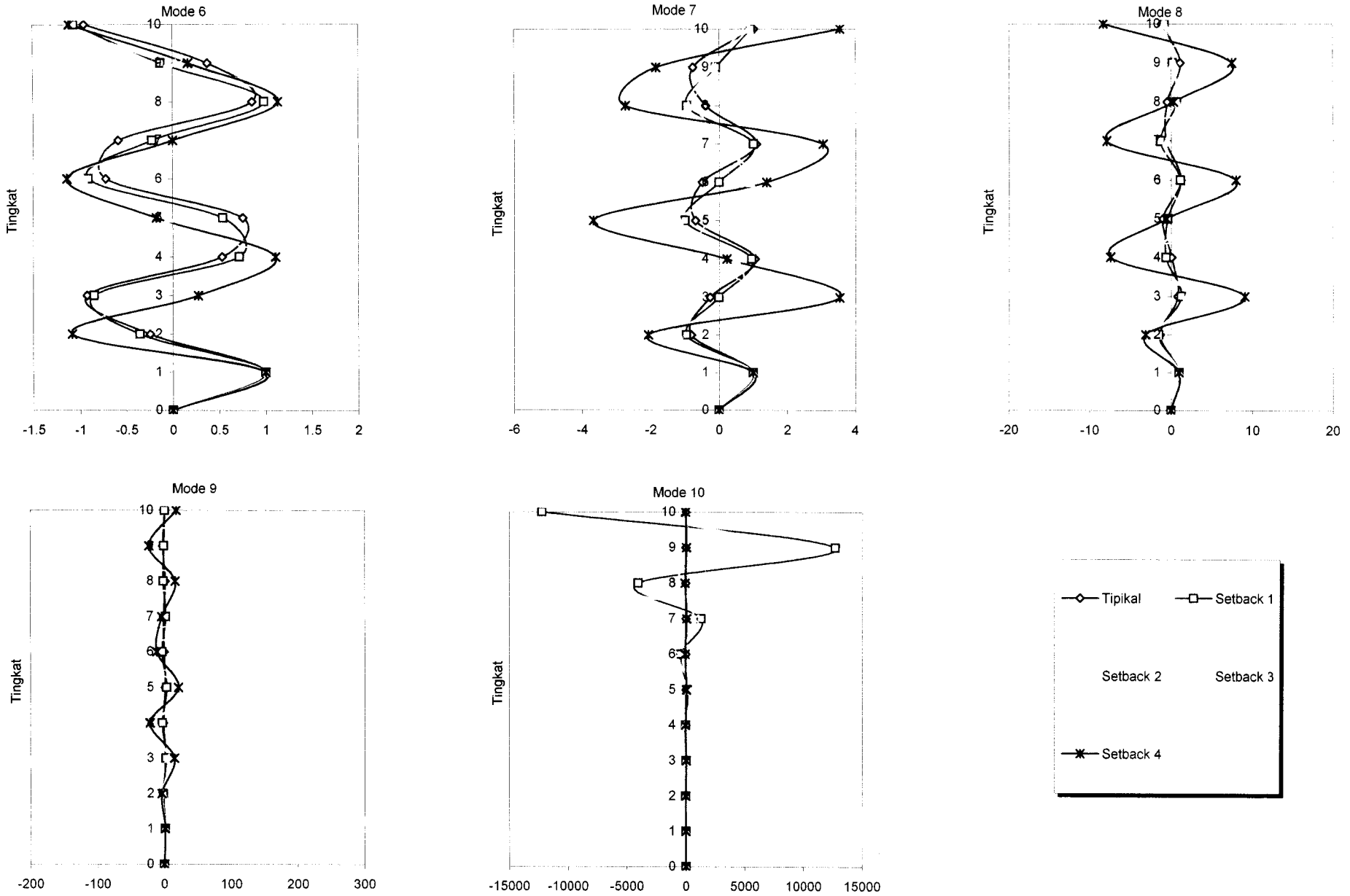
Nilai-nilai *mode shape* (pola/ragam goyangan) tidak bergantung terhadap percepatan gempa ,akan tetapi bergantung pada massa struktur dan kekakuan kolom



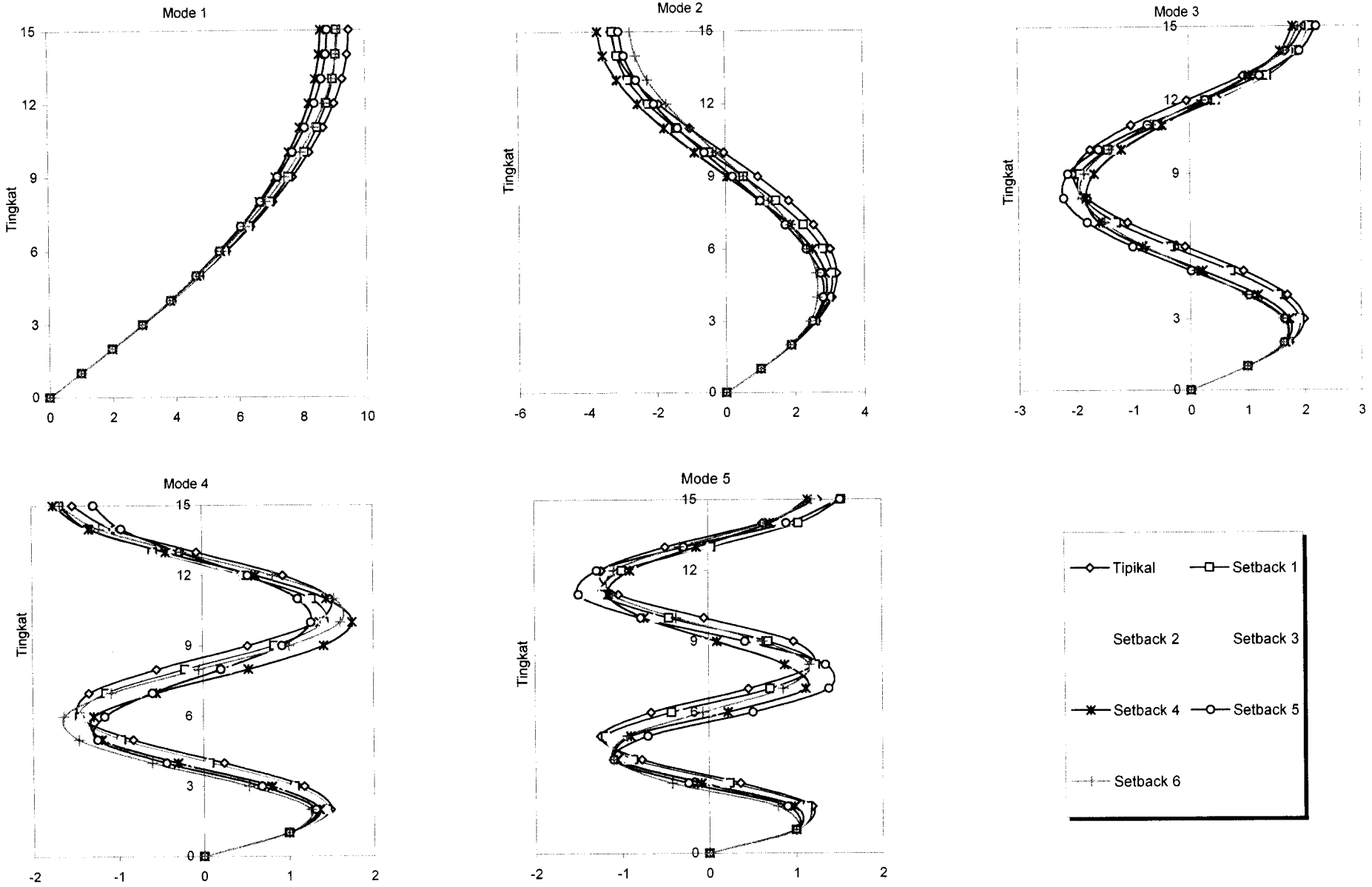
Gambar 5.1 Perbandingan Mode Shape Struktur Tingkat 7



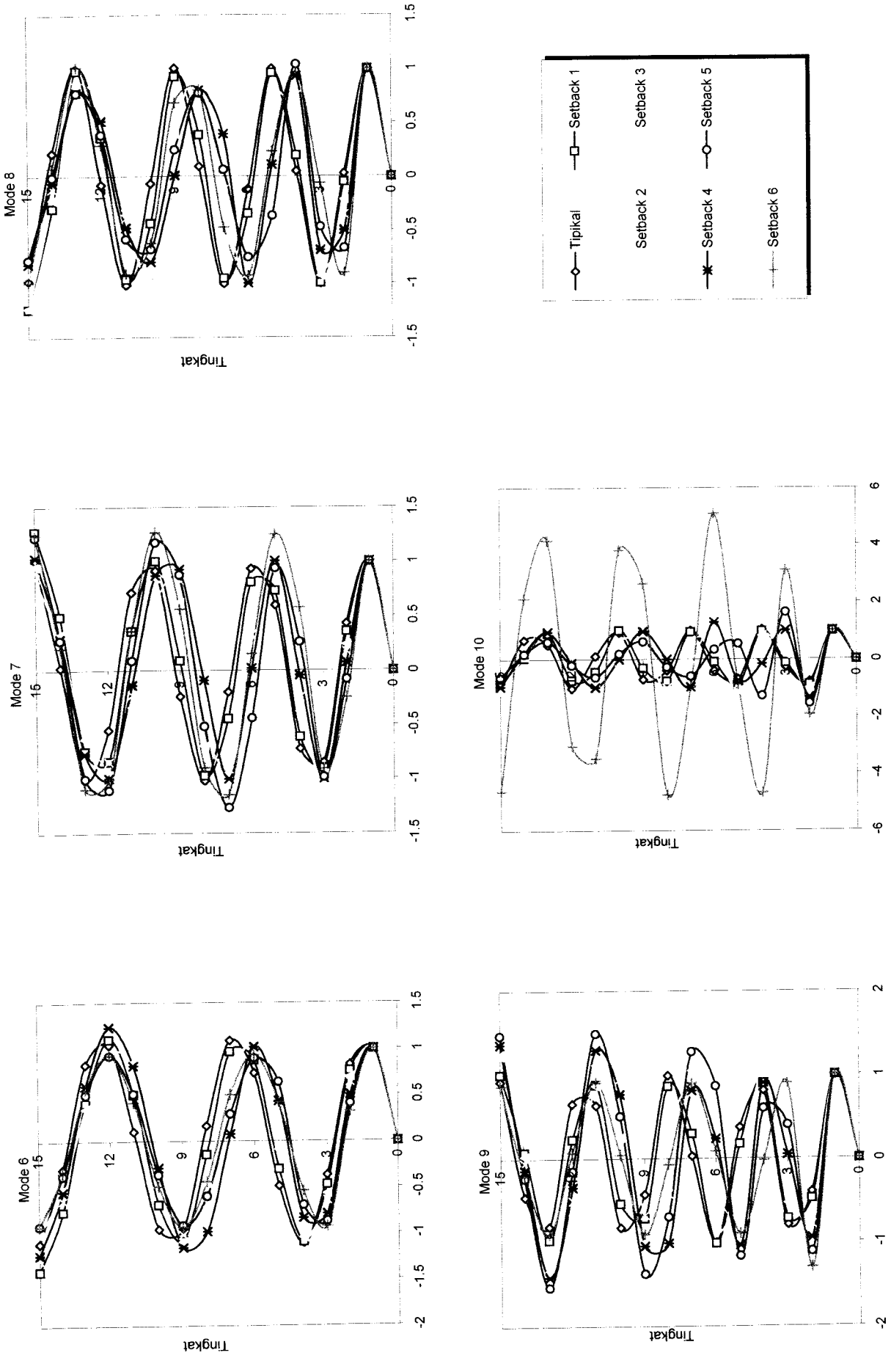
Gambar 5.2 Perbandingan Mode Shape Struktur Tingkat 10



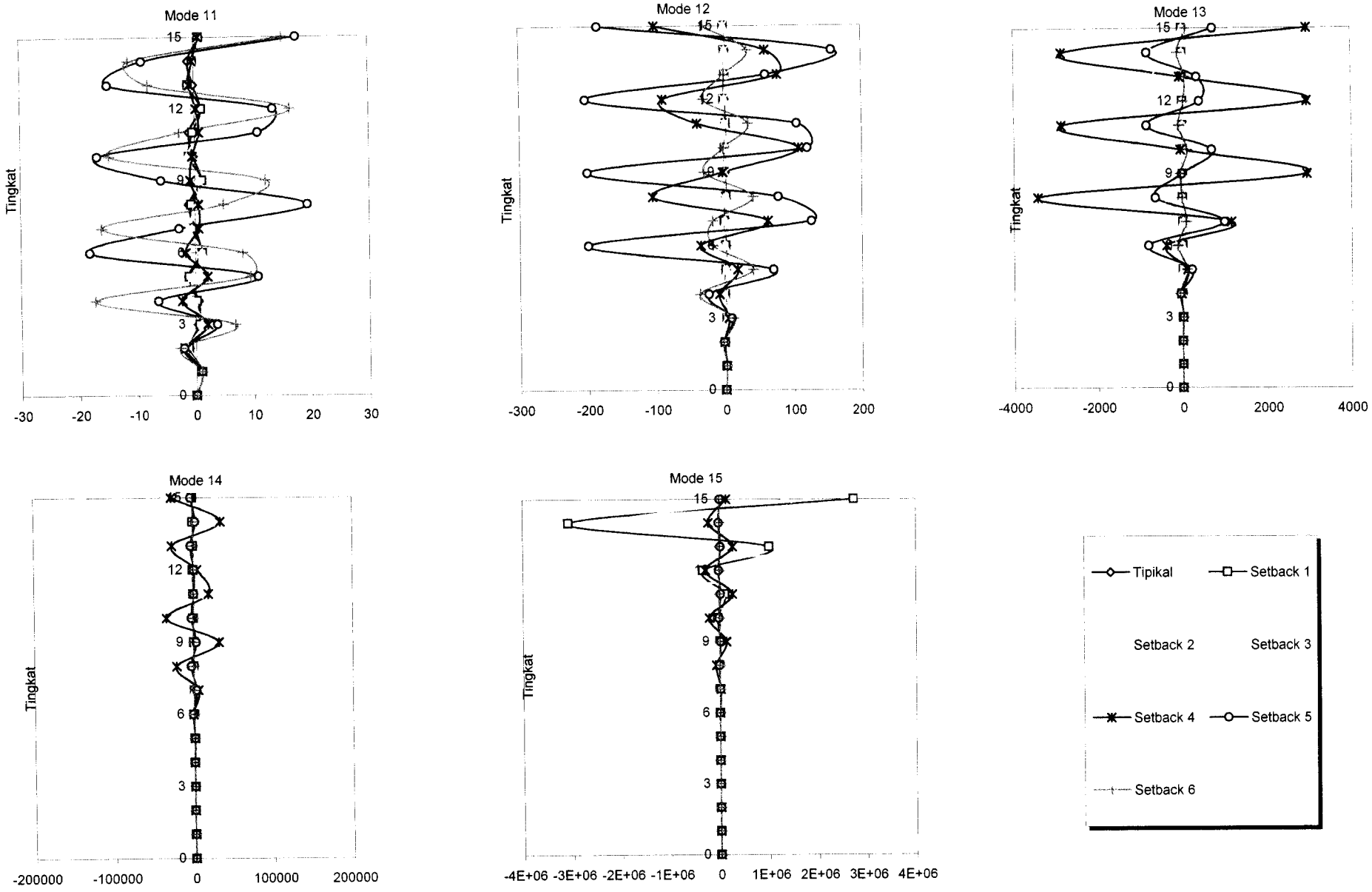
Gambar 5.2 Perbandingan Mode Shape Struktur Tingkat 10



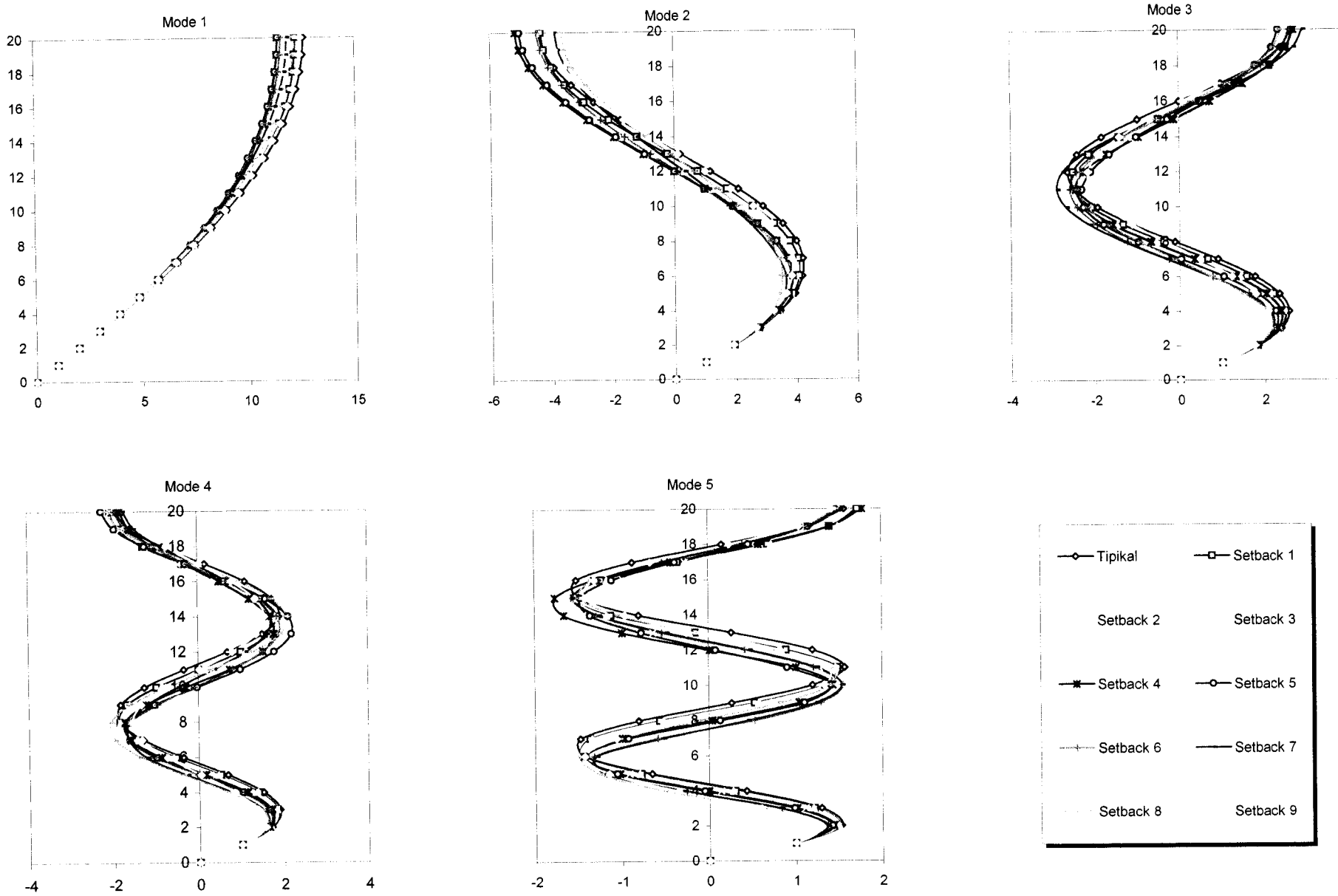
Gambar 5.3 Perbandingan Mode Shape Struktur Tingkat 15



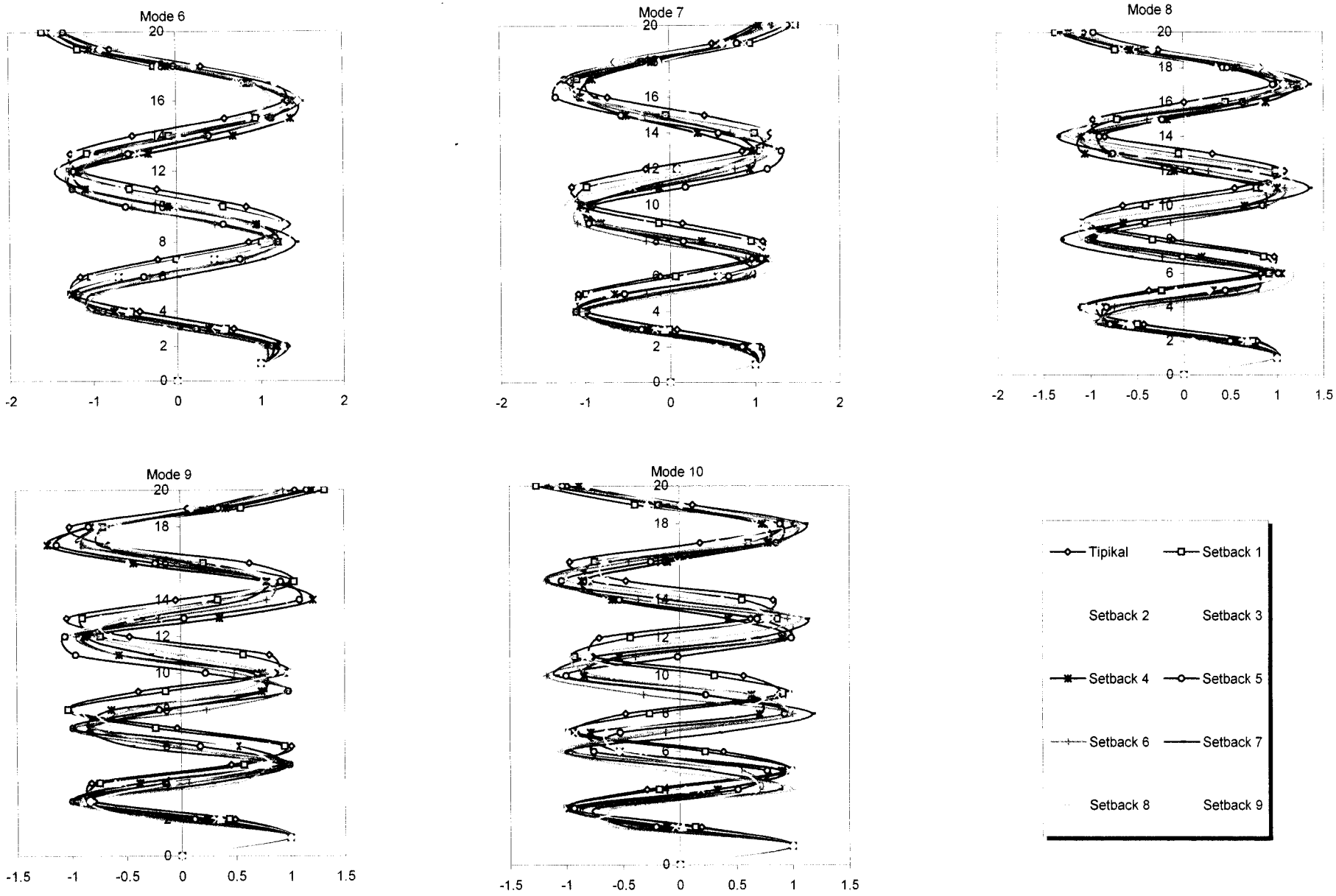
Gambar 5.3 Perbandingan Mode Shape Struktur Tingkat 15



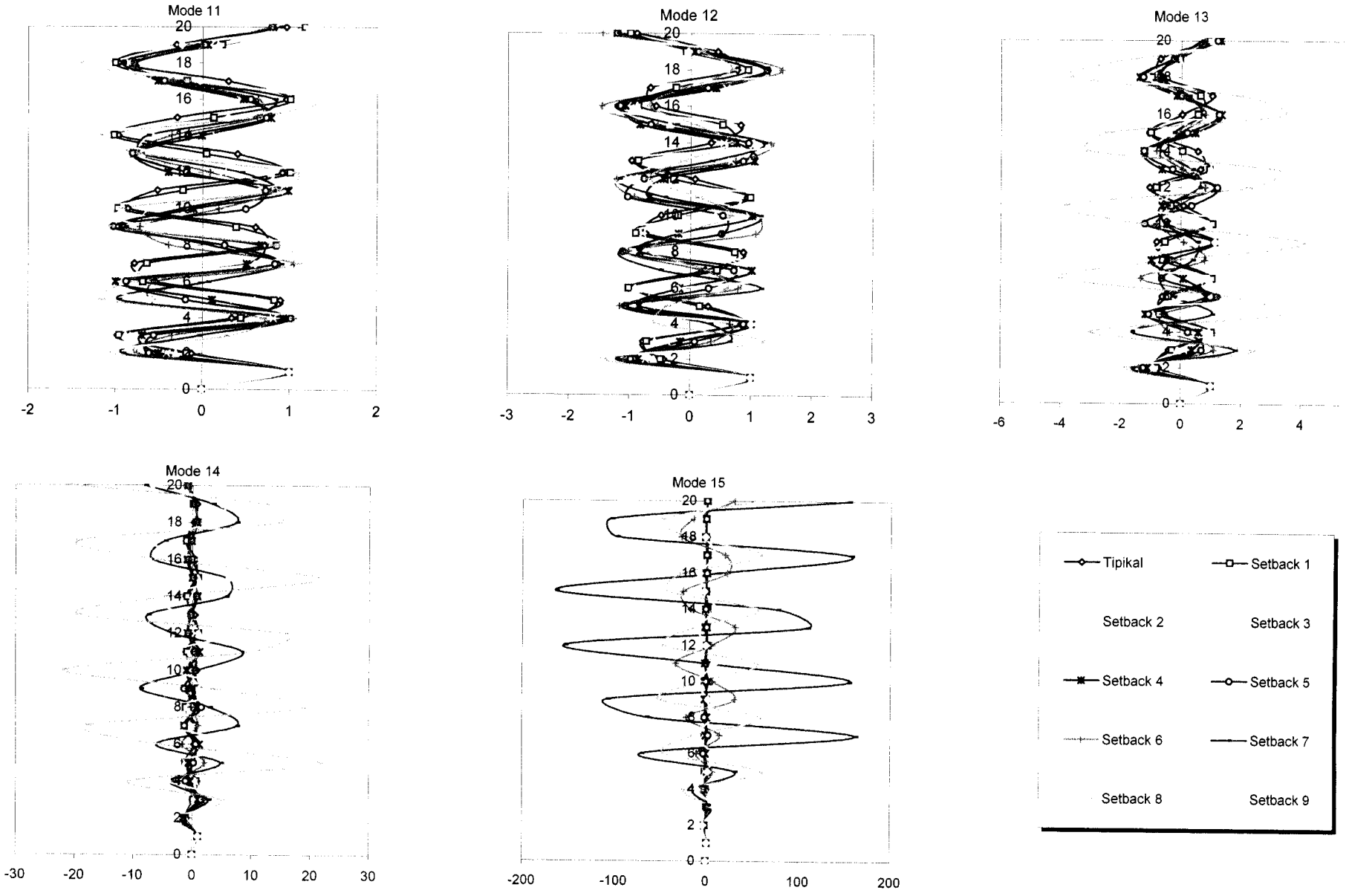
Gambar 5.3 Perbandingan Mode Shape Struktur Tingkat 15



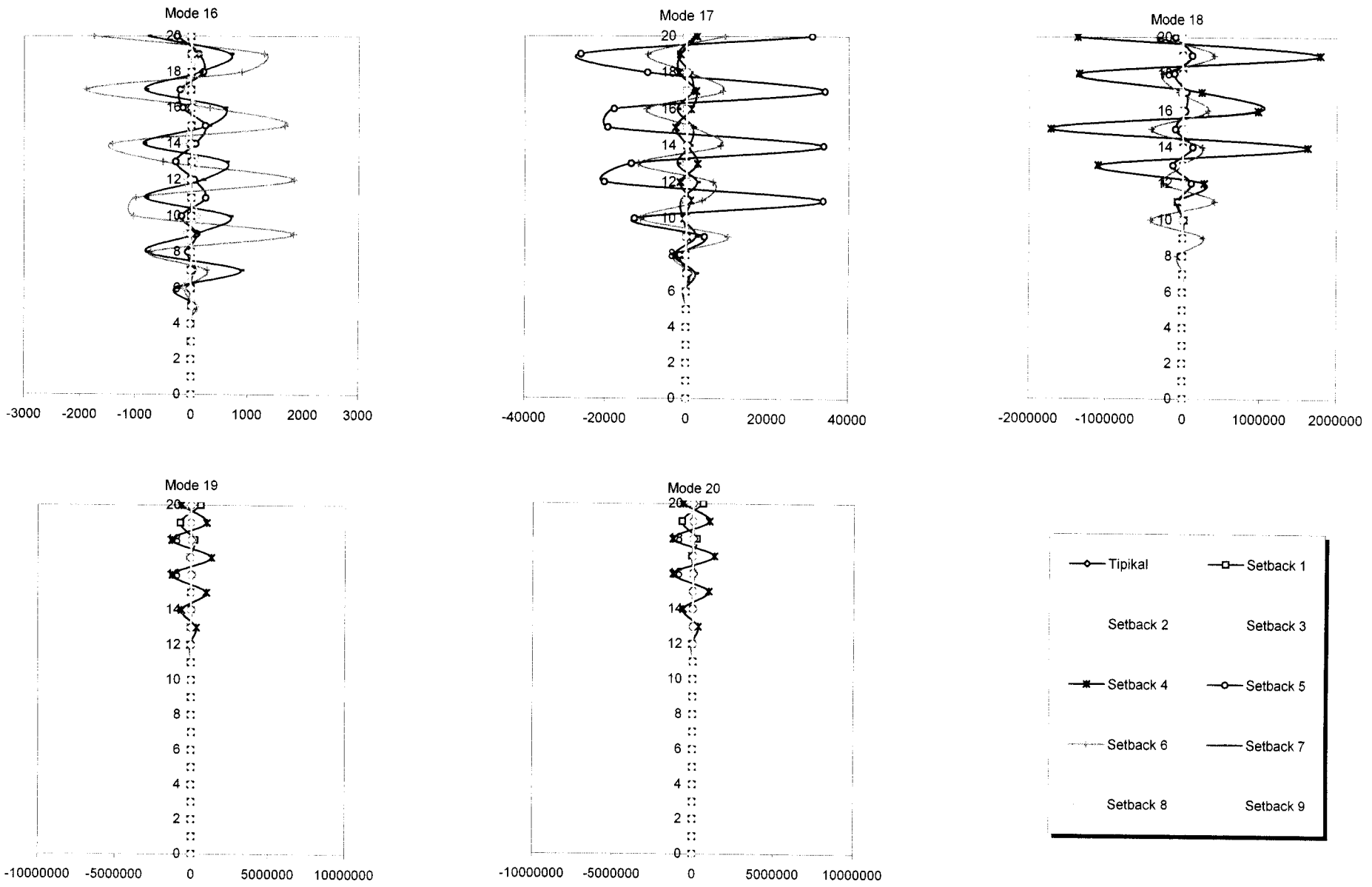
Gambar 5.4 Perbandingan Mode Shape Struktur Tingkat 20



Gambar 5.4 Perbandingan Mode Shape Struktur Tingkat 20



Gambar 5.4 Perbandingan Mode Shape Struktur Tingkat 20



Gambar 5.4 Perbandingan Mode Shape Struktur Tingkat 20

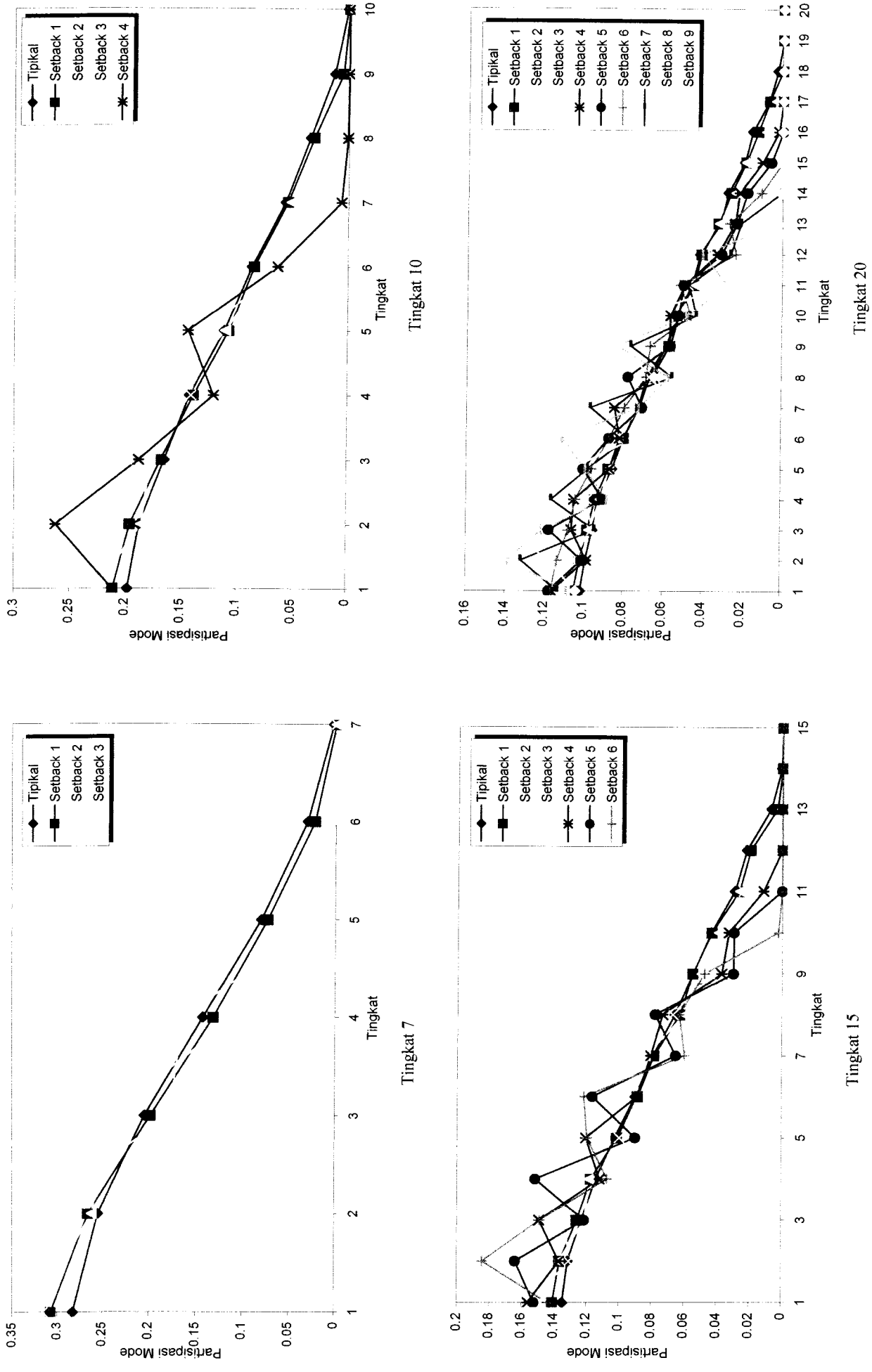
b. Partisipasi Mode

Partisipasi mode merupakan besarnya kontribusi mode dalam menentukan besar simpangan. Partisipasi mode untuk struktur bangunan tingkat 7, 10, 15 dan 20 disajikan pada Gambar 5.5. Dari hasil grafik Gambar 5.6 tampak bahwa semakin tinggi tingkat suatu struktur maka nilai partisipasi mode yang diberikan akan semakin kecil.

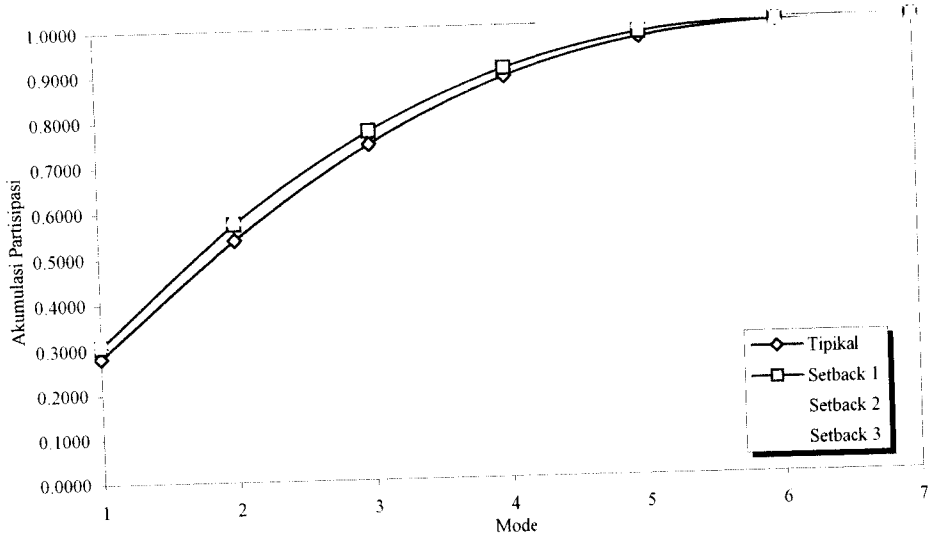
Walaupun dari gambar terlihat bahwa partisipasi mode tidak beraturan tetapi pada bangunan tipikal sampai setback yang paling kritis, nilai mode pertama (pada tingkat paling bawah) memberikan nilai partisipasi mode yang terbesar. Semakin ke atas semakin mengecil. Pada tingkat paling atas mempunyai nilai partisipasi mode mendekati nol. Hal ini disebabkan karena nilai P_j^* sebagai pembilang semakin ke atas semakin mengecil sebab pada tingkat pertama semua nilai mode shape bernilai positif sedangkan untuk tingkat di atasnya terdapat mode shape yang bernilai negatif sehingga jika dikalikan dengan matriks massa akan mengurangi nilai P_j^* itu sendiri.

Nilai partisipasi mode terbesar pada struktur tingkat 7, 10, 15 serta 20 terdapat pada bangunan setback vertikal yang paling kritis. Dari gambar 5.5 juga dapat kita lihat bahwa semakin tinggi suatu bangunan maka mempunyai nilai partisipasi mode yang semakin rapat dan tidak beraturan (fluktuatif).

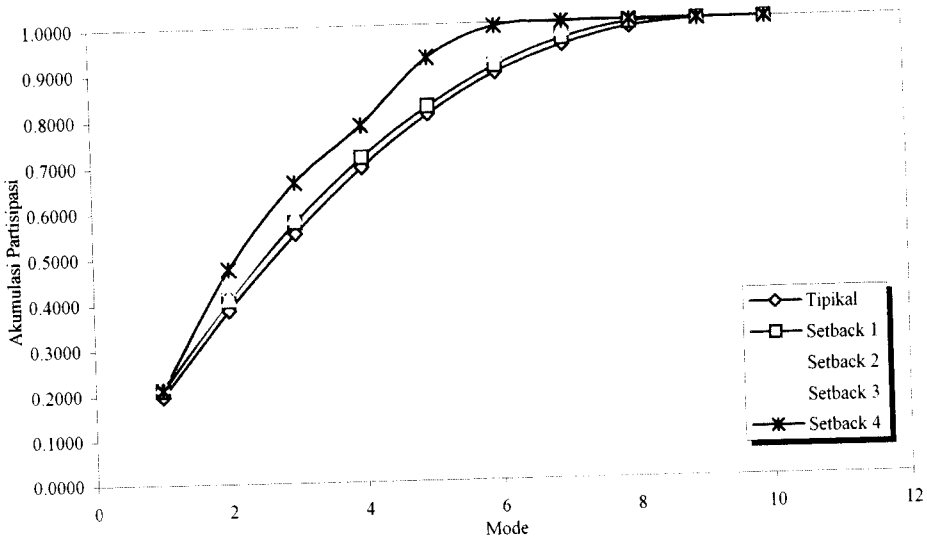
Sebagai bahan koreksinya yaitu akumulasi dari partisipasi setiap mode adalah satu atau nilai partisipasi mode dari suatu bangunan jika dijumlahkan hasilnya adalah satu. Ini berarti nilai partisipasi mode hasil dari perhitungan tersebut benar.



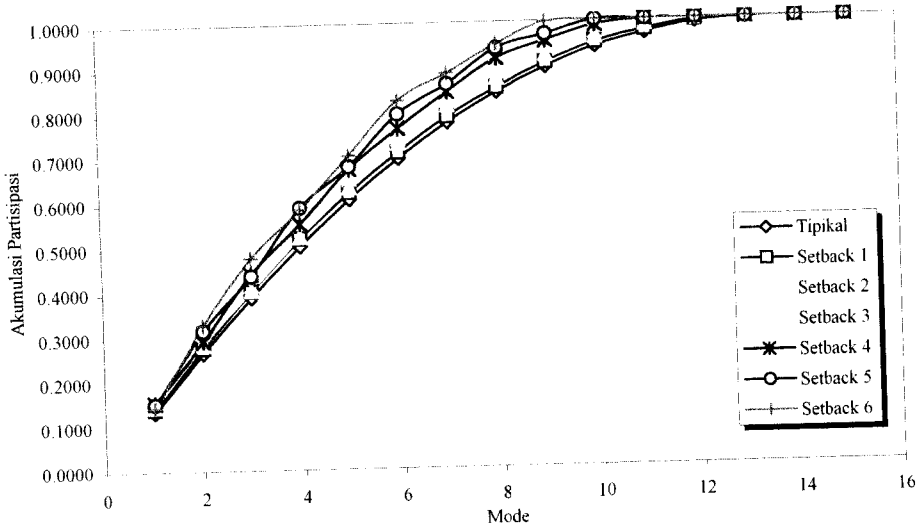
Gambar 5.5 Perbandingan Partisipasi Mode Struktur Bertingkat



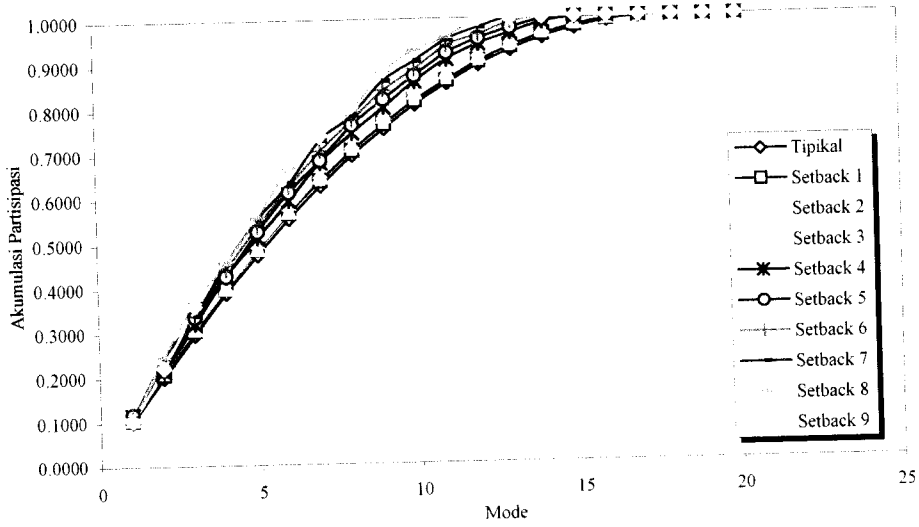
Tingkat 7



Tingkat 10



Tingkat 15



Tingkat 20

Gambar 5.6 Perbandingan Akumulasi Partisipasi Mode Struktur Bertingkat

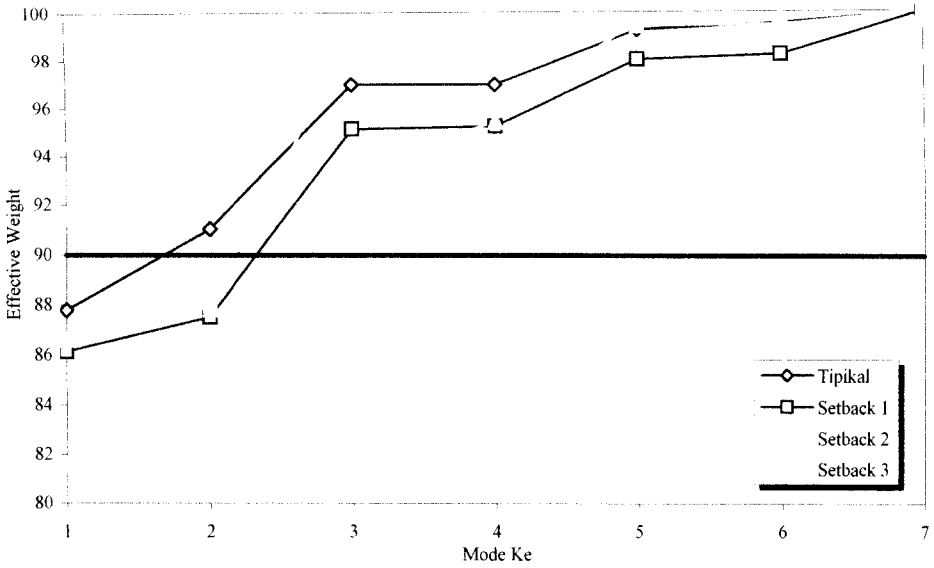
c. Modal Effective

Dari hasil Program PROGSIP 2006 ini dapat disajikan *Modal Effective Weight* dan *Modal Effective Mass* untuk struktur bangunan tingkat 7, 10, 15 dan 20 pada Gambar 5.7 sampai dengan Gambar 5.10.. Dari Gambar 5.7 sampai dengan Gambar 5.10 dapat dilihat bahwa nilai *Modal Effective Weight (Ew)* dan *Modal Effective Mass (Em)* semakin ke atas semakin kecil.

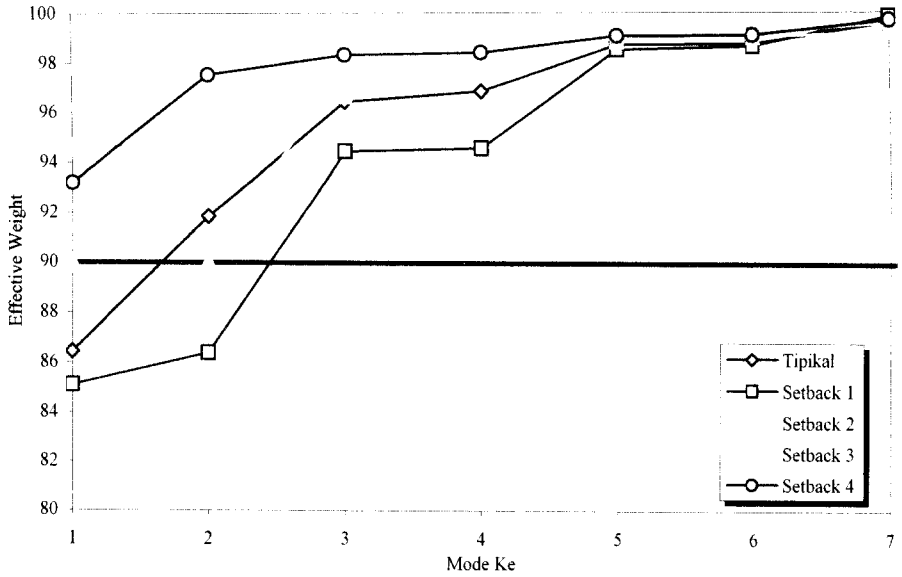
Nilai % jumlah Ew pada mode/tingkat paling atas mempunyai nilai mendekati nol. Untuk struktur bangunan tingkat 7, pada bangunan tipikal mempunyai nilai % jumlah Ew paling besar ditinjau dari mode pertama tetapi pada setback 2 mempunyai nilai % jumlah Ew paling kecil. Dalam *modal effective mass* dan *modal effective weight* sangat dipengaruhi oleh berat dan massa struktur.

Pada struktur bangunan tingkat 7 untuk mencapai 90% pada bangunan Tipikal cukup memperhitungkan mode kedua, sedangkan untuk mencapai 90% pada setback1, setback2 dan setback3 harus memperhitungkan sampai mode ketiga. Pada struktur tingkat 10 untuk mencapai 90% untuk bangunan tipikal memperhitungkan mode kedua, untuk setback1, setback2, setback3 memperhitungkan mode ketiga, sedangkan untuk setback4, setback5 dan setback6 cukup memperhitungkan mode pertama untuk mencapai 90% energi gempa.

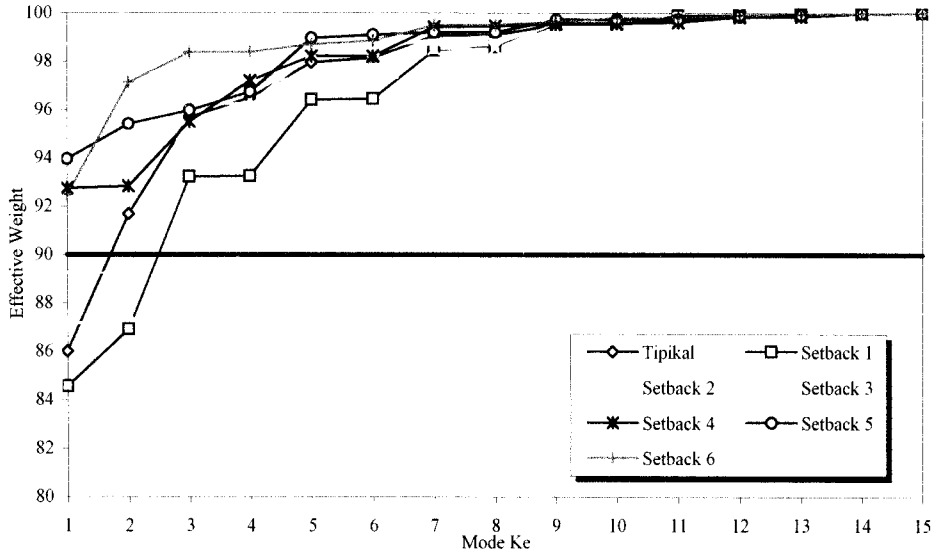
Ketidak teraturan tersebut sangat dipengaruhi oleh spektrum respon yang sangat fluktuatif, dimana pada periode getar (T) yang semakin besar belum tentu mempunyai nilai spektrum respon yang semakin besar secara regular maupun mengecil secara regular.



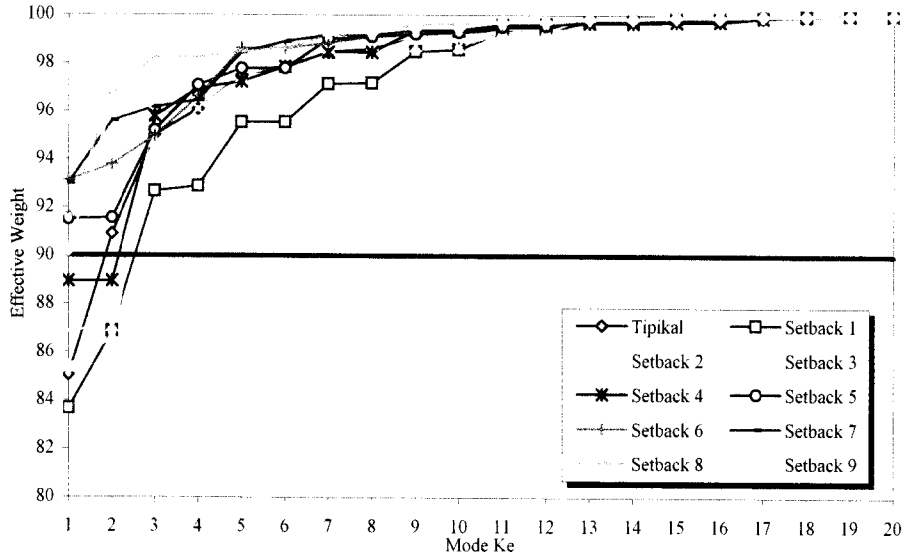
Tingkat 7



Tiingkat 10

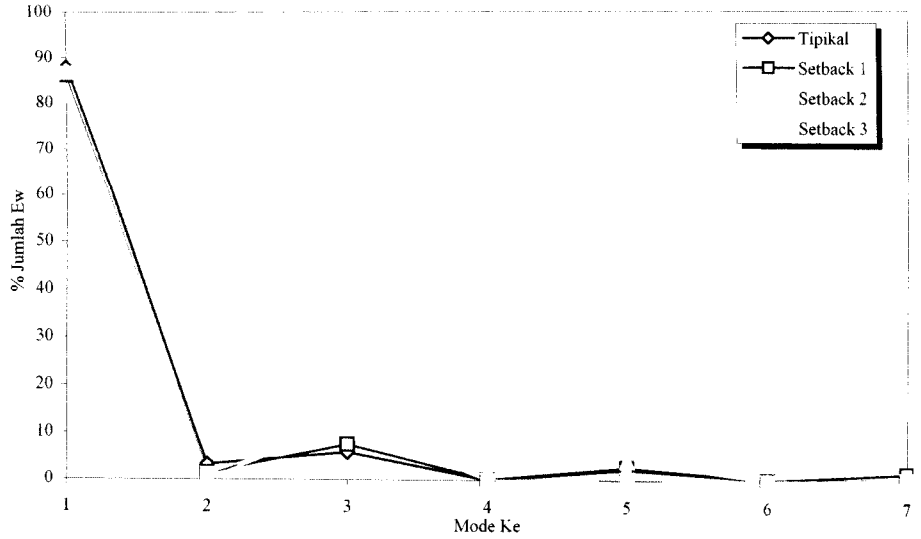


Tingkat 15

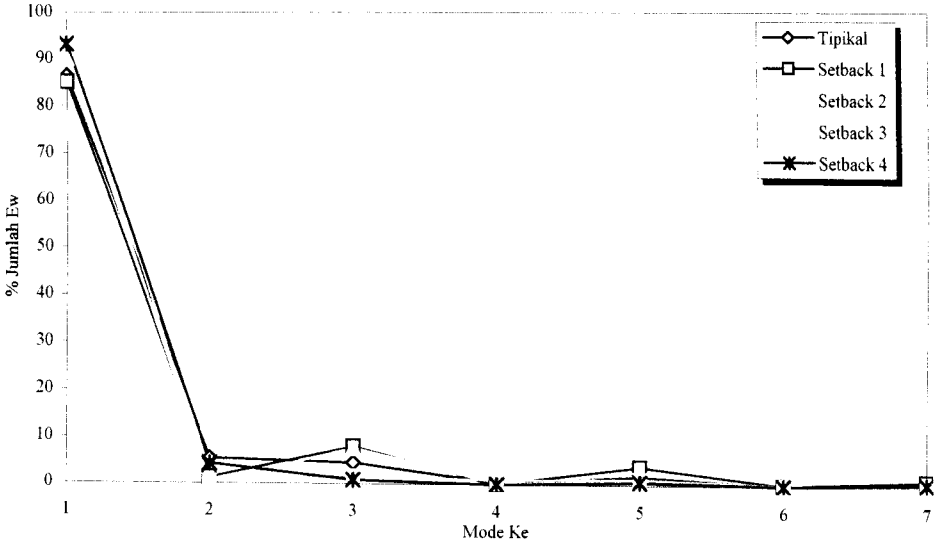


Tingkat 20

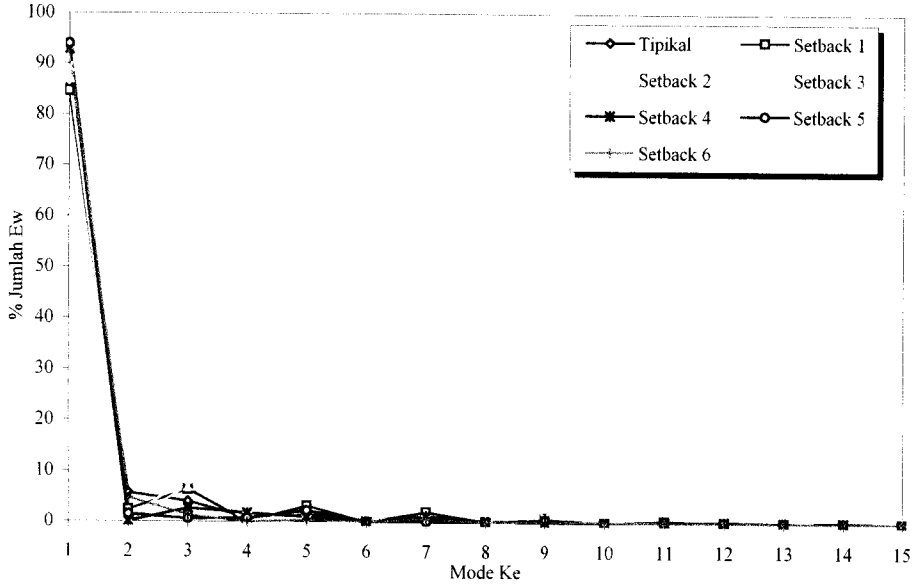
Gambar 5.7 Perbandingan Akumulasi Effective Weight Struktur Bertingkat



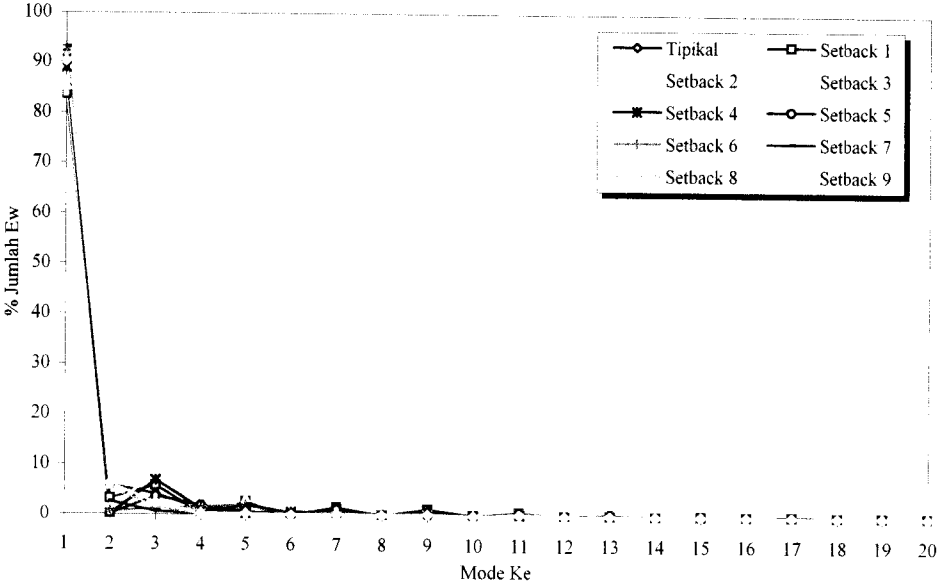
Tingkat 7



Tingkat 10

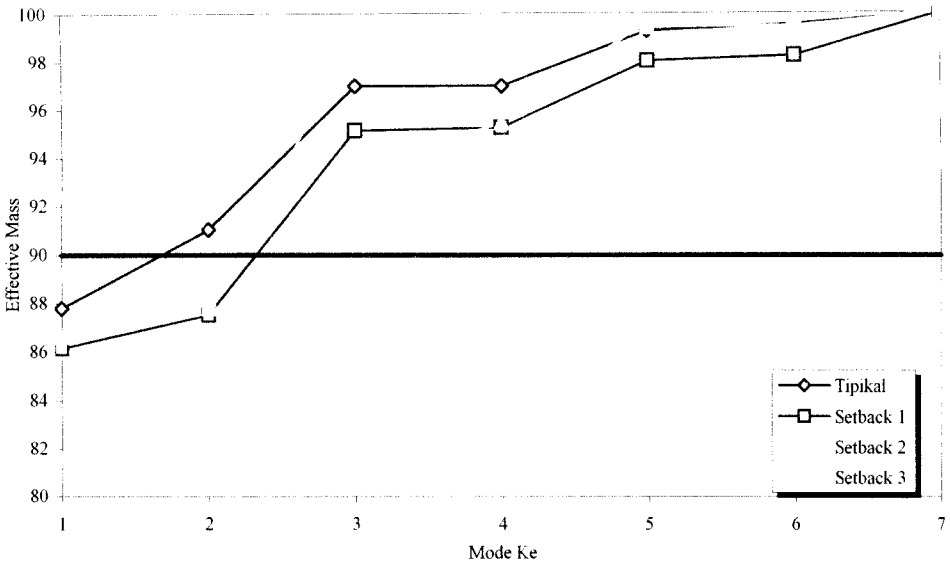


Tingkat 15

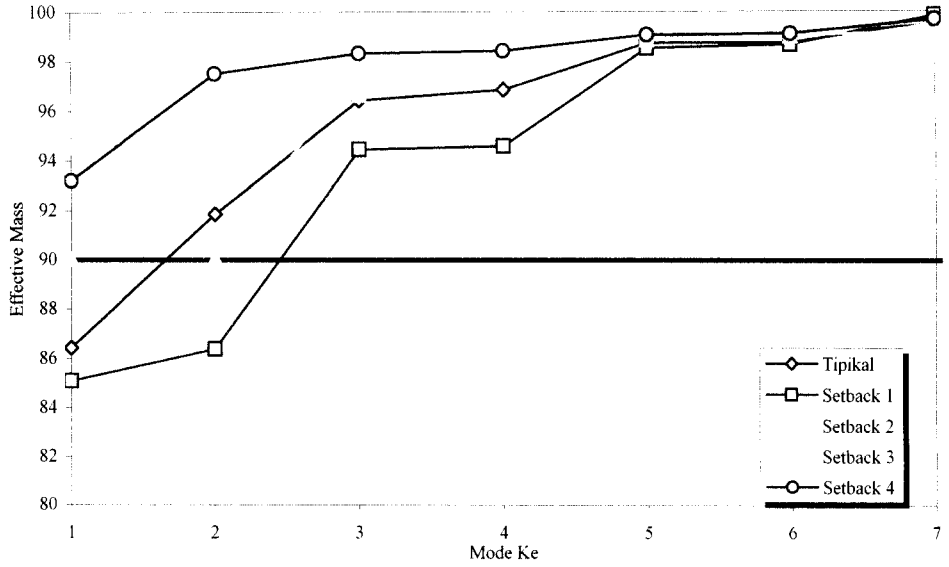


Tingkat 20

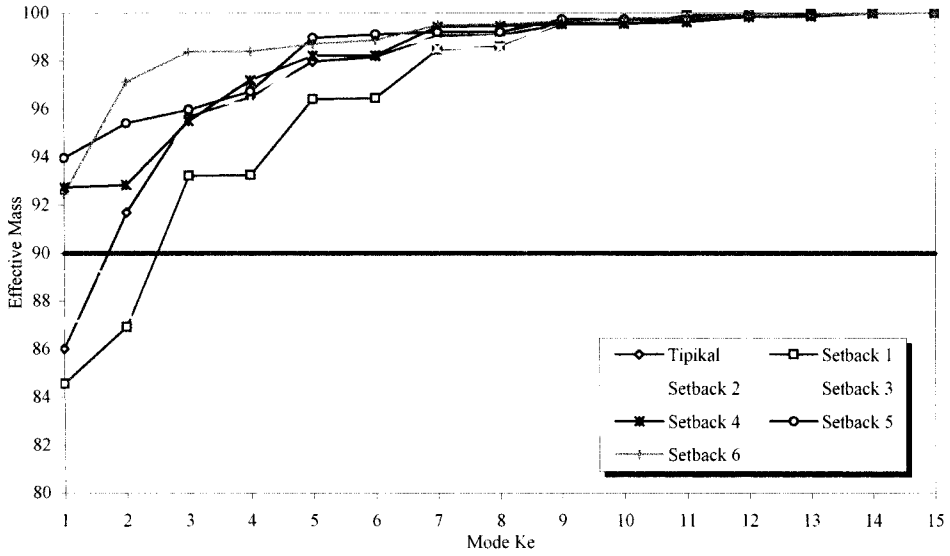
Gambar 5.8 Perbandingan % Jumlah Modal Effective Weight Struktur Bertingkat



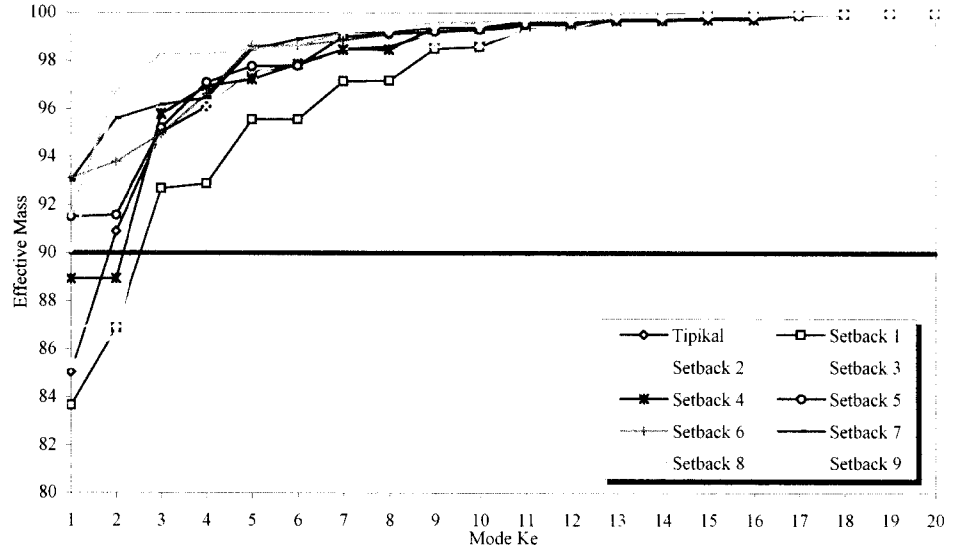
Tingkat 7



Tingkat 10

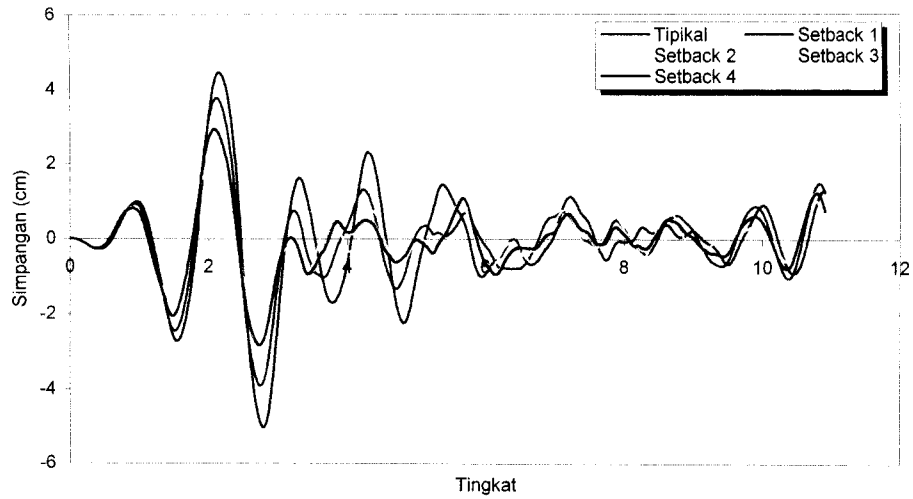


Tingkat 15

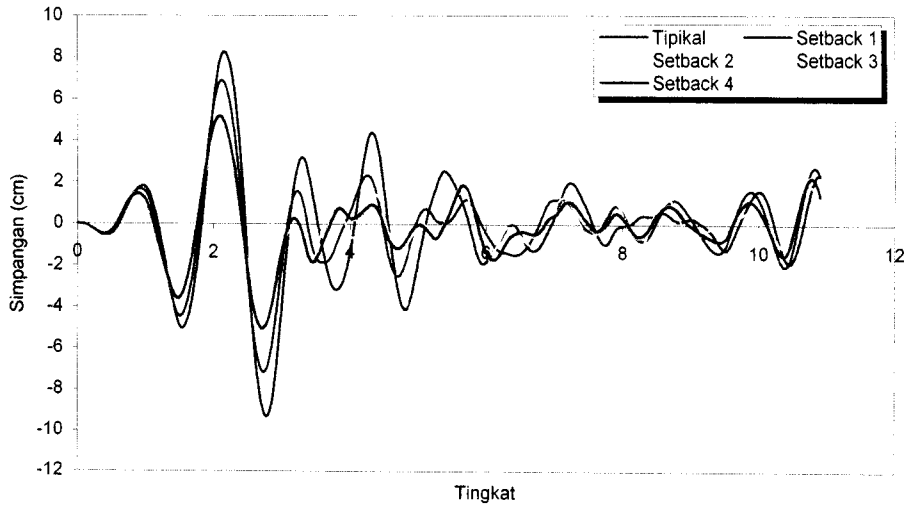


Tingkat 20

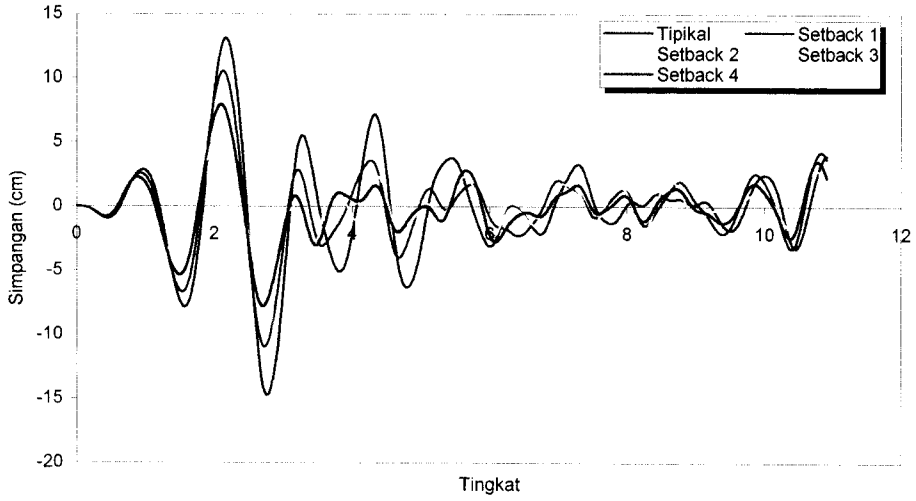
Gambar 5.9 Perbandingan Akumulasi Effective Mass Struktur Bertingkat



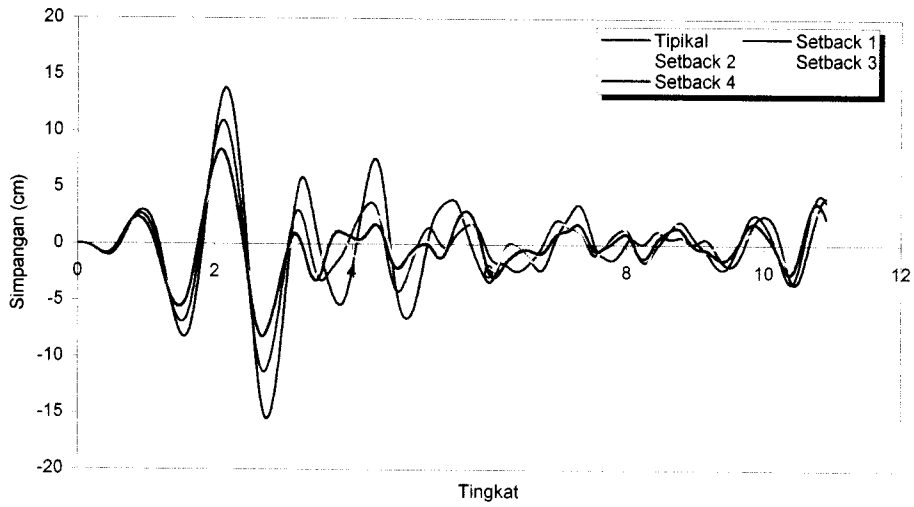
Tingkat 2



Tingkat 4

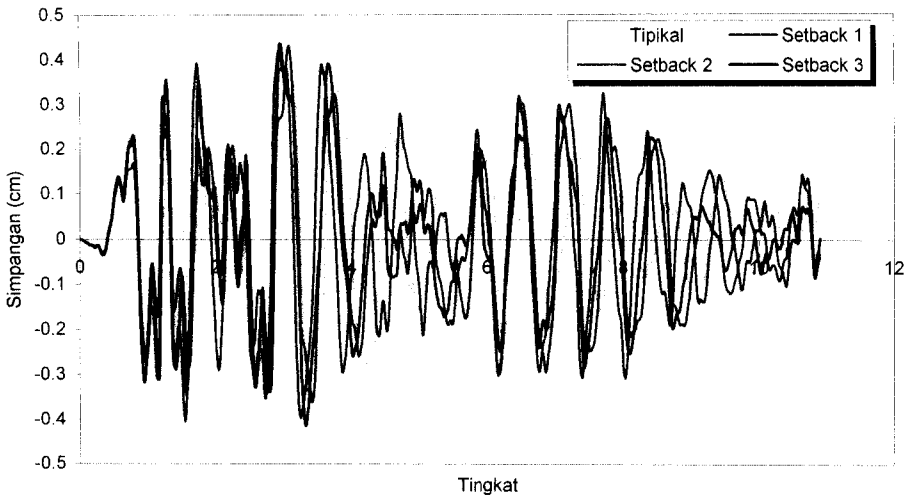


Tingkat 8

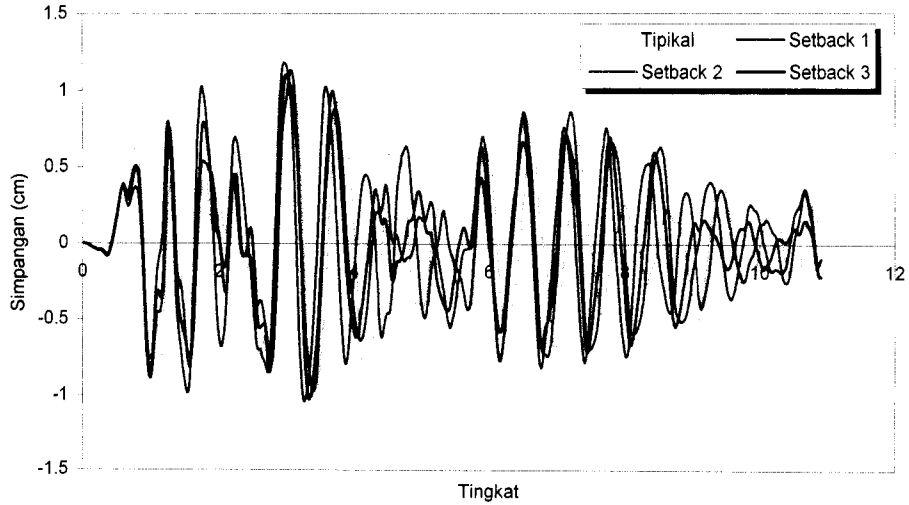


Tingkat 10

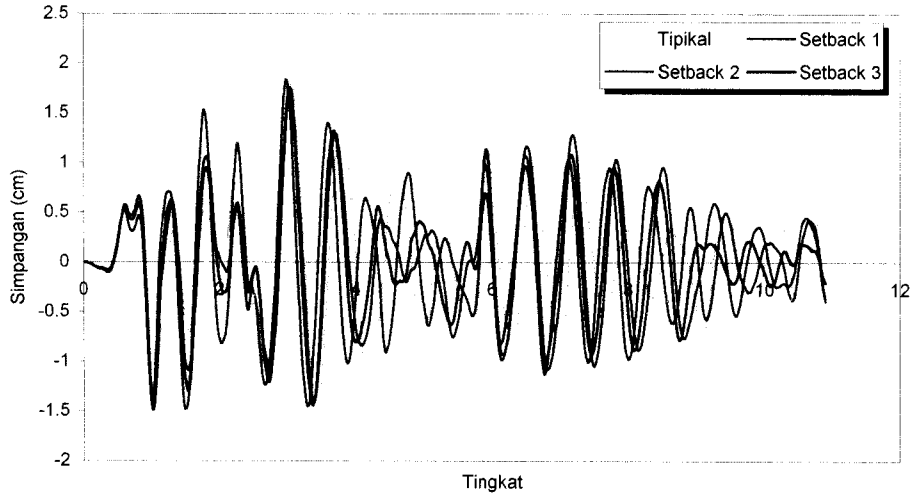
Gambar 5.21 Perbandingan Simpangan Struktur Tingkat 10 Akibat Gempa Bucharest



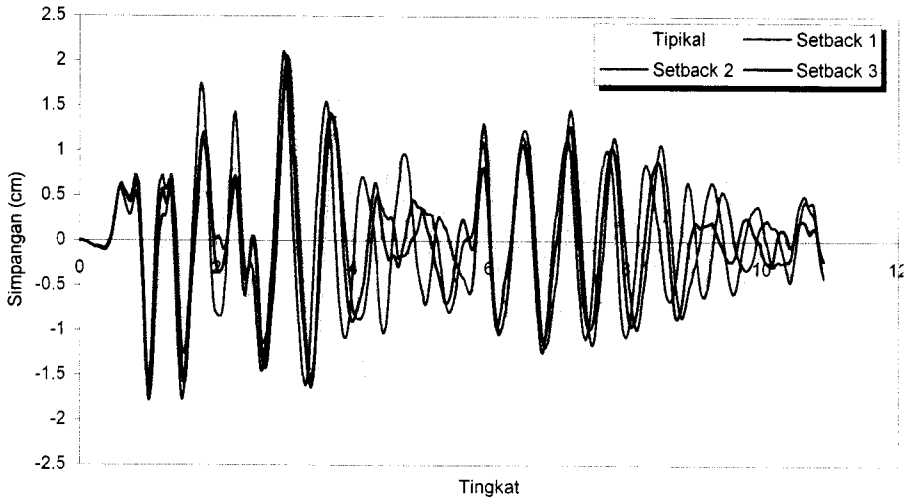
Tingkat 1



Tingkat 3

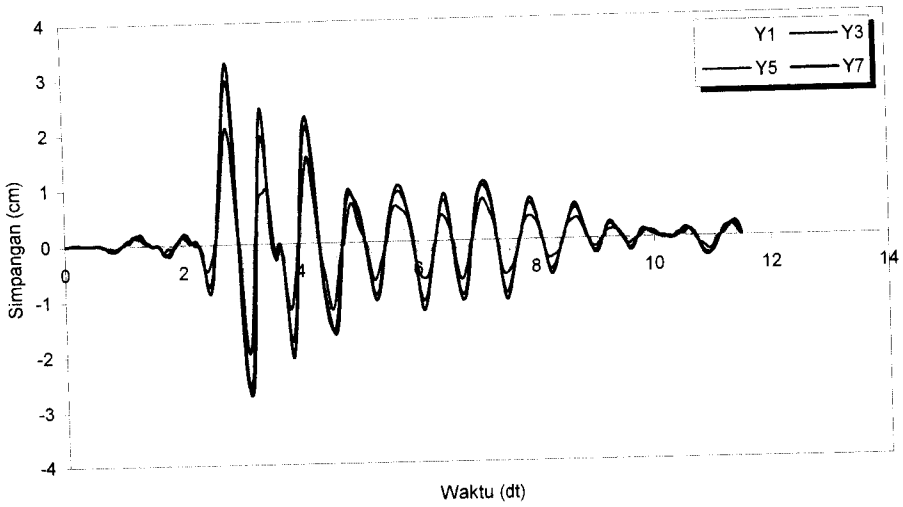


Tingkat 5

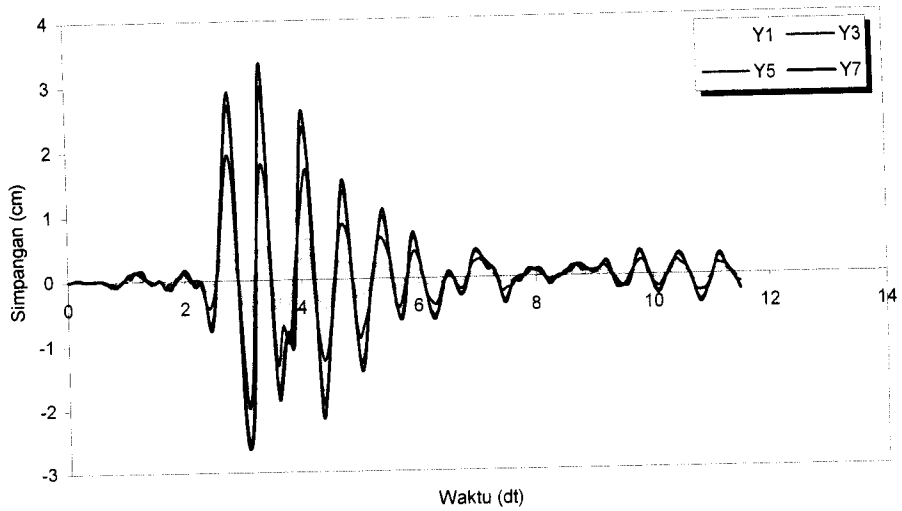


Tingkat 7

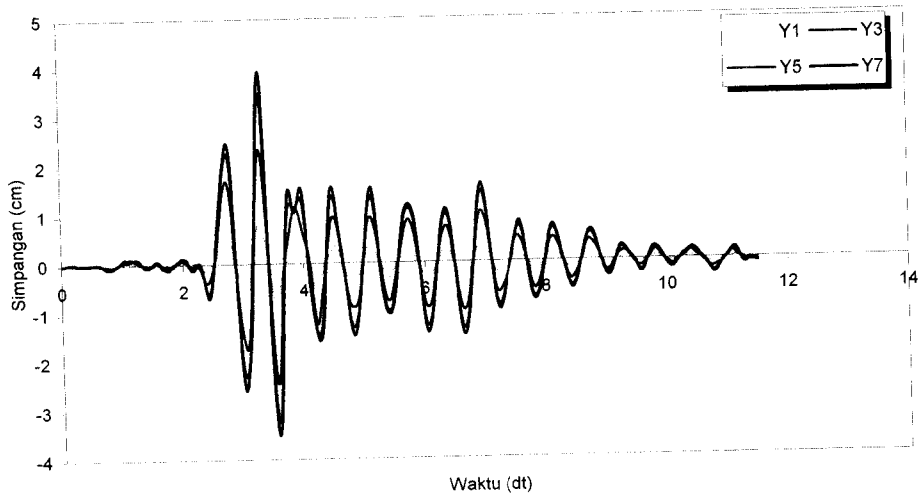
Gambar 5.14 Perbandingan Simpangan Struktur Tingkat 7 Akibat Gempa El Centro



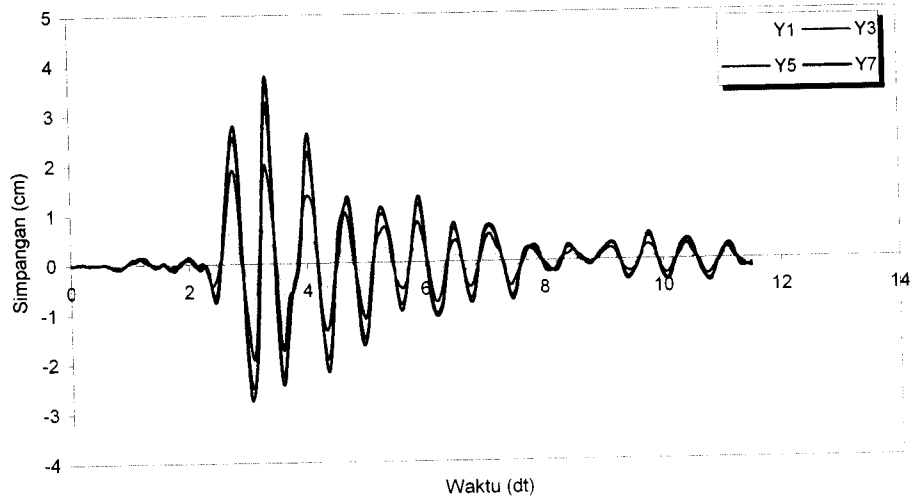
Tipikal



Setback 1

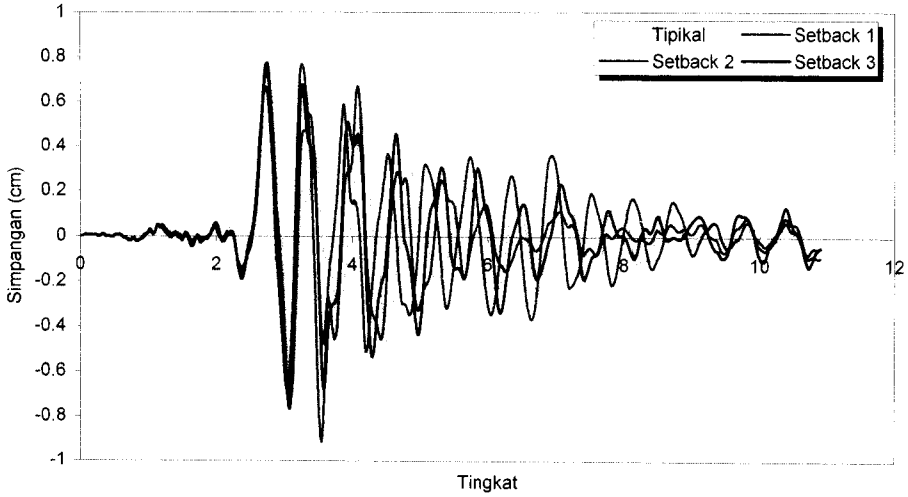


Setback 2

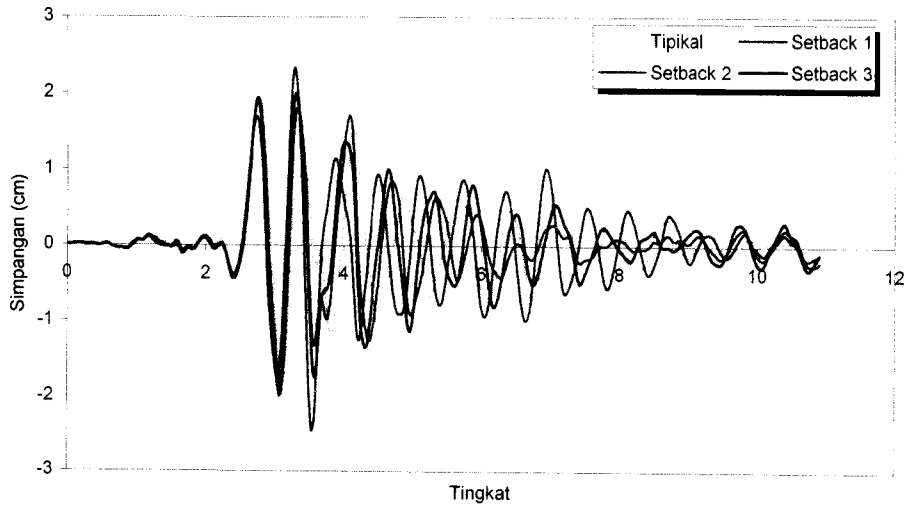


Setback 3

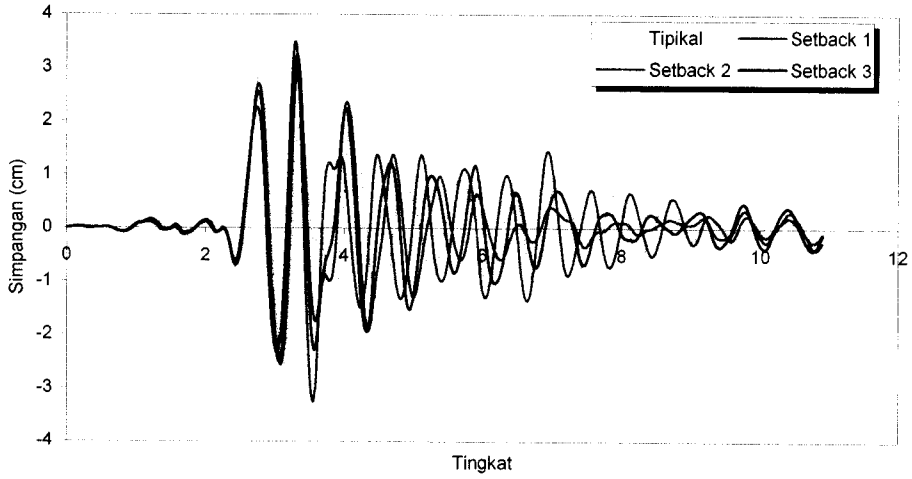
Gambar 5.15 Simpangan Struktur Tingkat 7 Akibat Gempa Gilroy



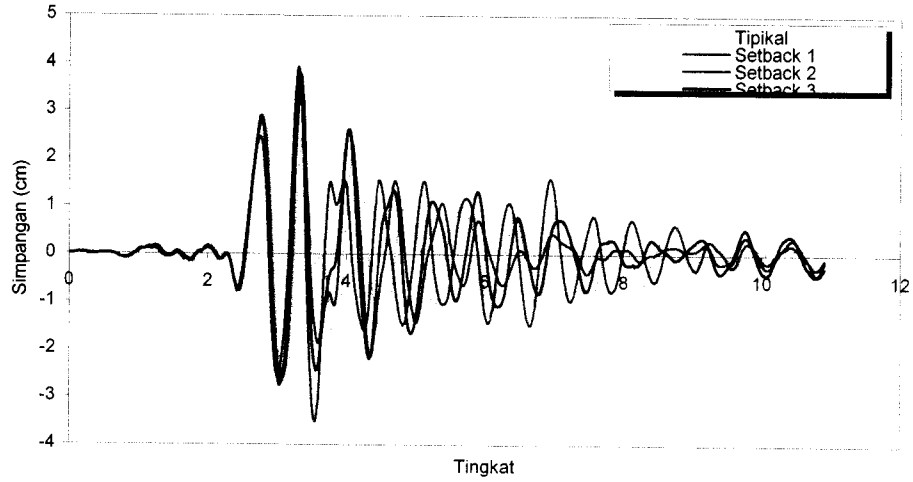
Tingkat 1



Tingkat 3

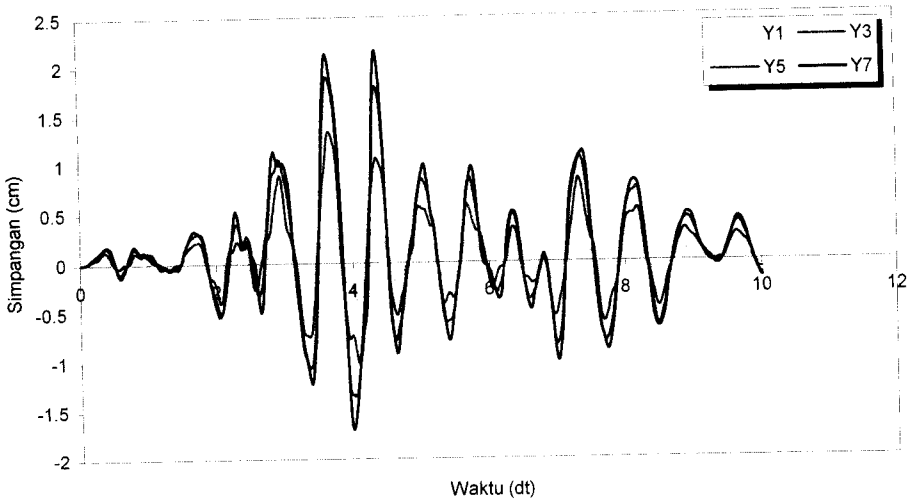


Tingkat 5

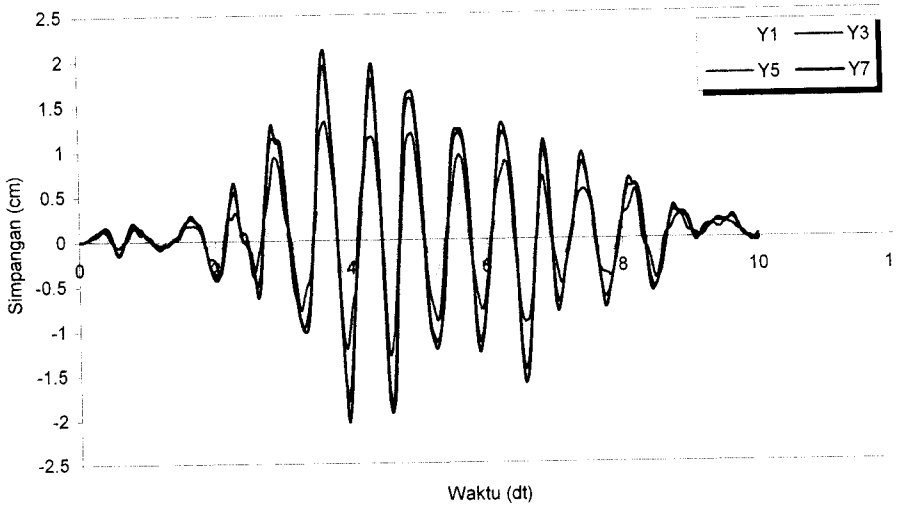


Tingkat 7

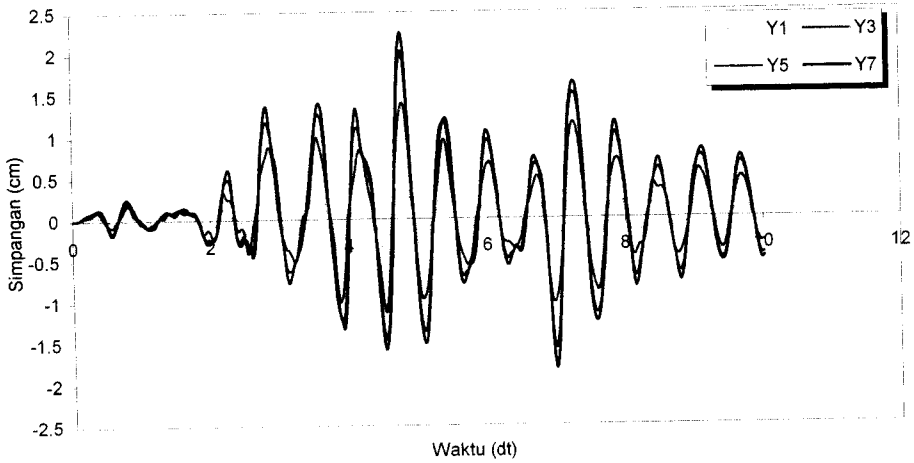
Gambar 5.16 Perbandingan Simpangan Struktur Tingkat 7 Akibat Gempa Gilroy



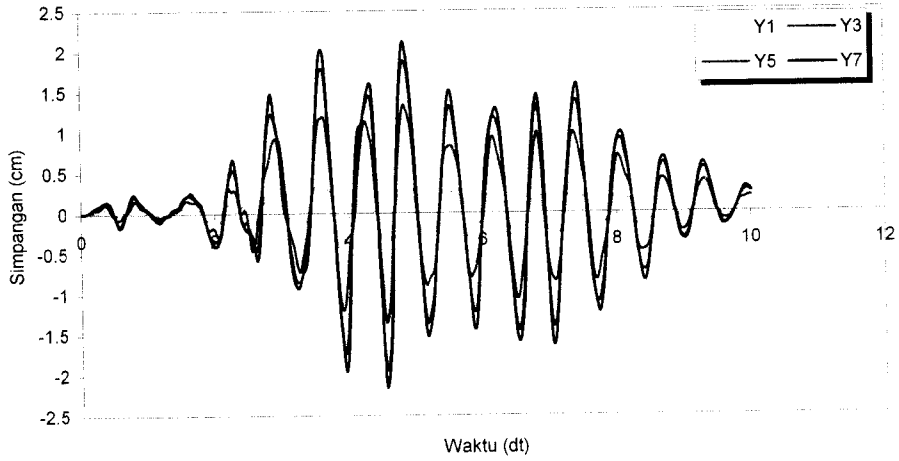
Tipikal



Setback 1

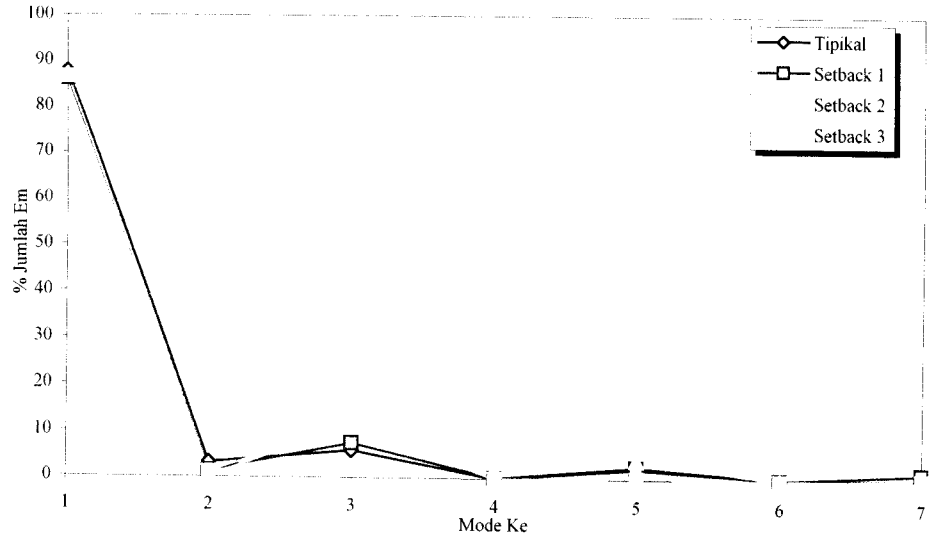


Setback 2

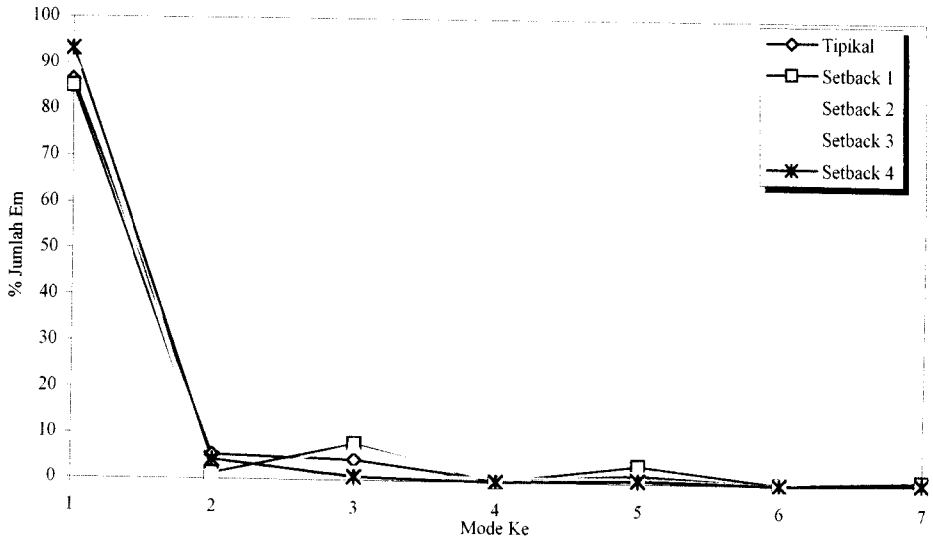


Setback 3

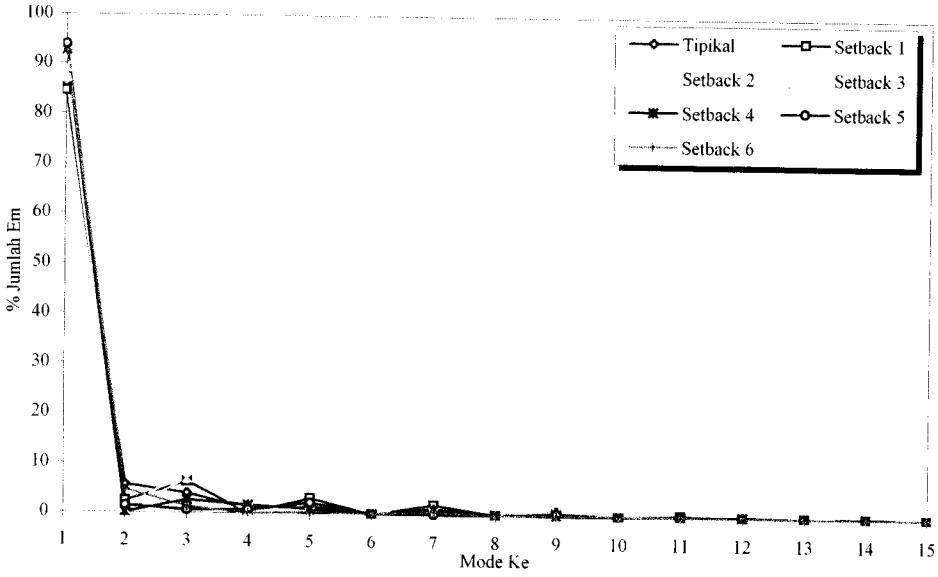
Gambar 5.17 Simpangan Struktur Tingkat 7 Akibat Gempa Koyna



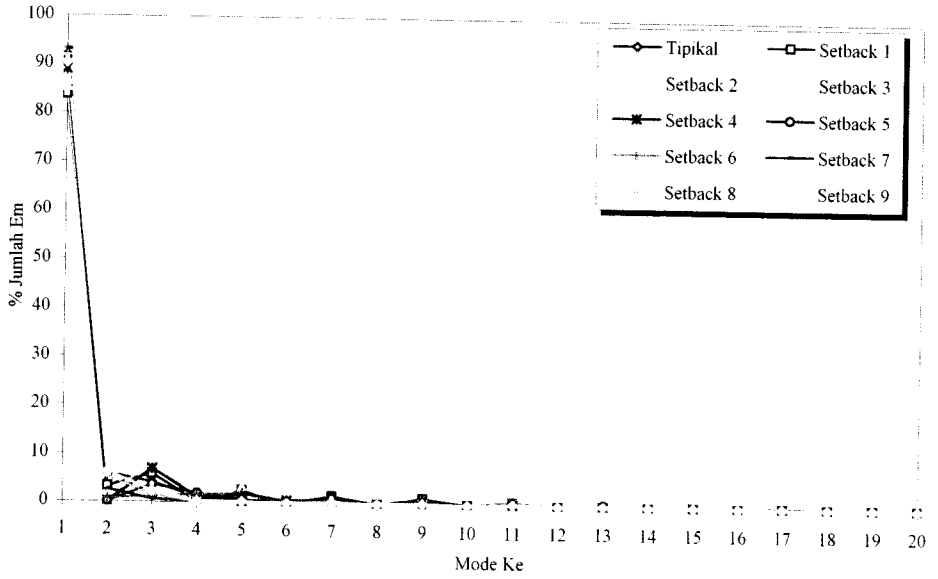
Tingkat 7



Tingkat 10

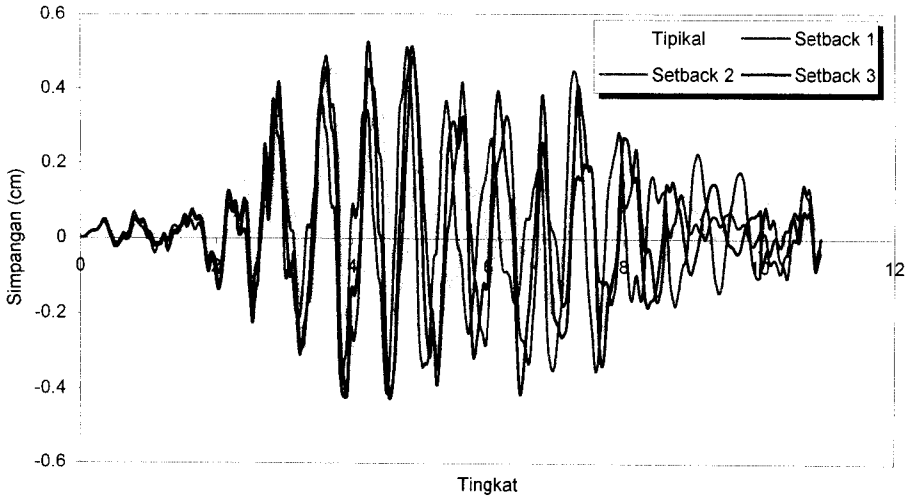


Tingkat 15

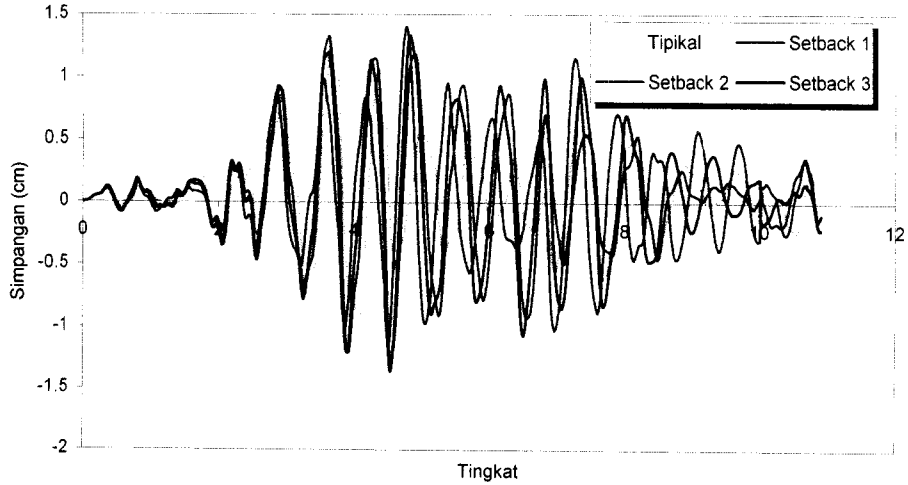


Tingkat 20

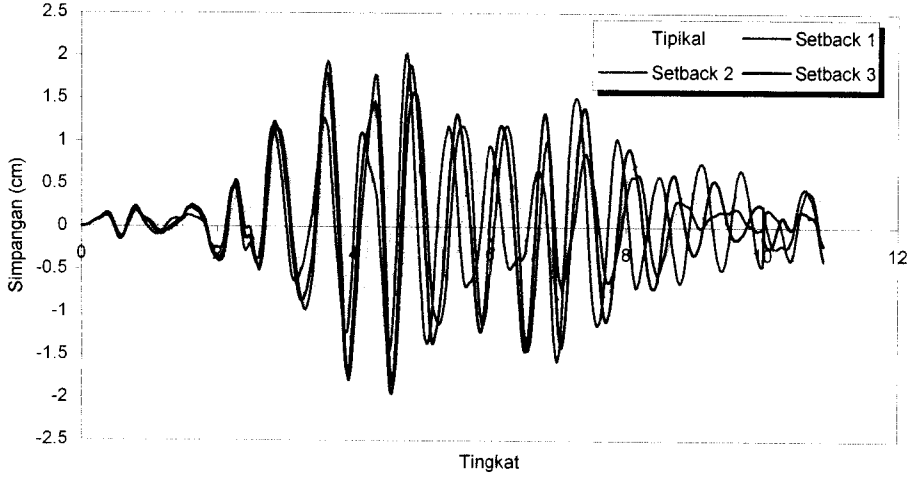
Gambar 5.10 Perbandingan % Jumlah Modal Effective Weight Struktur Bertingkat



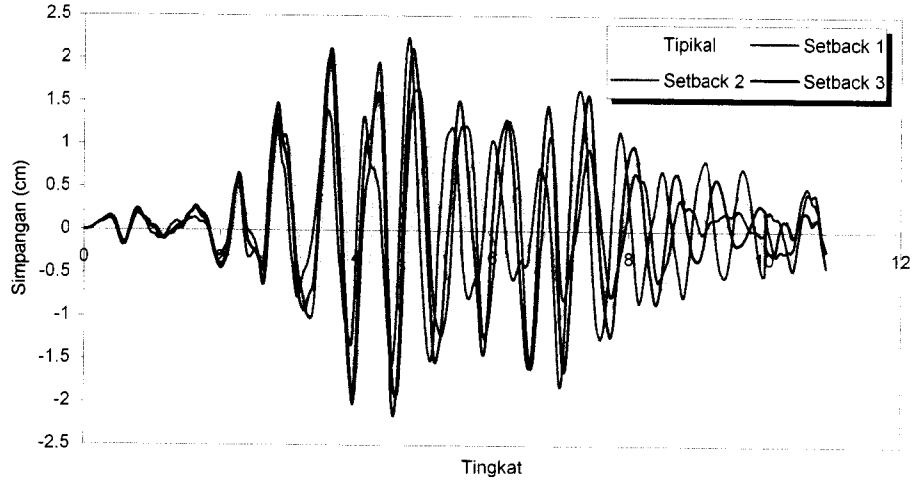
Tingkat 1



Tingkat 3

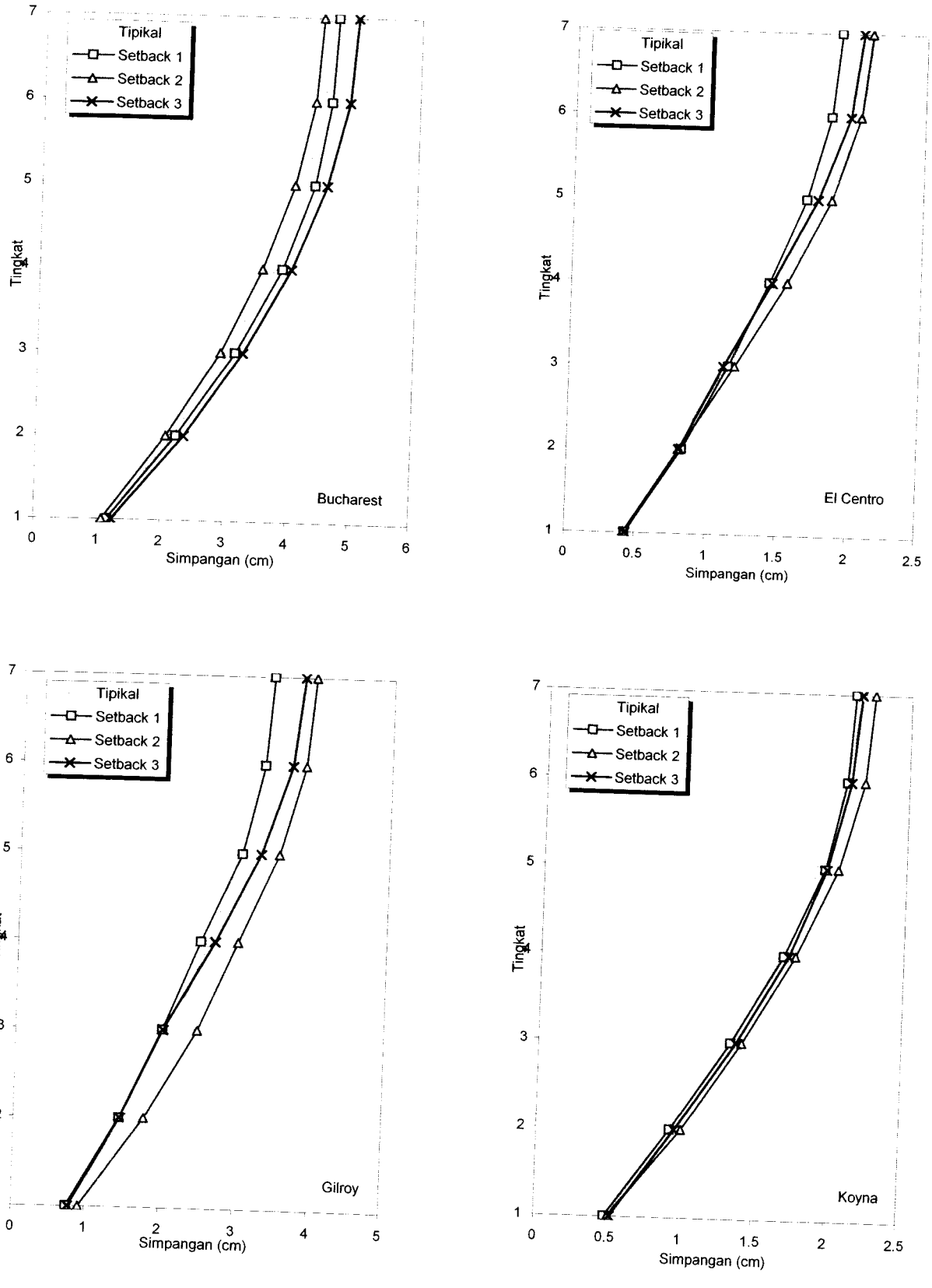


Tingkat 5

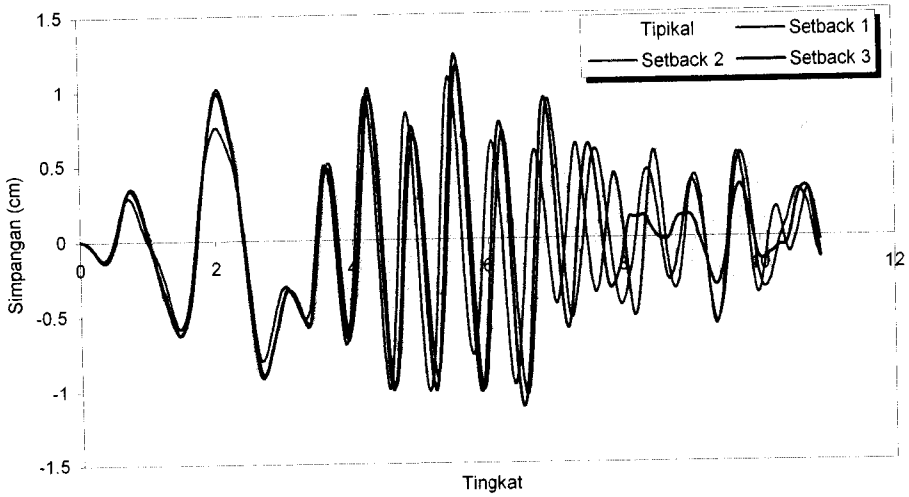


Tingkat 7

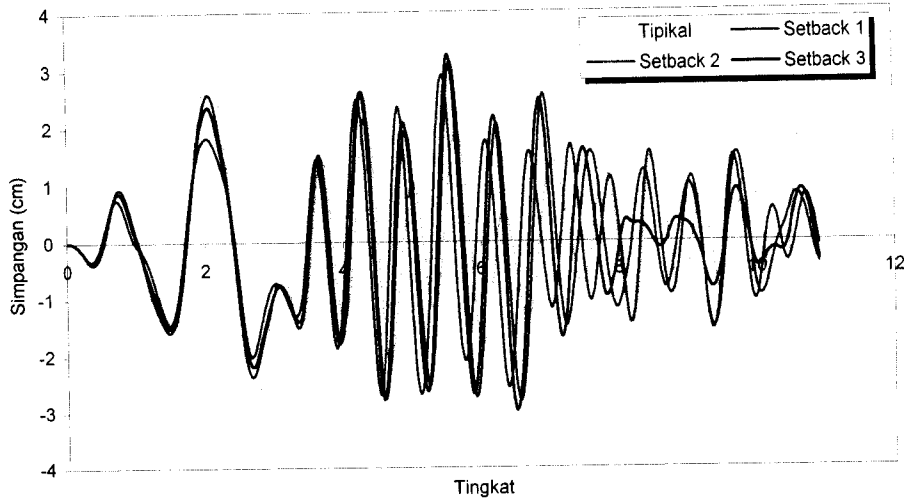
Gambar 5.18 Perbandingan Simpangan Struktur Tingkat 7 Akibat Gempa Koyna



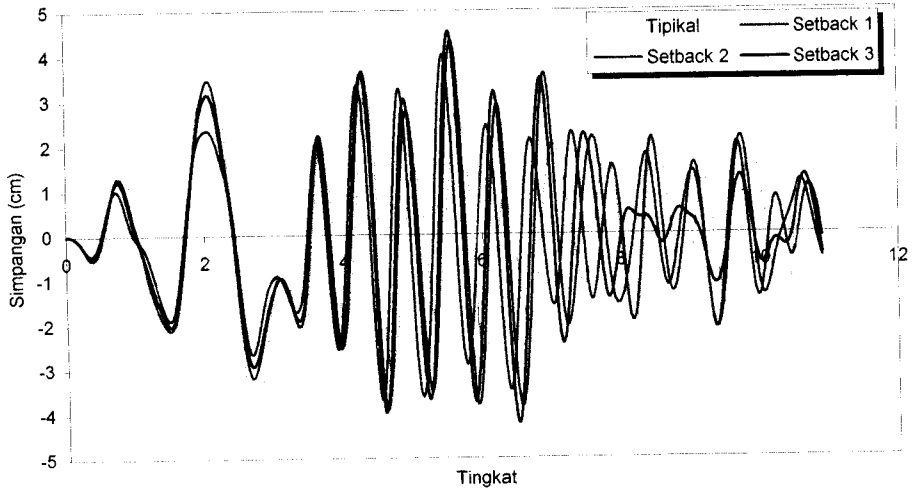
Gambar 5.19 Simpangan Maksimum Struktur Tingkat 7 Akibat 4 Gempa



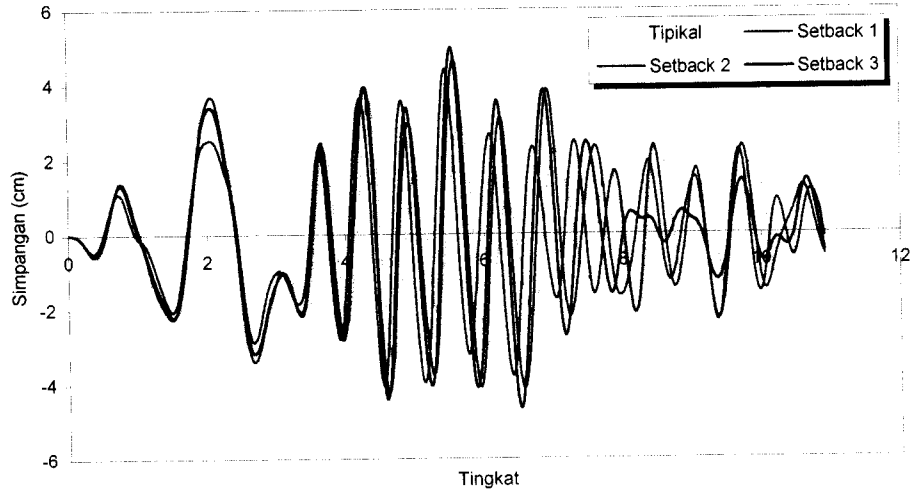
Tingkat 1



Tingkat 3

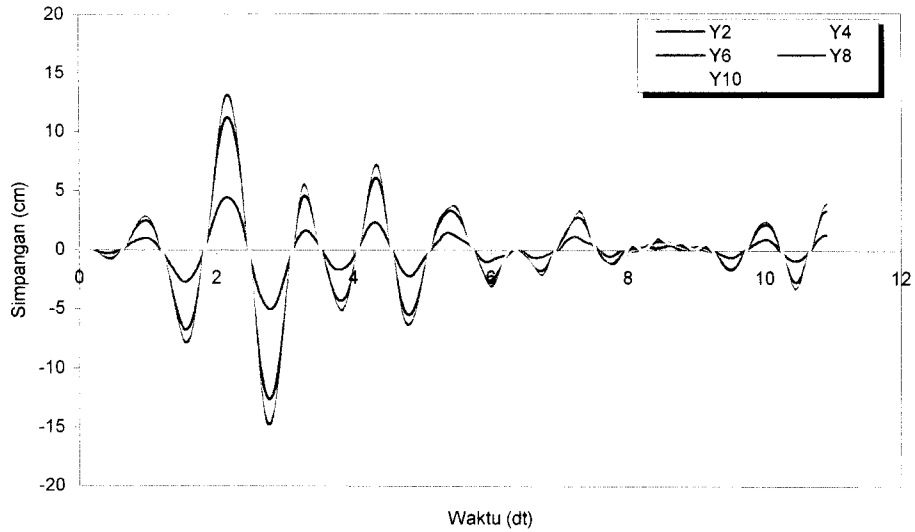


Tingkat 5

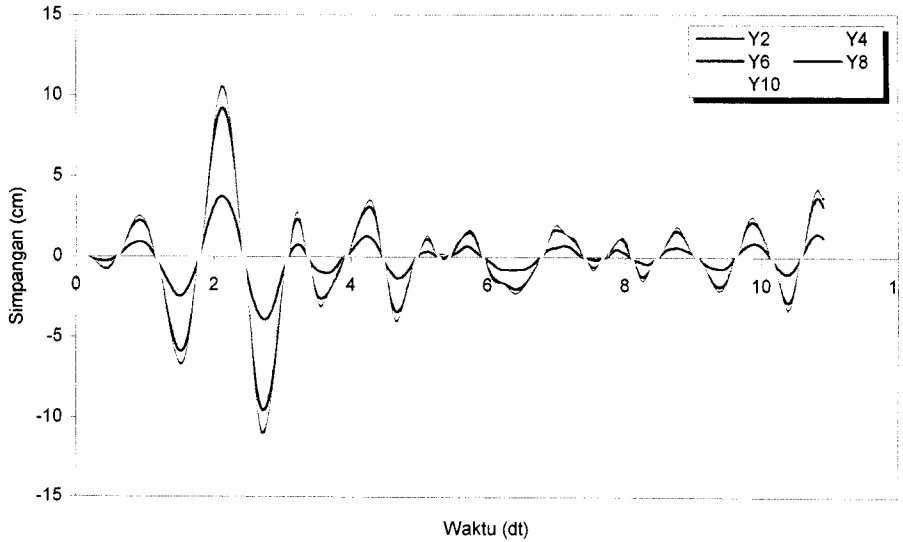


Tingkat 7

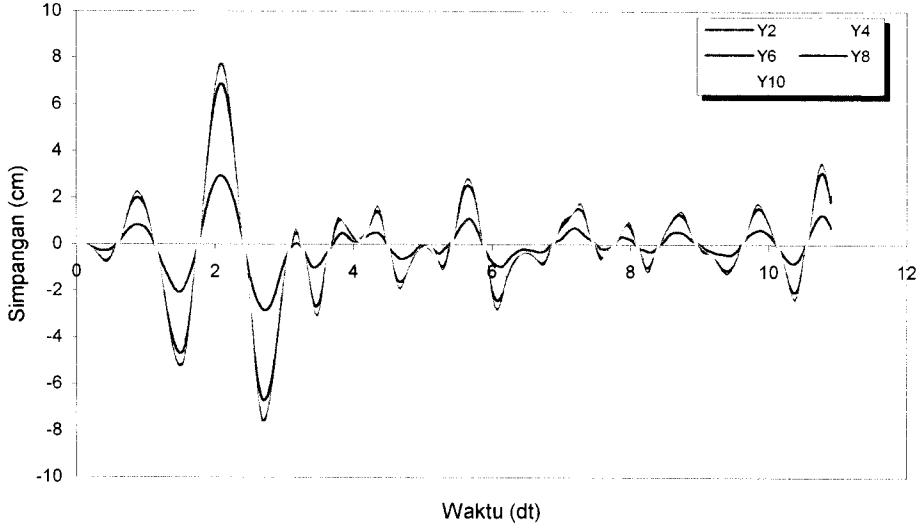
Gambar 5.12 Perbandingan Simpangan Struktur Tingkat 7 Akibat Gempa Bucharest



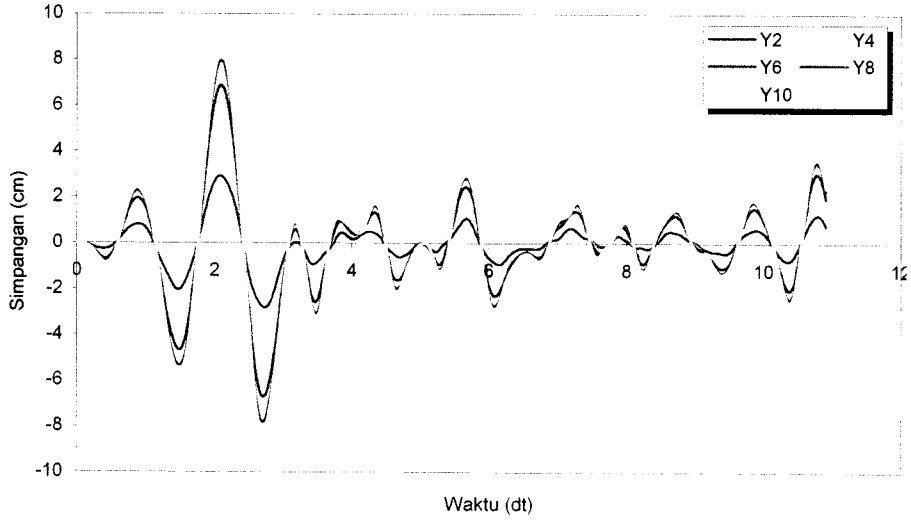
Tipikal



Setback 1

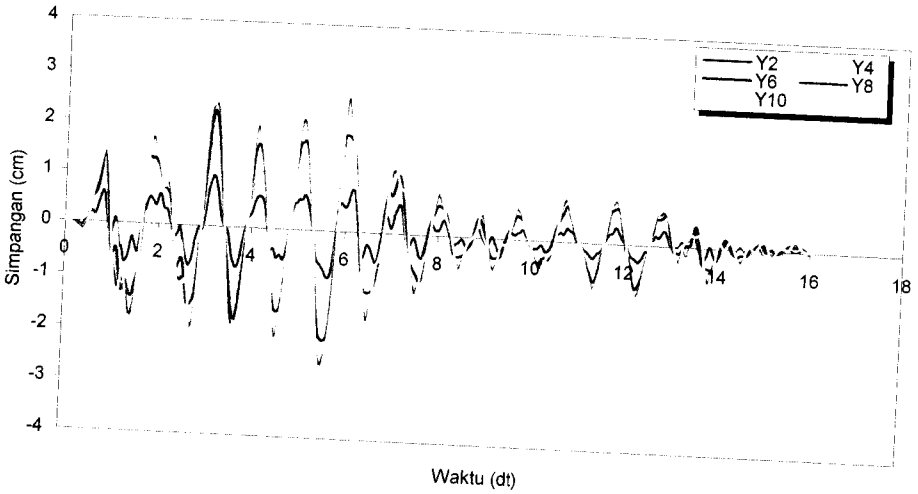


Setback 2

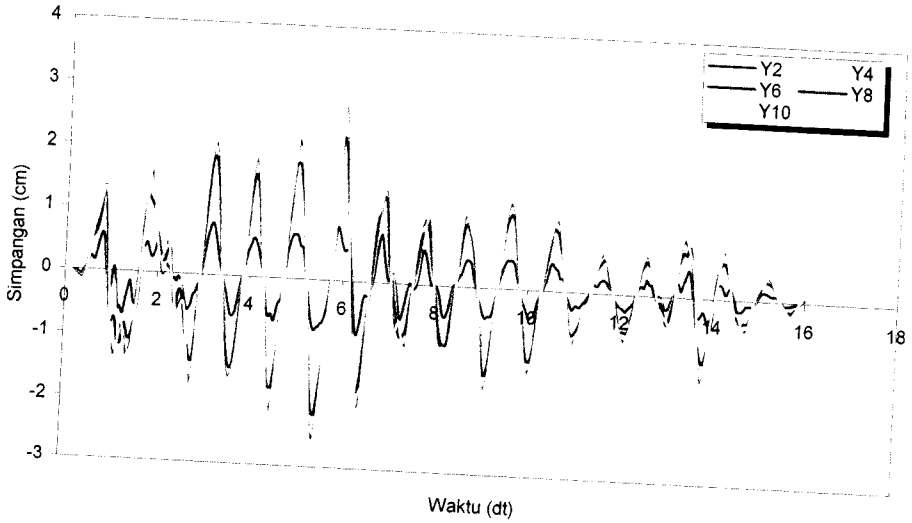


Setback 4

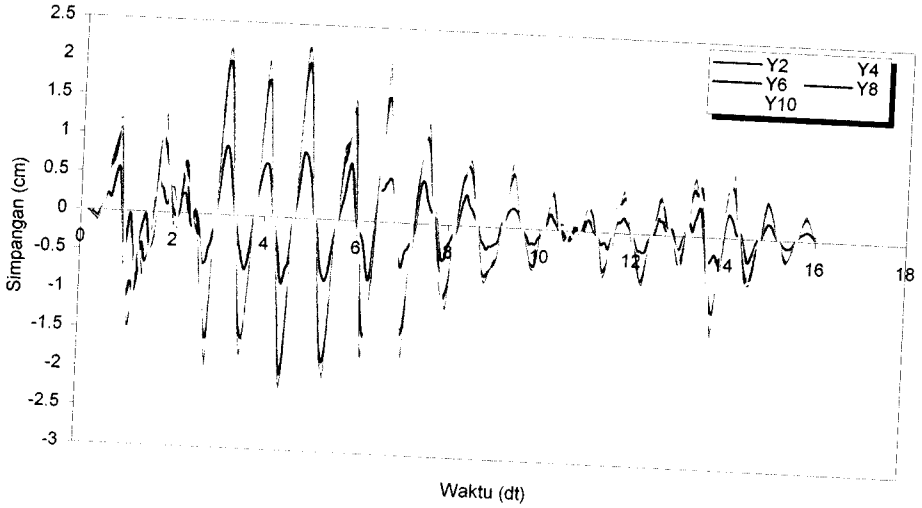
Gambar 5.20 Simpangan Struktur Tingkat 10 Akibat Gempa Bucharest



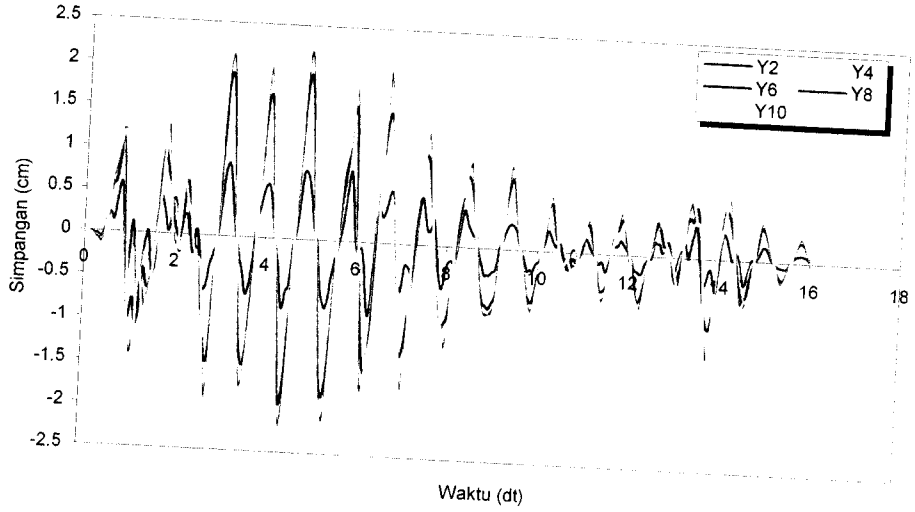
Tipikal



Setback 1

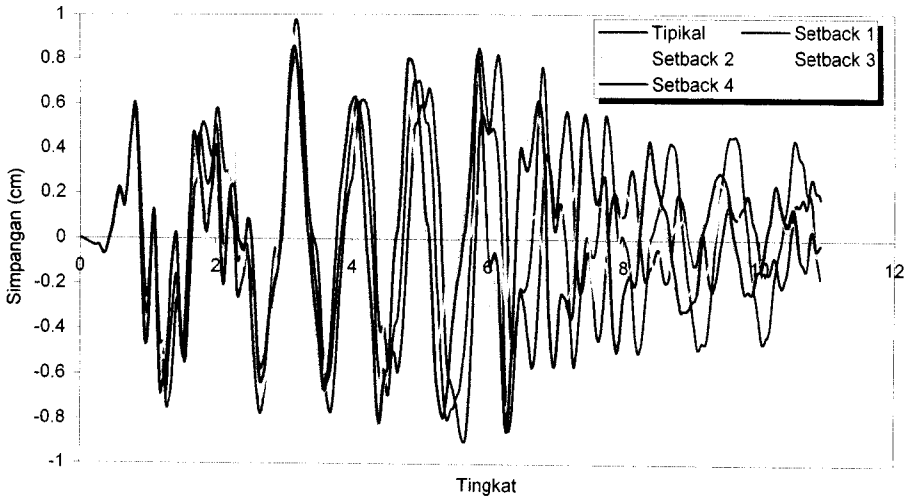


Setback 2

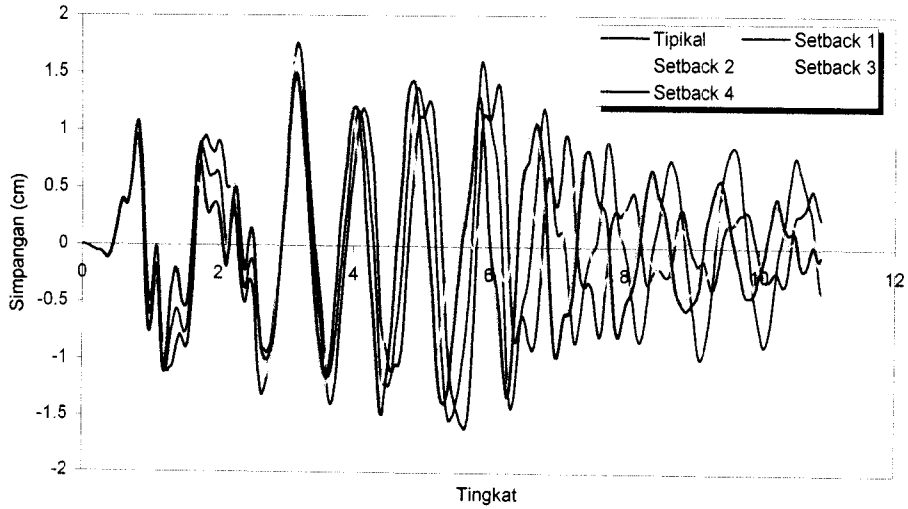


Setback 4

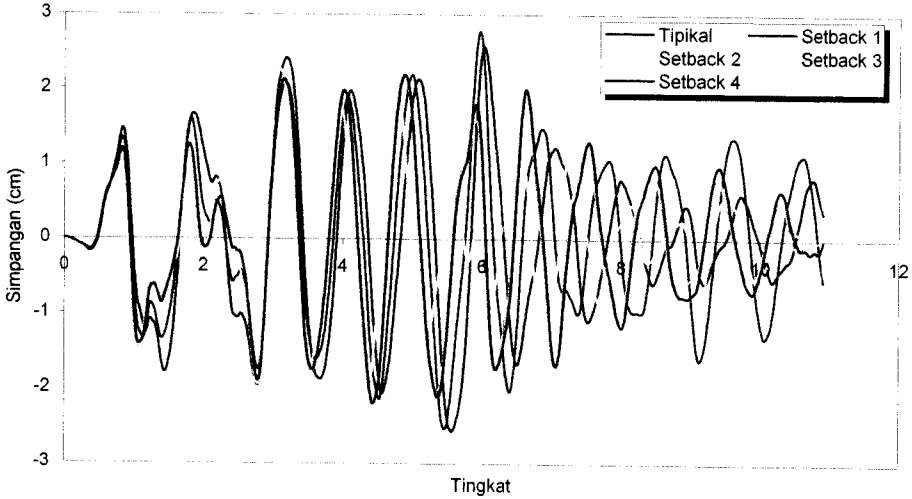
Gambar 5.22 Simpangan Struktur Tingkat 10 Akibat Gempa El Centro



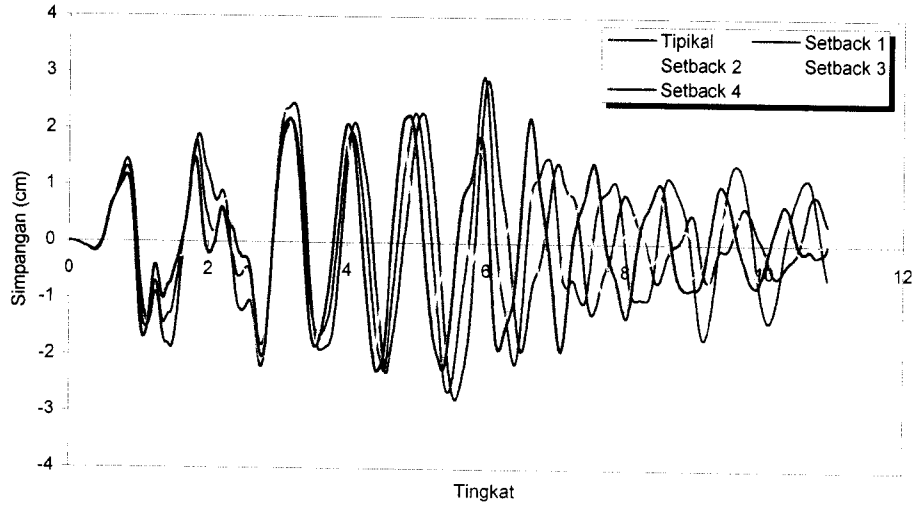
Tingkat 2



Tingkat 4

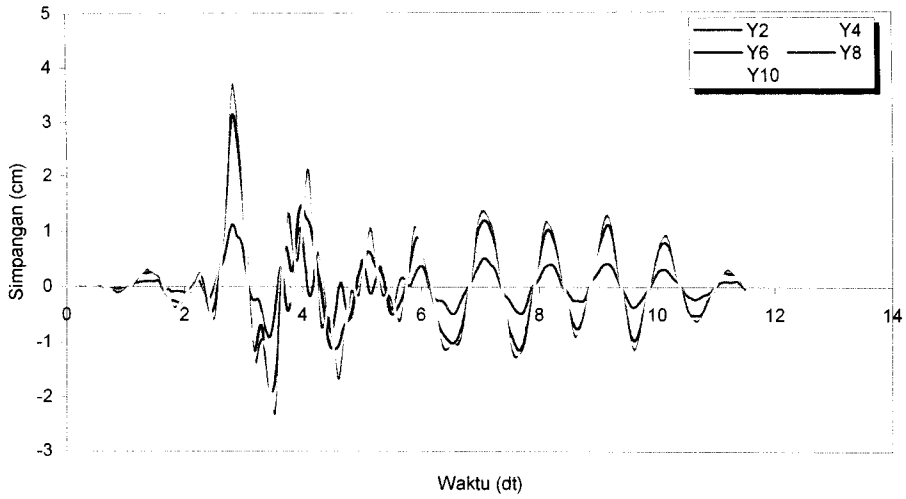


Tingkat 8

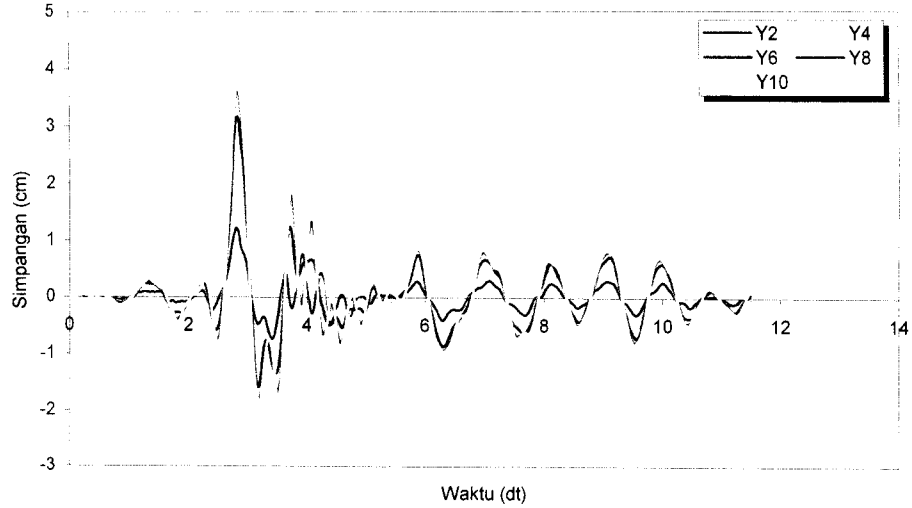


Tingkat 10

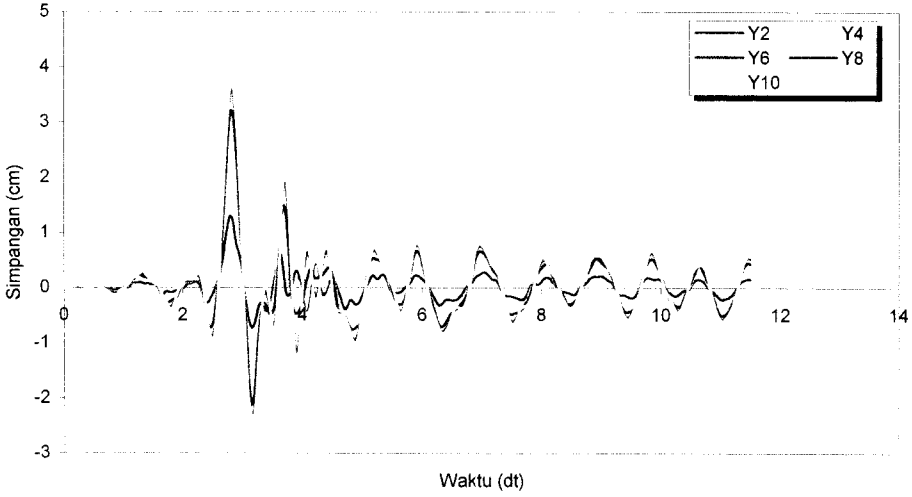
Gambar 5.23 Perbandingan Simpangan Struktur Tingkat 10 Akibar Gempa El Centro



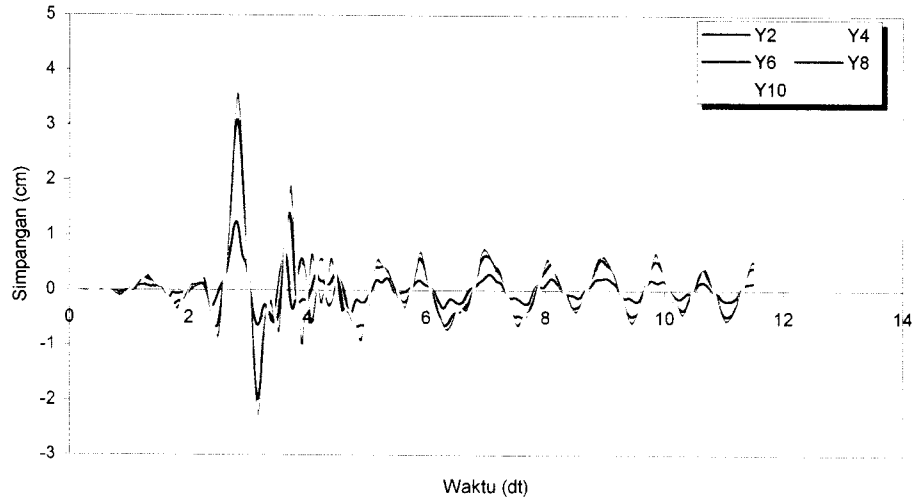
Tipikal



Setback 1

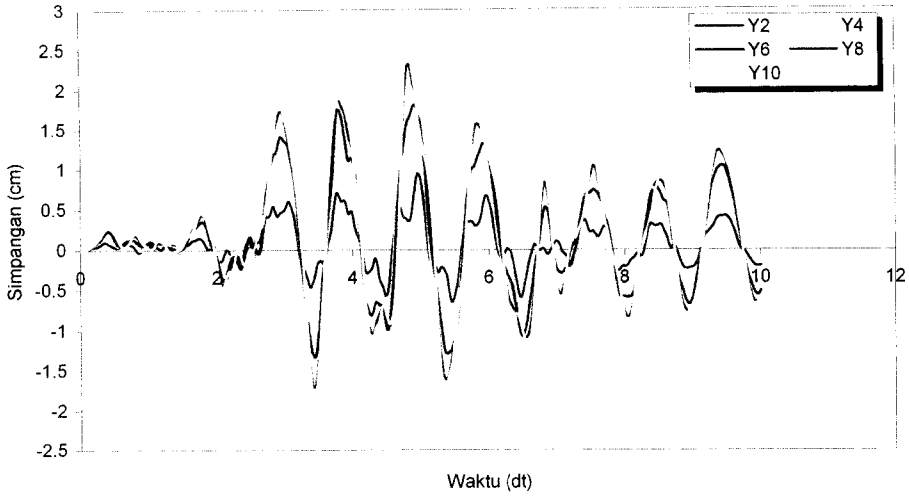


Setback 2

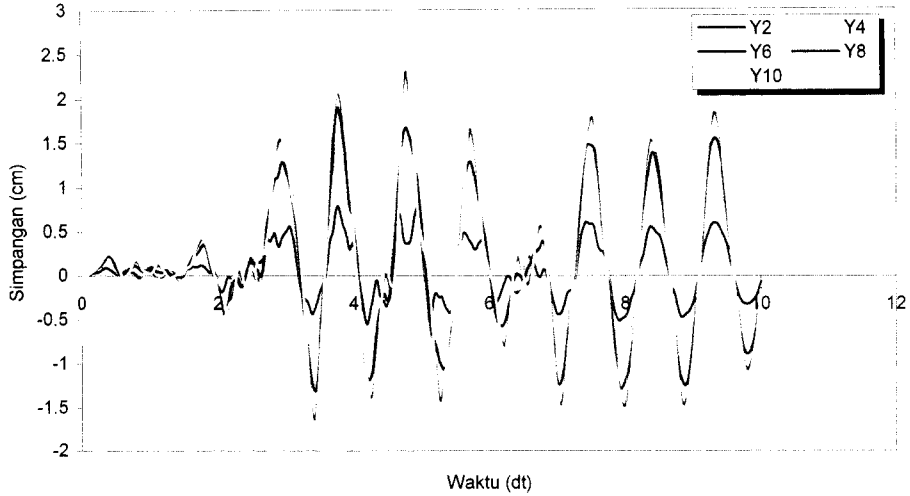


Setback 4

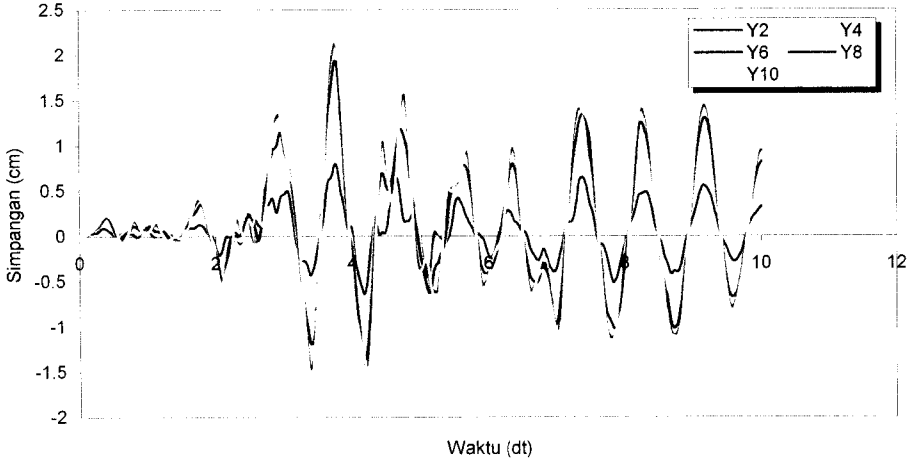
Gambar 5.24 Simpangan Struktur Tingkat 10 Akibat Gempa Gilroy



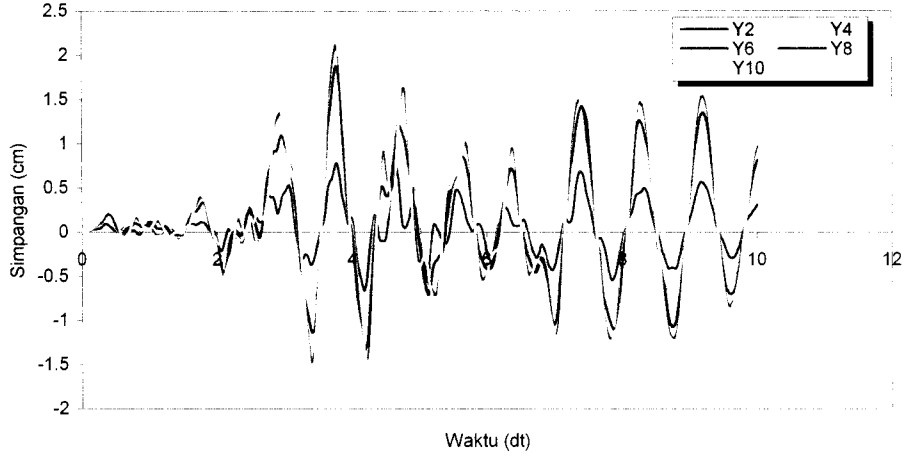
Tipikal



Setback 1

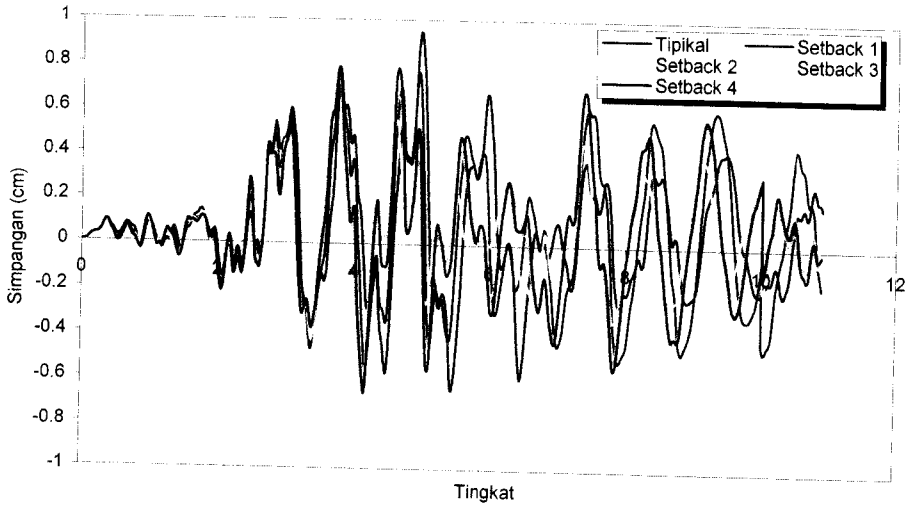


Setback 2

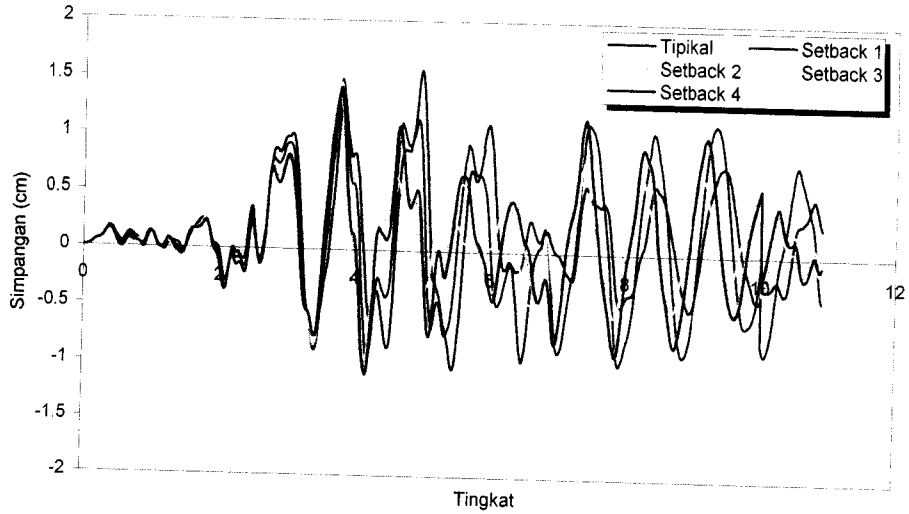


Setback 4

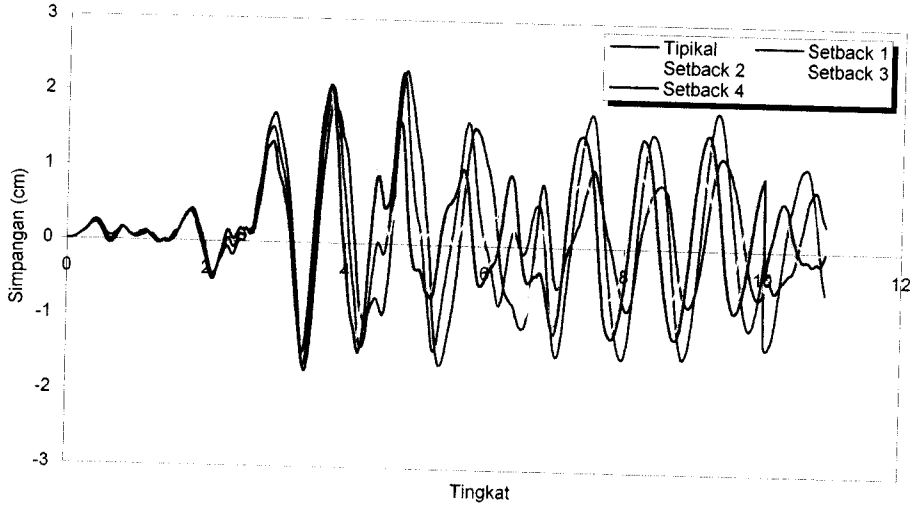
Gambar 5.26 Simpangan Struktur Tingkat 10 Akibat Gempa Koyna



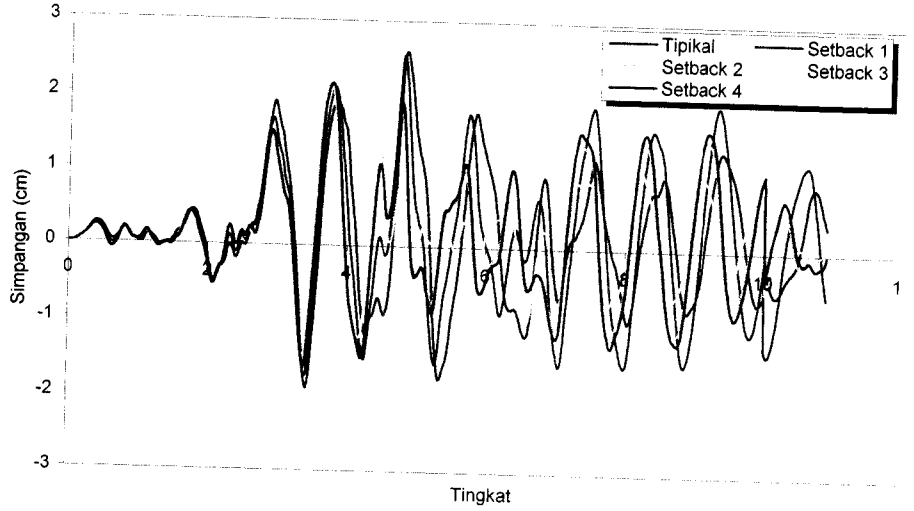
Tingkat 2



Tingkat 4



Tingkat 8



Tingkat 10

Gambar 5.27 Perbandingan Simpangan Struktur Tingkat 10 Akibat Gempa Koyna

5.4.2 **Simpangan Struktur**

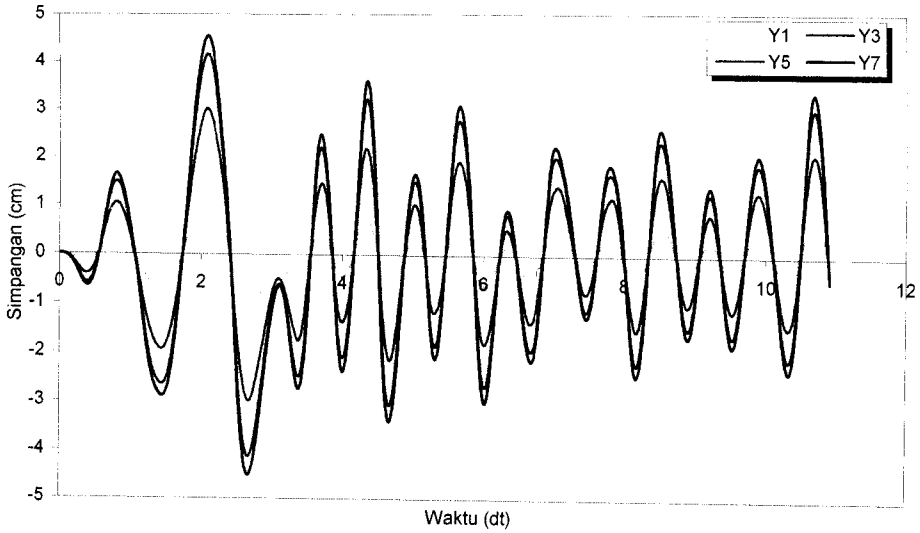
Simpangan struktur dihitung berdasarkan atas persamaan (3.51). Hasil analisis dengan variasi gempa ditampilkan dalam bentuk grafik antara simpangan dengan waktu (dengan interval 0,01).

Dari program ini nilai-nilai simpangan untuk struktur bangunan tingkat 7, 10, 15 dan 20 dengan 4 variasi gempa disajikan pada Gambar 5.11 sampai dengan Gambar 5.38. Dengan memperhatikan Gambar 5.11 sampai dengan Gambar 5.38 tersebut dapat dilihat bahwa simpangan yang dinormalisasi akibat beban gempa Bucharest mempunyai simpangan paling besar. Hal tersebut disebabkan karena percepatan maksimum (A_{maks}) gempa Bucharest mendekati 0,2g sehingga skala gempa mendekati satu. Simpangan semakin ke atas nilainya semakin besar

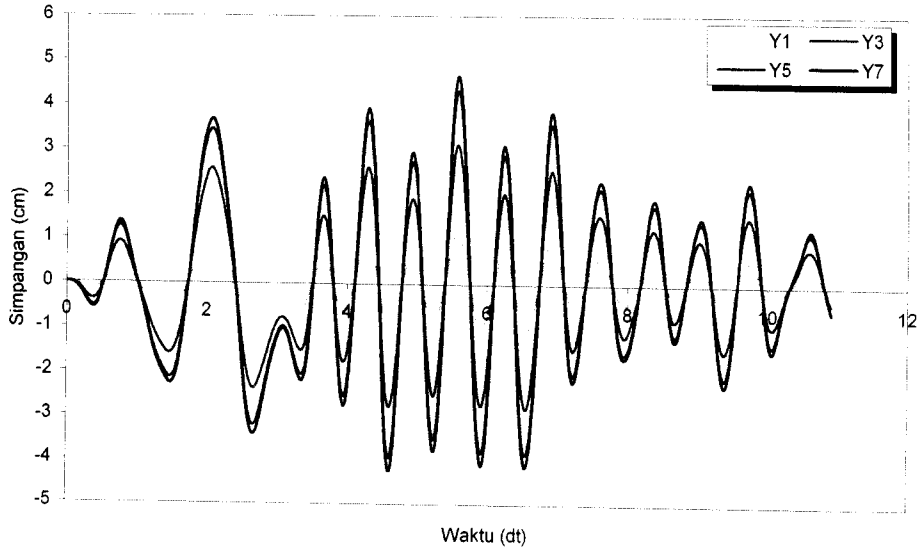
Nilai simpangan akan semakin mengecil pada tingkat dimana terdapat pengurangan massa dan kekakuan secara vertikal (setback vertikal). Hal itu disebabkan karena pada bangunan tersebut terjadi perbedaan periode getar sehingga massa yang lebih kecil diatas dapat berfungsi sebagai redaman simpangan dari massa yang berada di bawahnya.

Akan tetapi, pada gempa Elcentro dan Gilroy nilai simpangan cenderung fluktuatif itu dikarenakan perbedaan periode (T). Untuk nilai simpangan akibat gempa koyna nilainya semakin rapat karena berfrekuensi tinggi.

Nilai simpangan akan semakin besar pada bangunan bertingkat yang semakin tinggi. Hal ini disebabkan karena semakin tinggi suatu bangunan maka akan semakin fleksibel. Sehingga semakin rendah (kaku) suatu bangunan maka akan semakin kecil nilai simpangannya.



Tipikal



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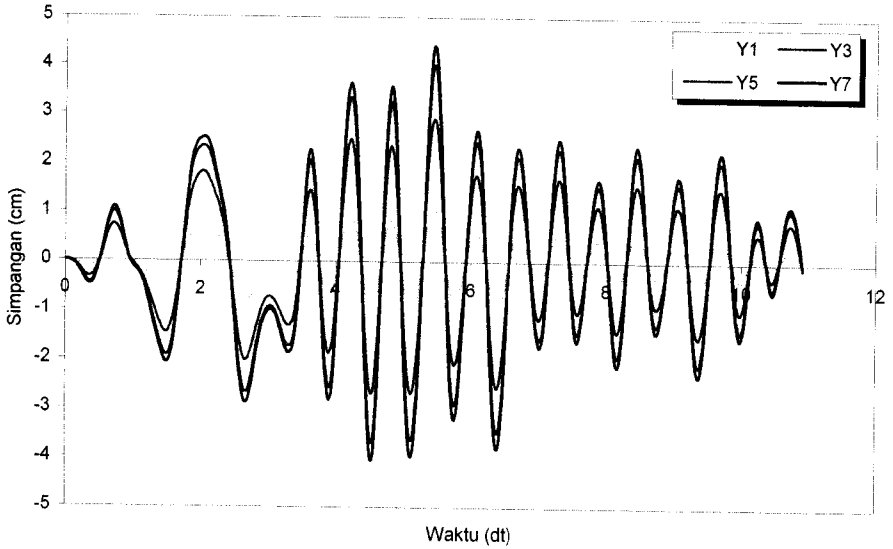

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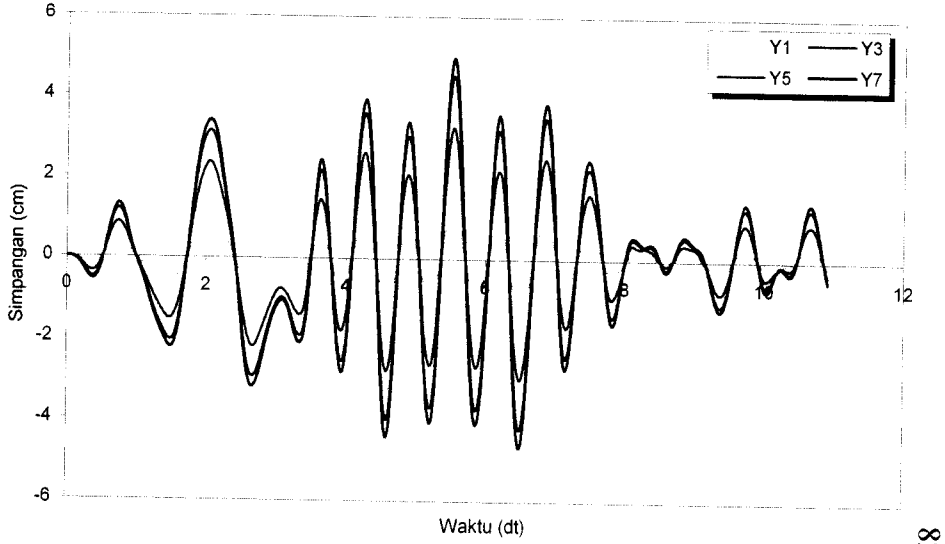
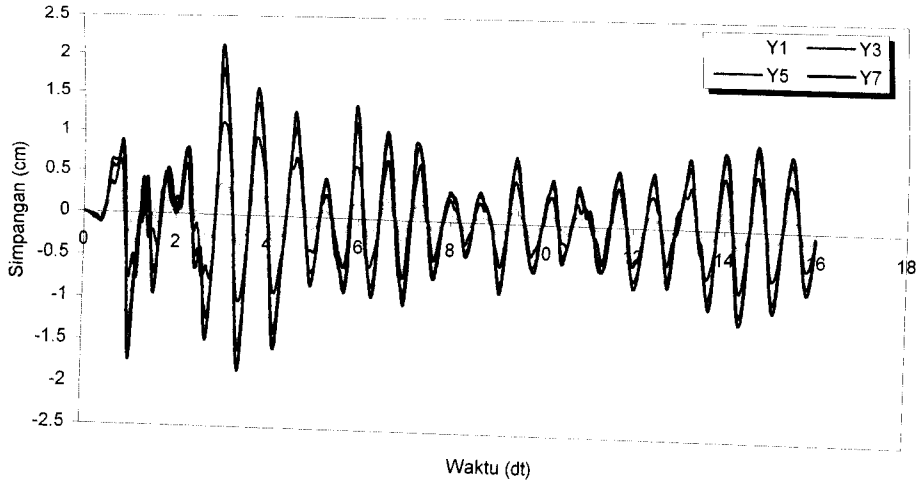


Setback 3

Gambar 5.11 Simpangan Struktur Tingkat 7 Akibat Gempa Bucharest



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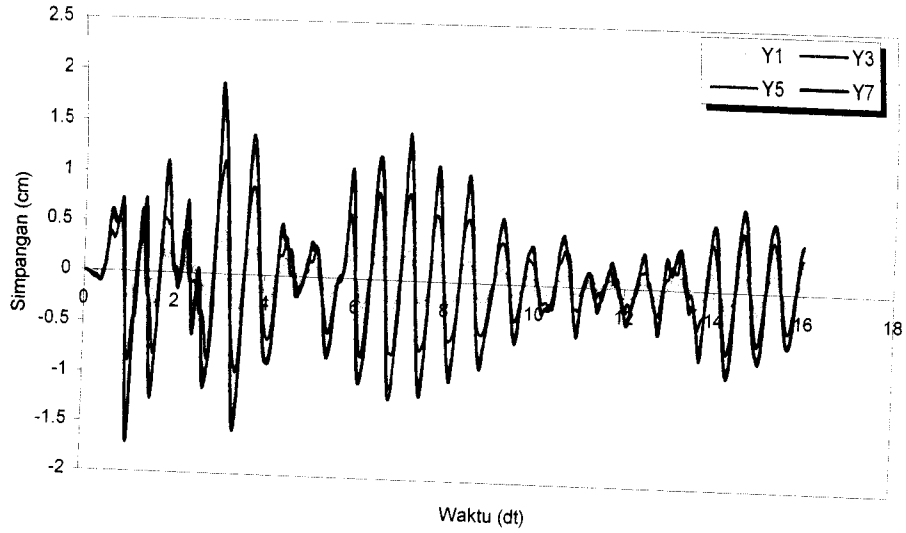

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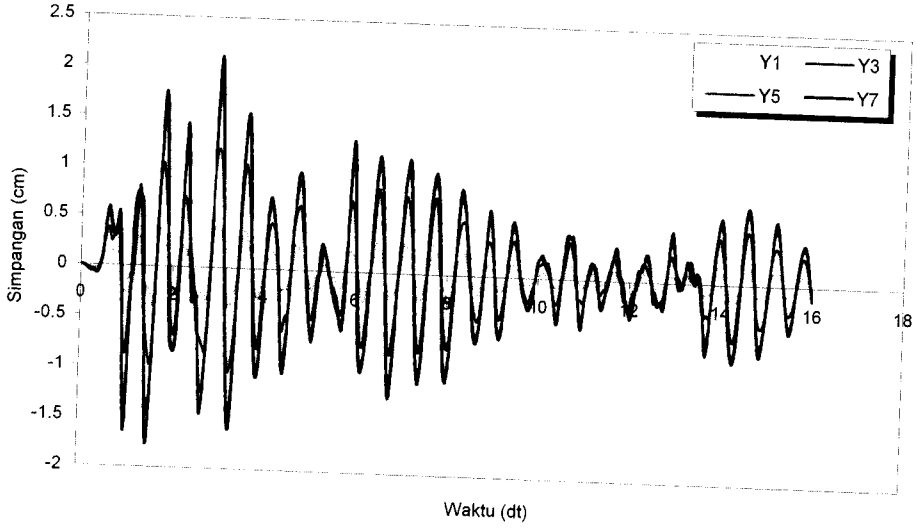

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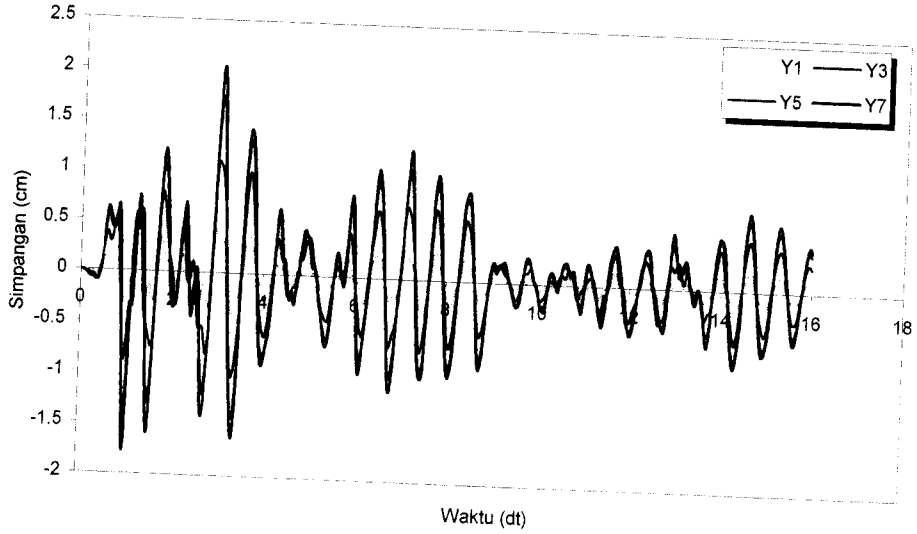
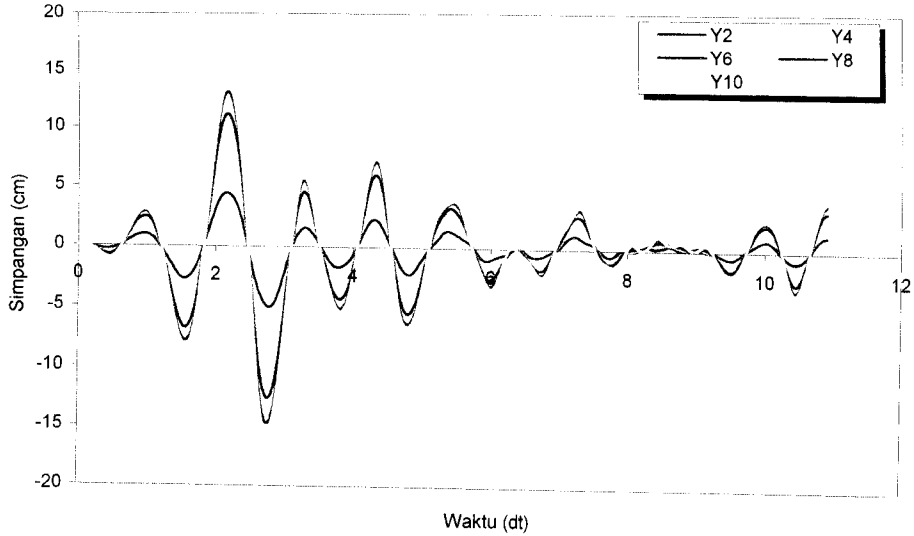


Setback 3

Gambar 5.13 Simpangan Struktur Tingkat 7 Akibat Gempa El Centro



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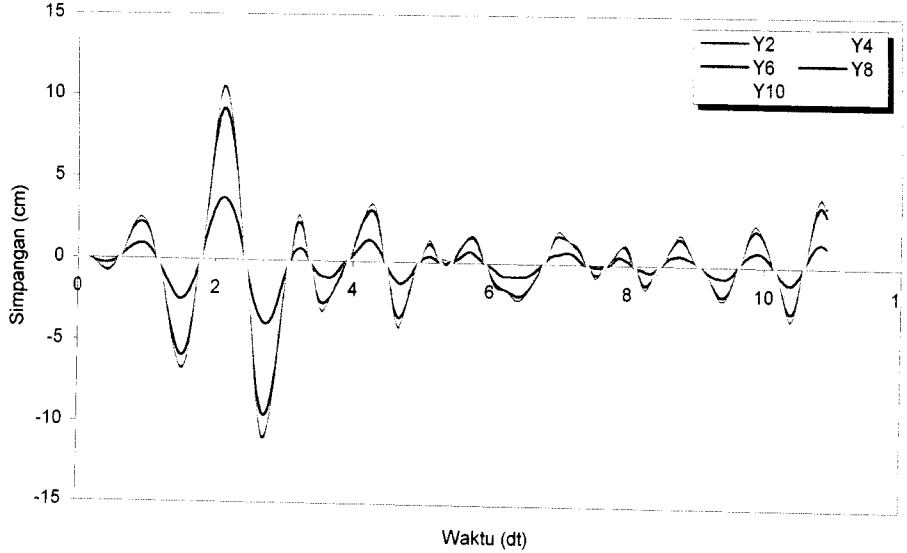

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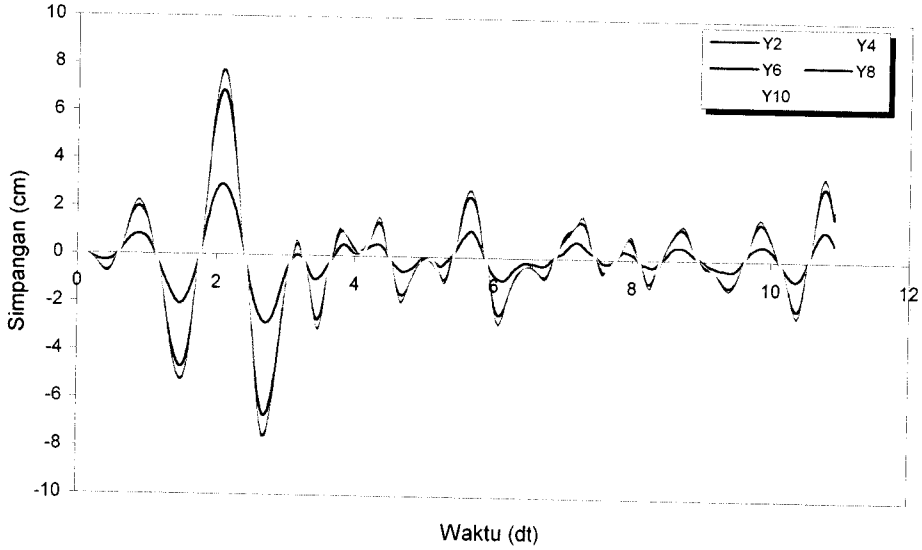

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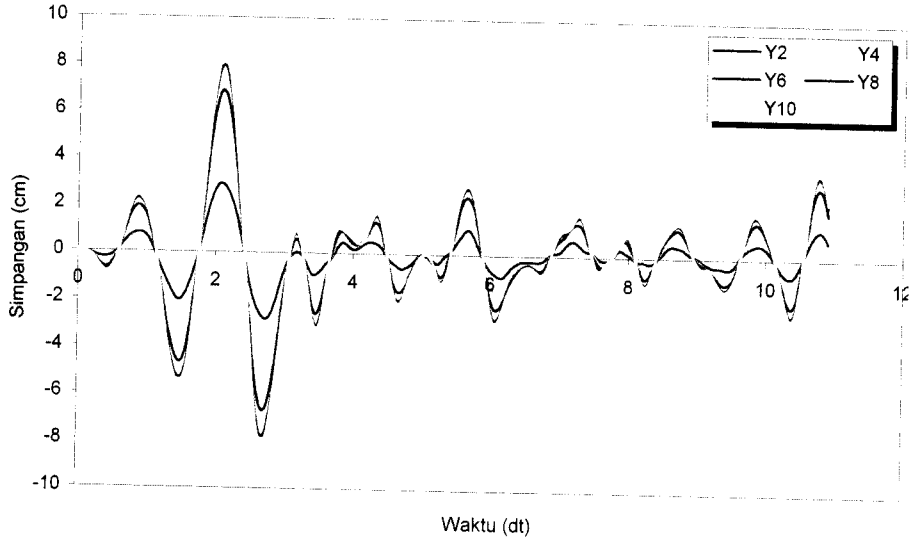
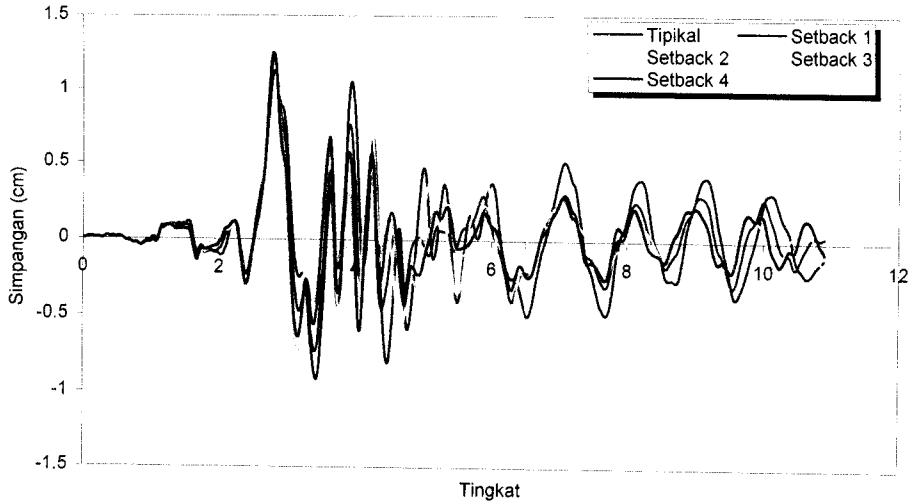
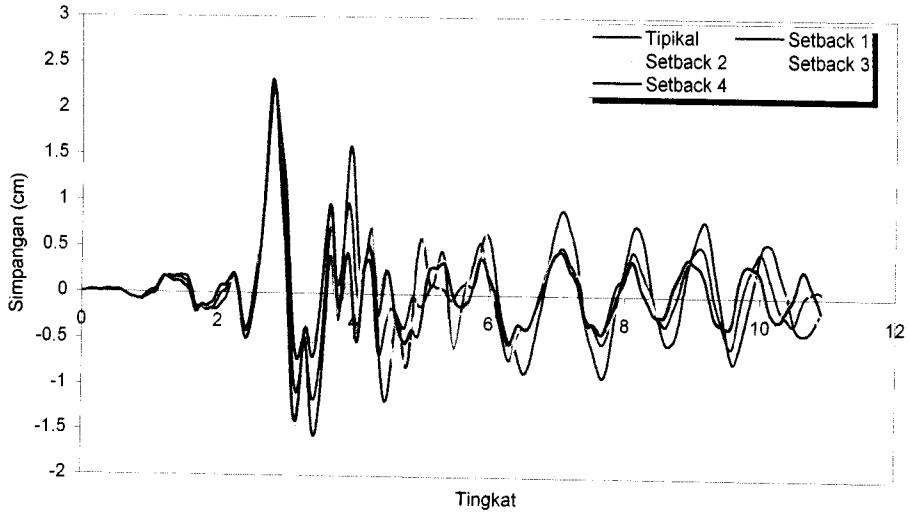


Setback 4

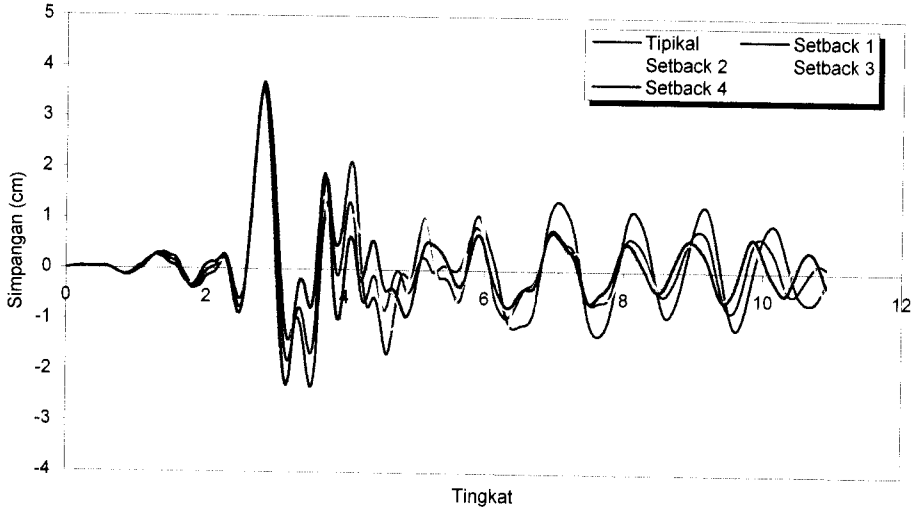
Gambar 5.20 Simpangan Struktur Tingkat 10 Akibat Gempa Bucharest



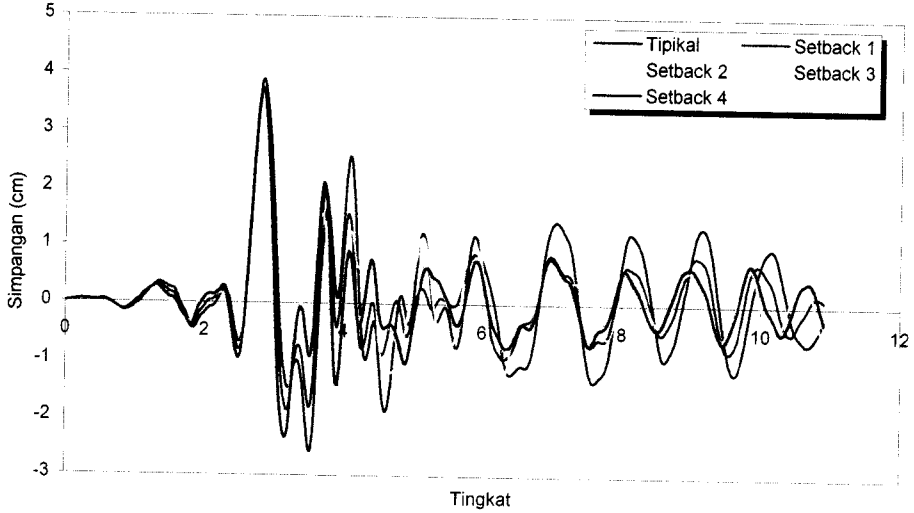
Tingkat 2



Tingkat 4



Tingkat 8



Tingkat 10

Gambar 5.25 Perbandingan Simpangan Struktur Tingkat 10 Akibat Gempa Gilroy

5.4.2 **Simpangan Struktur**

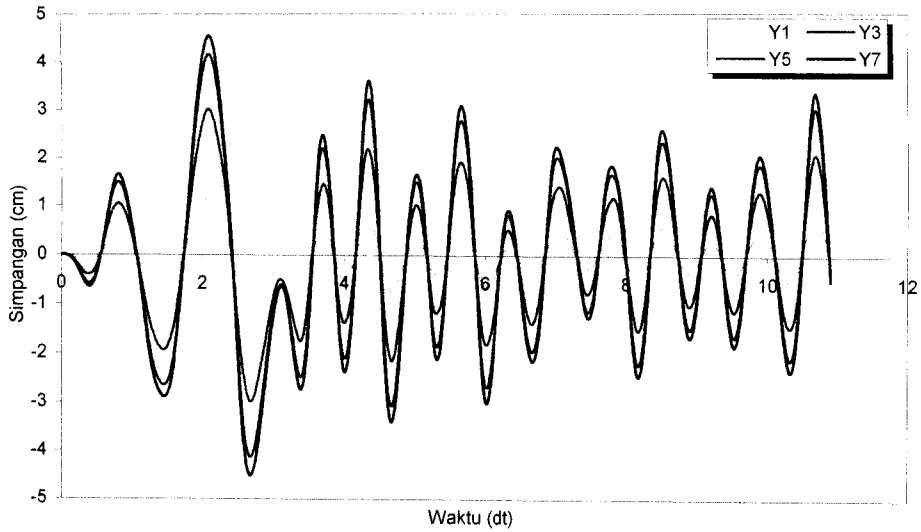
Simpangan struktur dihitung berdasarkan atas persamaan (3.51). Hasil analisis dengan variasi gempa ditampilkan dalam bentuk grafik antara simpangan dengan waktu (dengan interval 0,01).

Dari program ini nilai-nilai simpangan untuk struktur bangunan tingkat 7, 10, 15 dan 20 dengan 4 variasi gempa disajikan pada Gambar 5.11 sampai dengan Gambar 5.38. Dengan memperhatikan Gambar 5.11 sampai dengan Gambar 5.38 tersebut dapat dilihat bahwa simpangan yang dinormalisasi akibat beban gempa Bucharest mempunyai simpangan paling besar. Hal tersebut disebabkan karena percepatan maksimum (A_{maks}) gempa Bucharest mendekati 0,2g sehingga skala gempa mendekati satu. Simpangan semakin ke atas nilainya semakin besar

Nilai simpangan akan semakin mengecil pada tingkat dimana terdapat pengurangan massa dan kekakuan secara vertikal (setback vertikal). Hal itu disebabkan karena pada bangunan tersebut terjadi perbedaan periode getar sehingga massa yang lebih kecil diatas dapat berfungsi sebagai redaman simpangan dari massa yang berada di bawahnya.

Akan tetapi, pada gempa Elcentro dan Gilroy nilai simpangan cenderung fluktuatif itu dikarenakan perbedaan periode (T). Untuk nilai simpangan akibat gempa koyna nilainya semakin rapat karena berfrekuensi tinggi.

Nilai simpangan akan semakin besar pada bangunan bertingkat yang semakin tinggi. Hal ini disebabkan karena semakin tinggi suatu bangunan maka akan semakin fleksibel. Sehingga semakin rendah (kaku) suatu bangunan maka akan semakin kecil nilai simpangannya.



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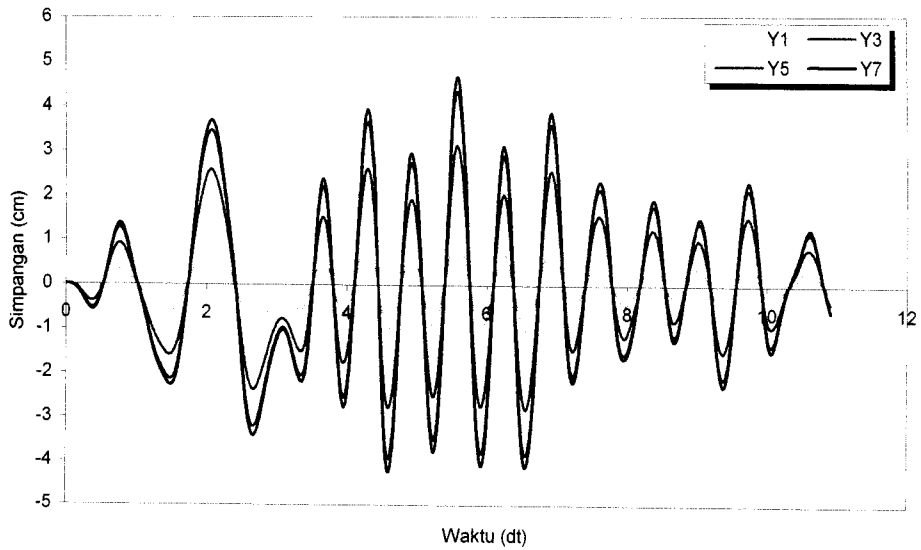

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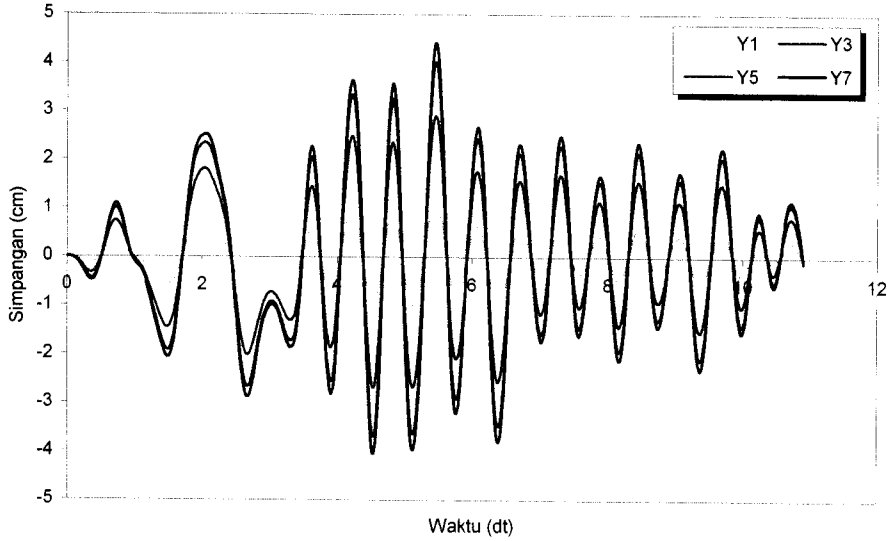

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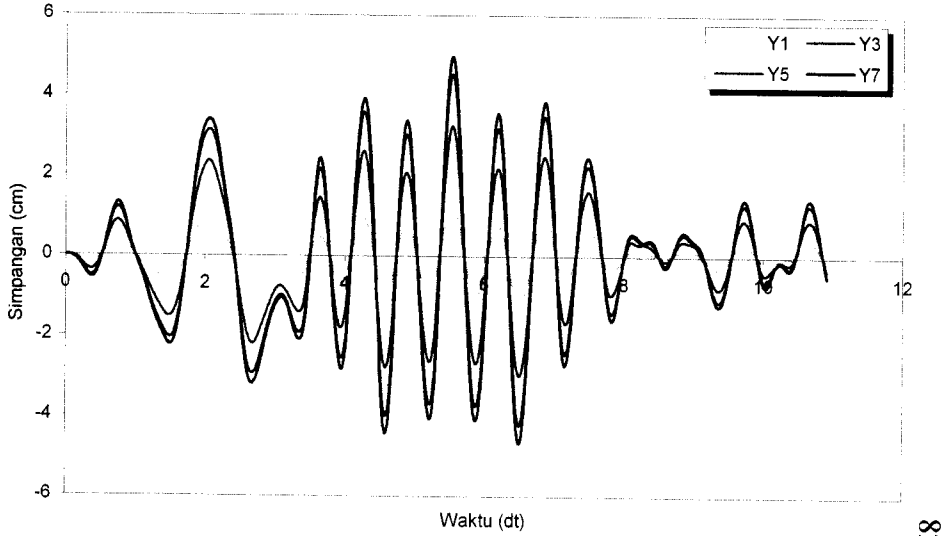
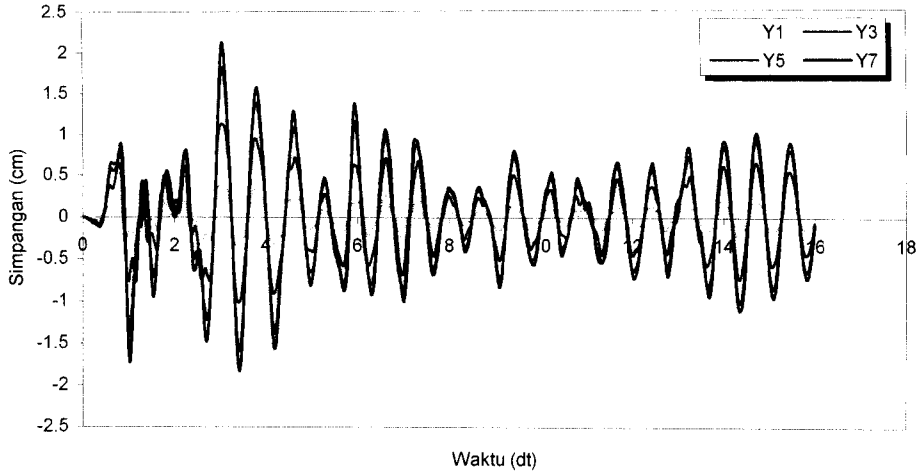


Setback 3

Gambar 5.11 Simpangan Struktur Tingkat 7 Akibat Gempa Bucharest



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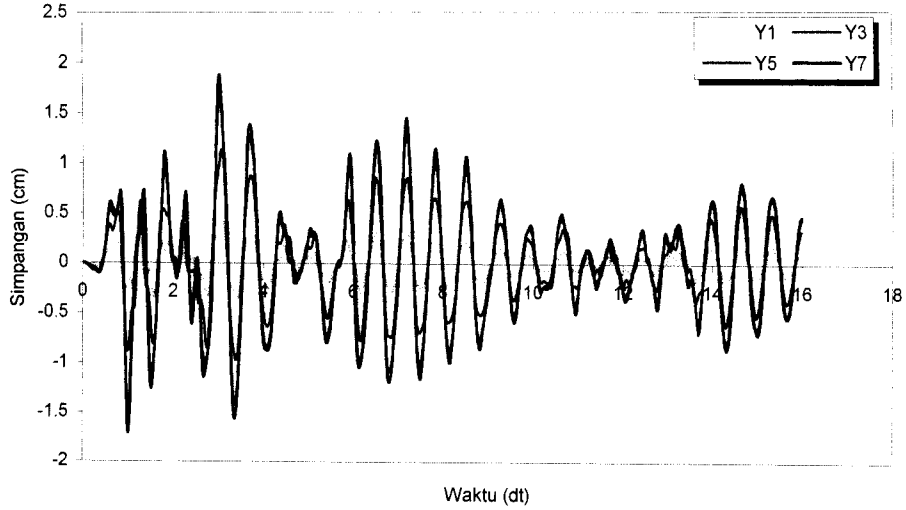

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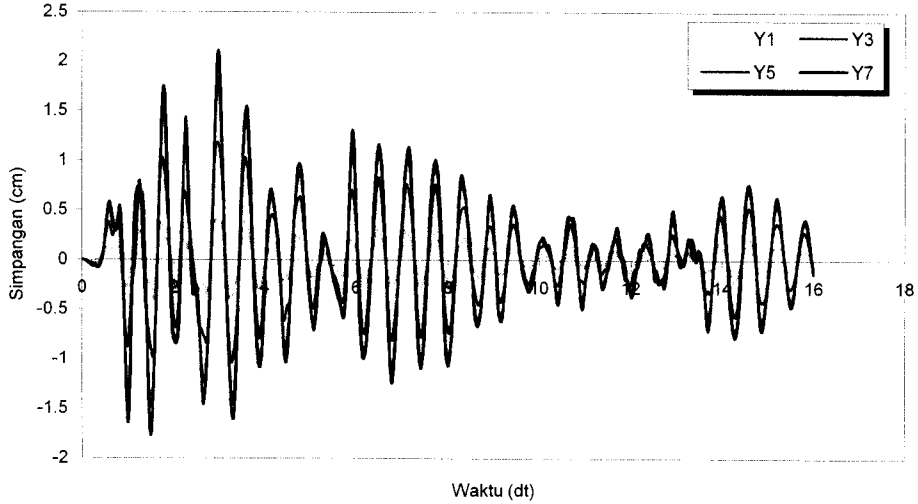

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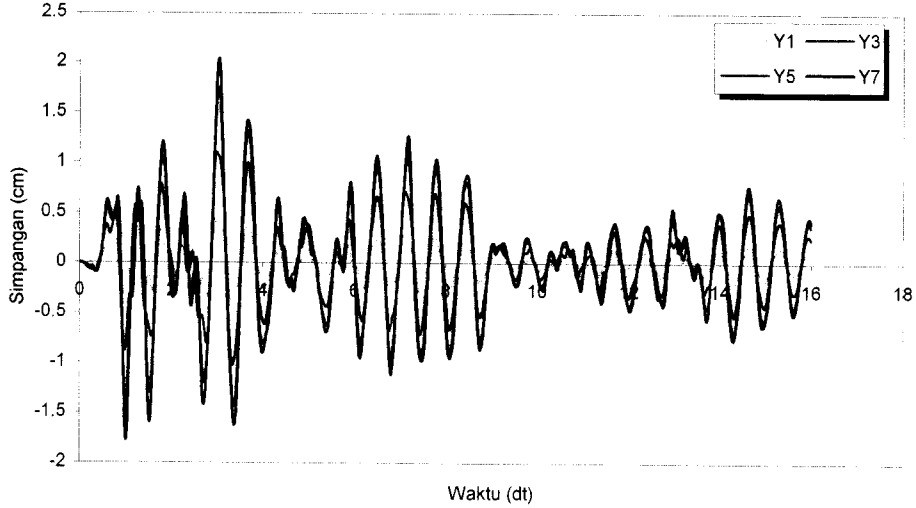
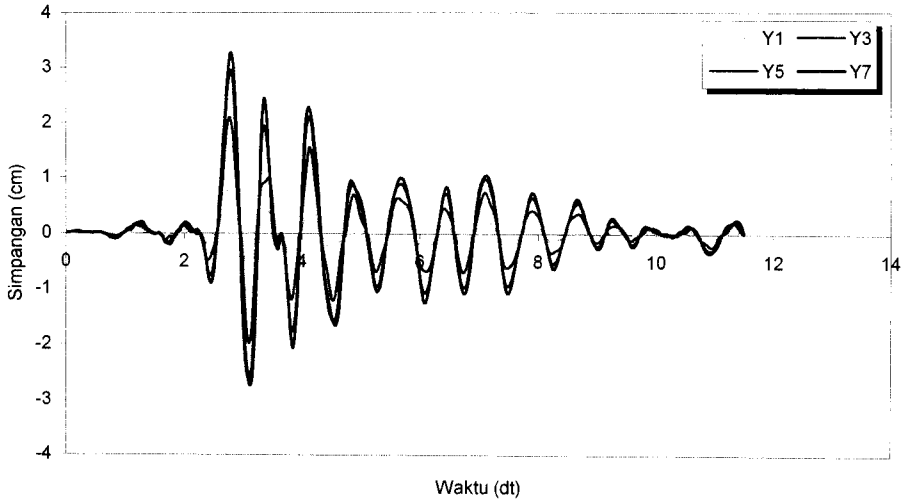
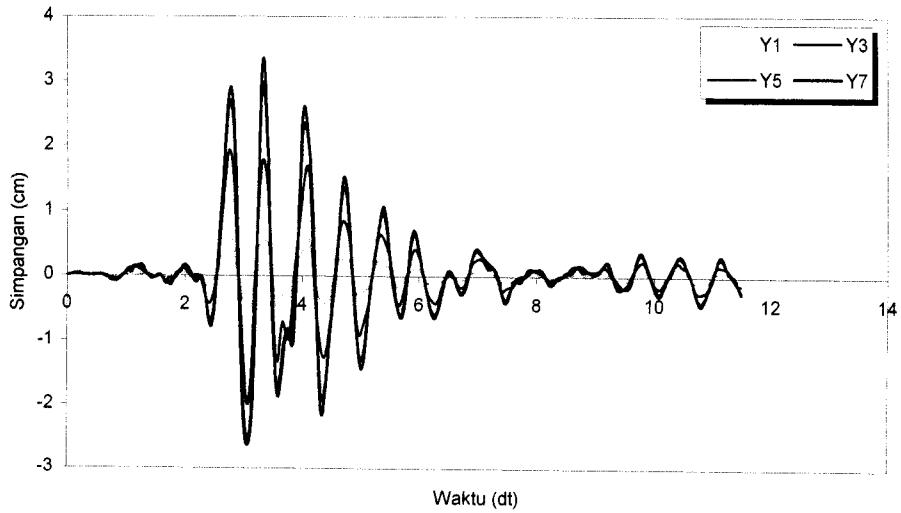


Setback 3

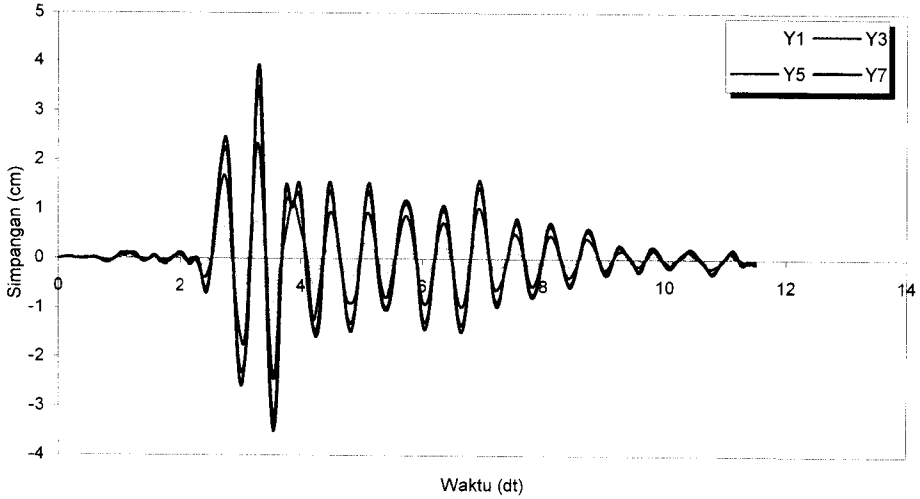
Gambar 5.13 Simpangan Struktur Tingkat 7 Akibat Gempa El Centro



Tipikal



Setback 1



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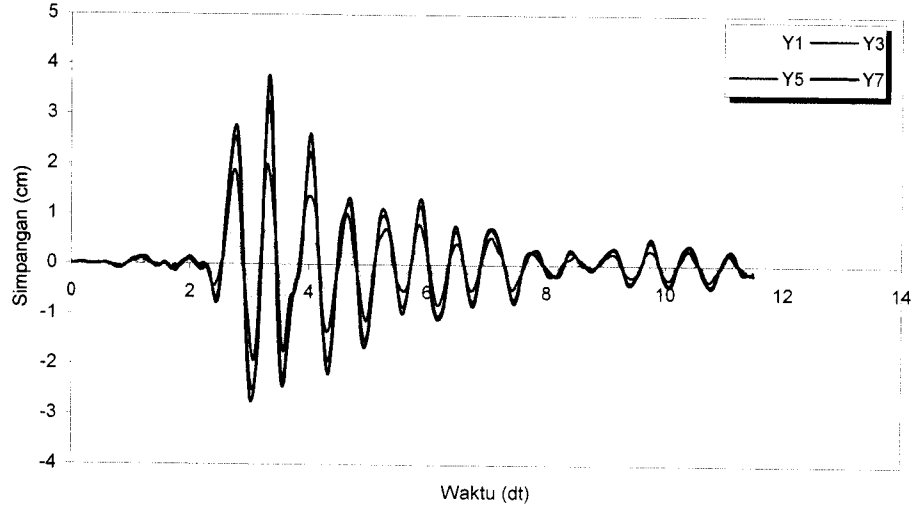
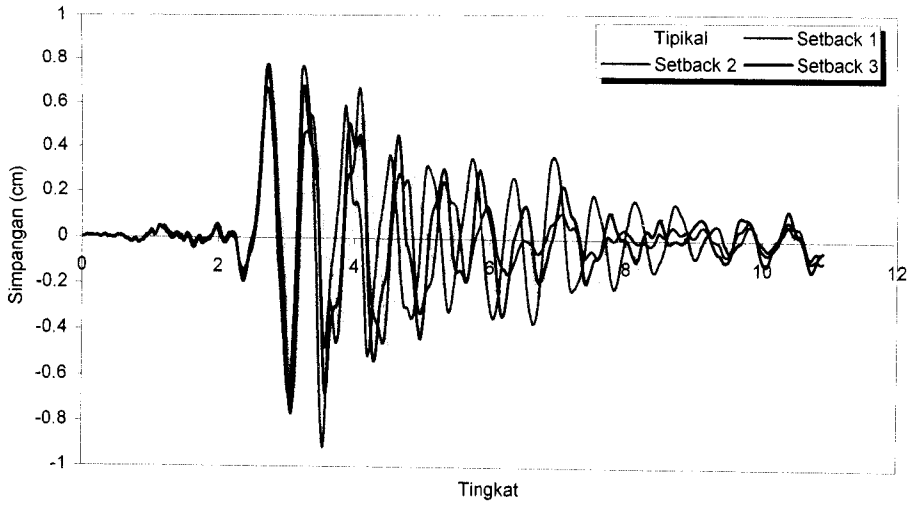
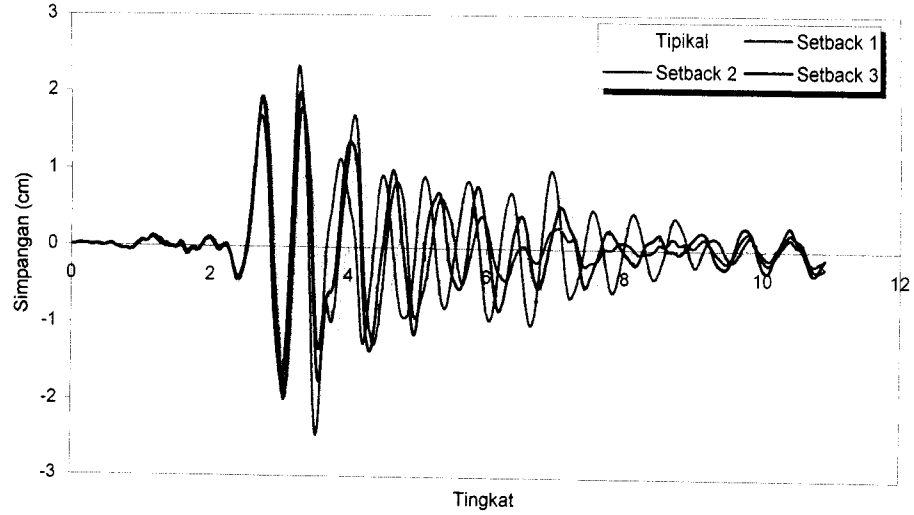


Setback 3

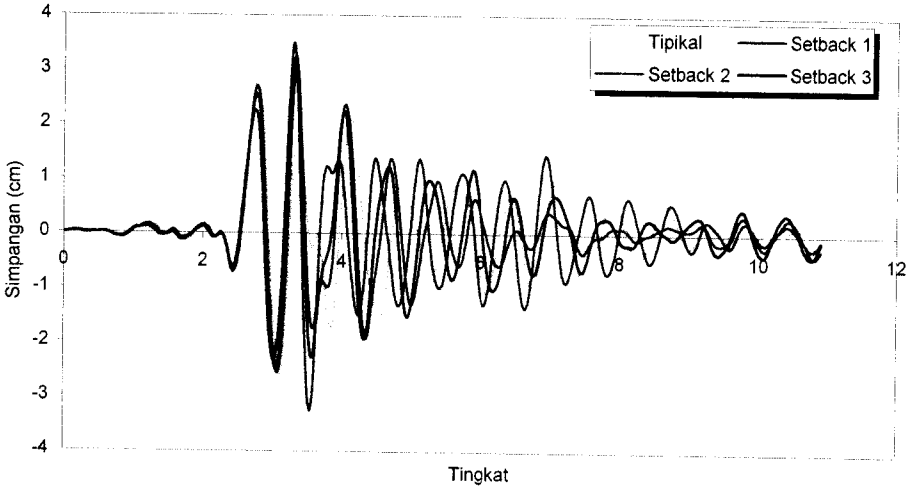
Gambar 5.15 Simpangan Struktur Tingkat 7 Akibat Gempa Gilroy



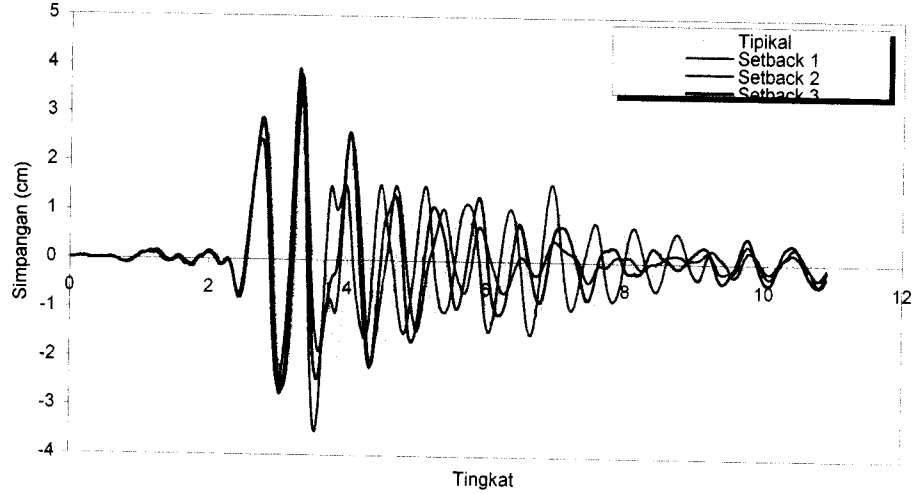
Tingkat 1



Tingkat 3

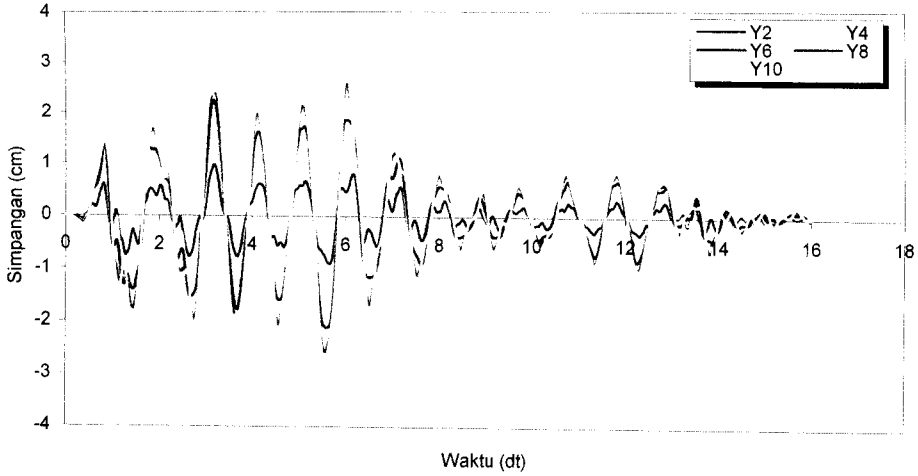


Tingkat 5

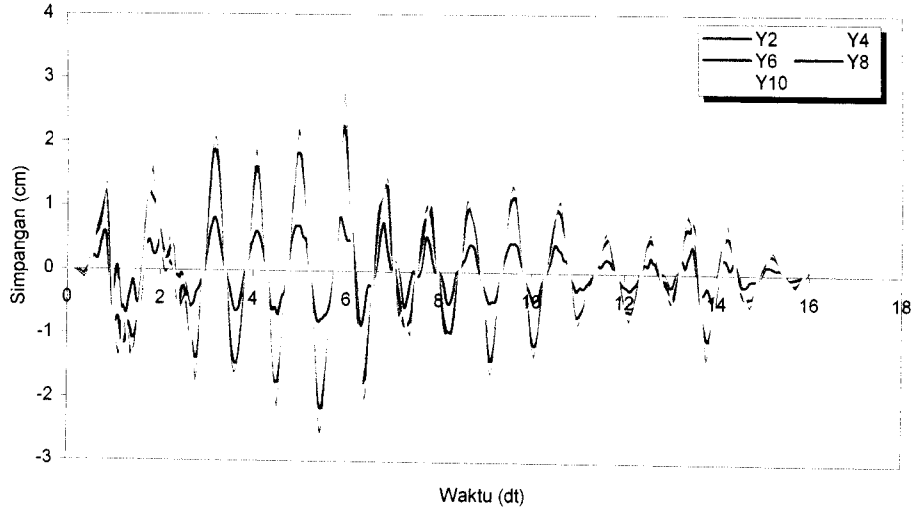


Tingkat 7

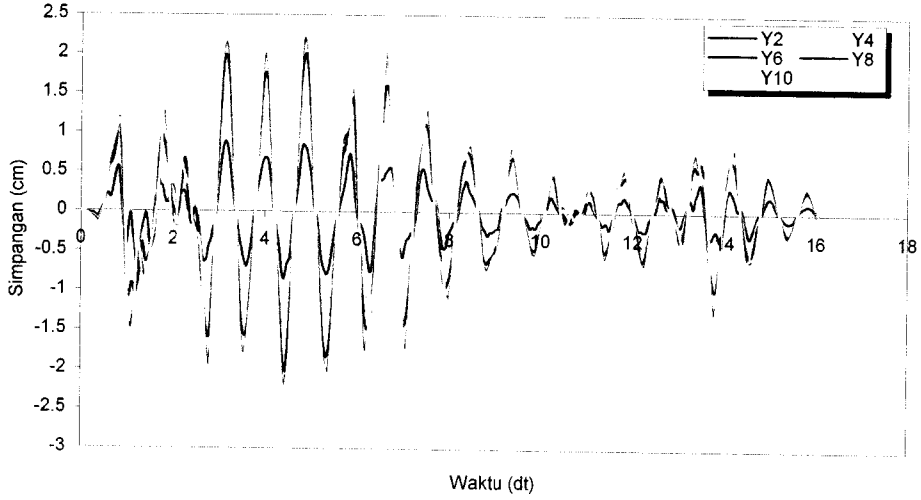
Gambar 5.16 Perbandingan Simpangan Struktur Tingkat 7 Akibat Gempa Gilroy



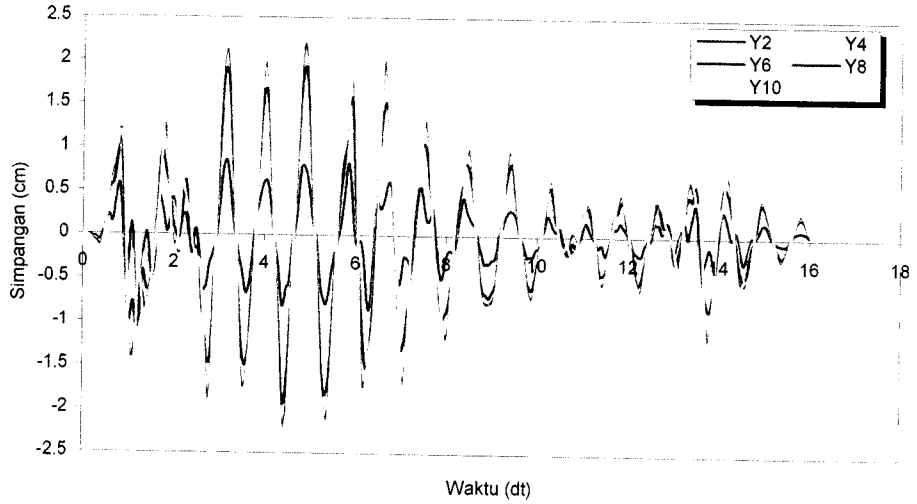
Tipikal



Setback 1

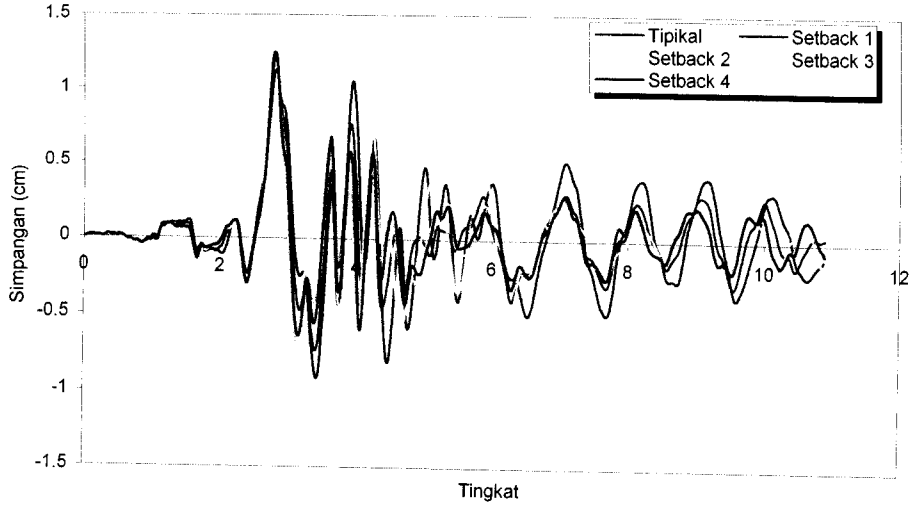


Setback 2

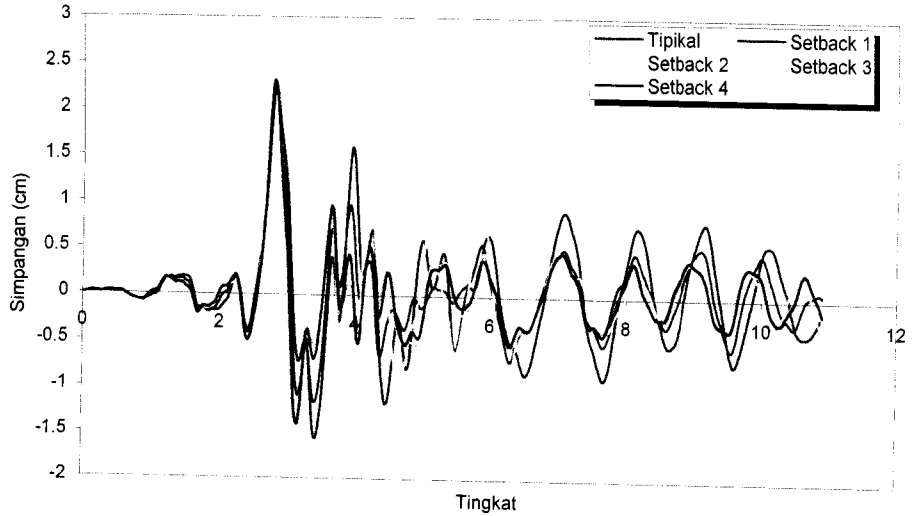


Setback 4

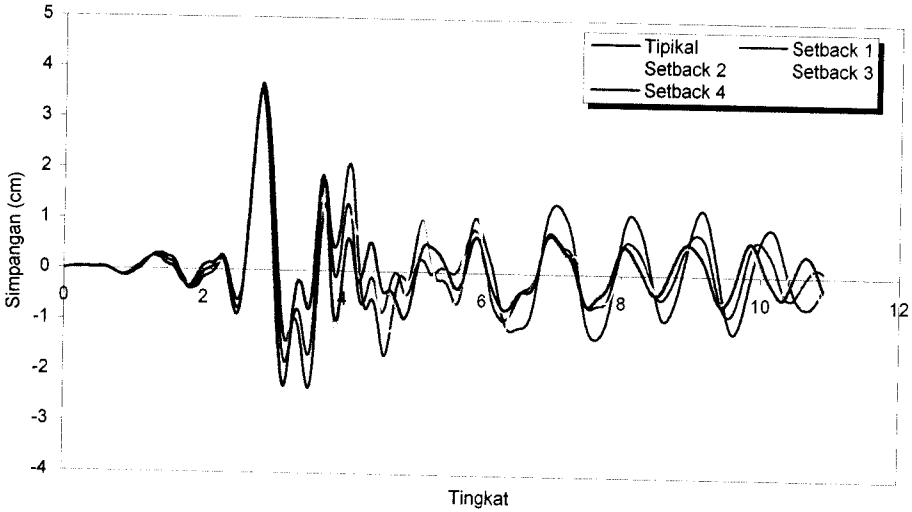
Gambar 5.22 Simpangan Struktur Tingkat 10 Akibat Gempa El Centro



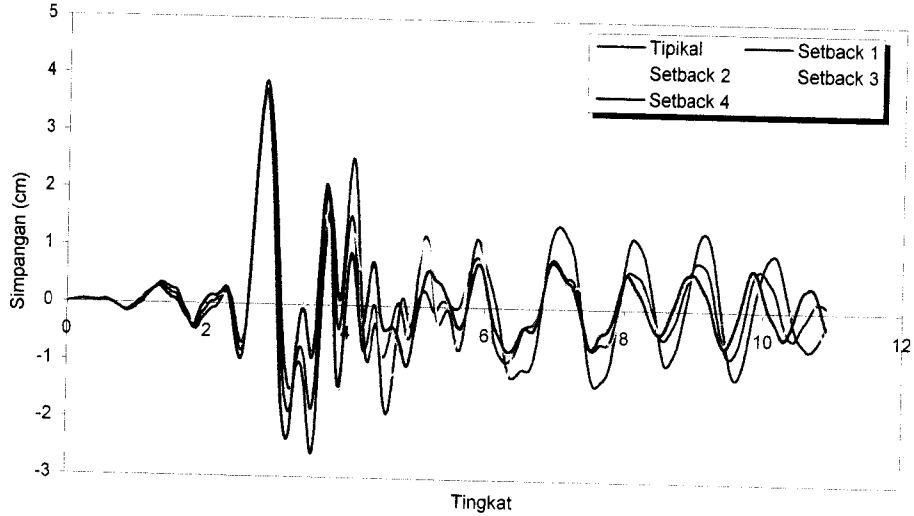
Tingkat 2



Tingkat 4

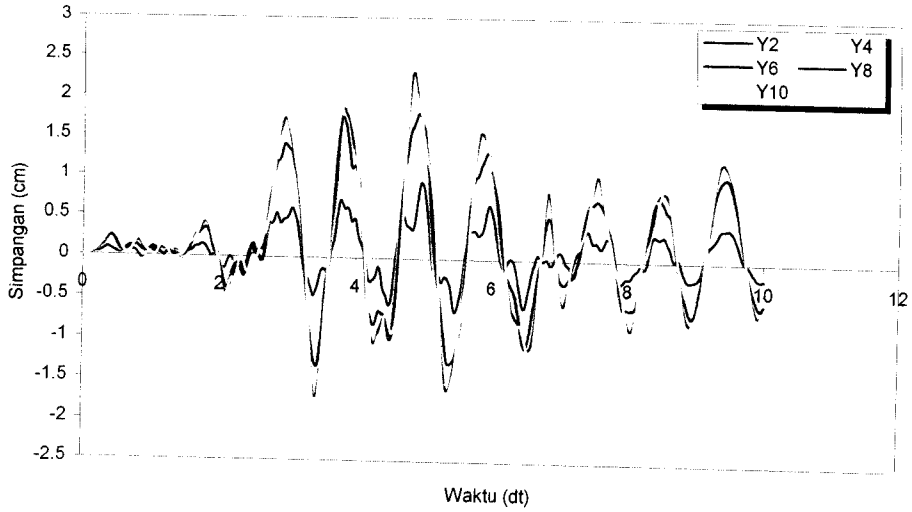


Tingkat 8



Tingkat 10

Gambar 5.25 Perbandingan Simpangan Struktur Tingkat 10 Akibat Gempa Gilroy



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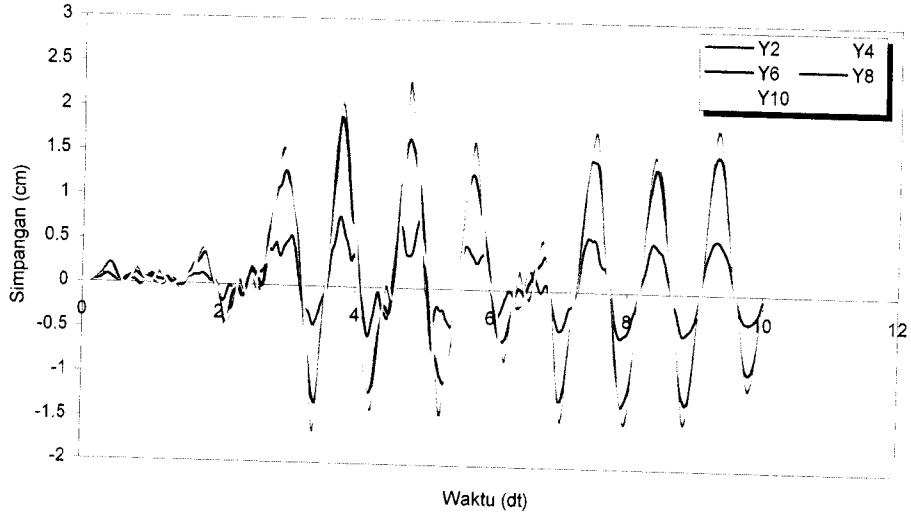
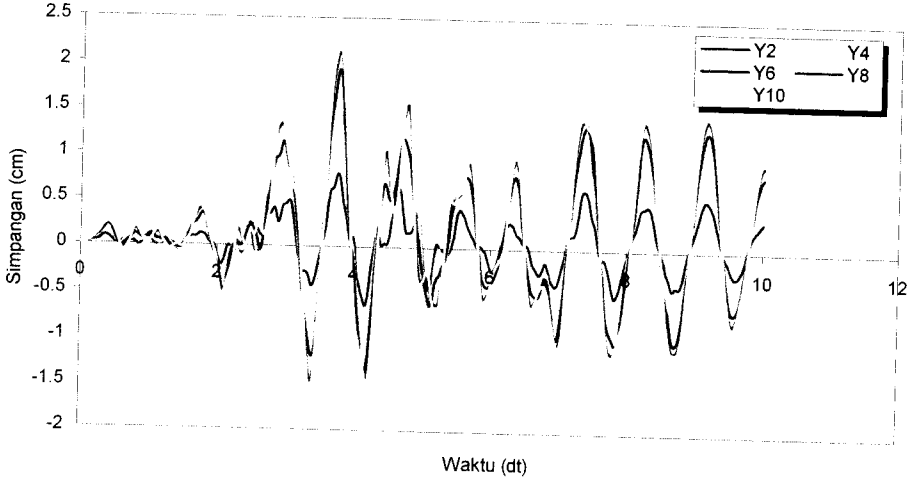


Setback 1



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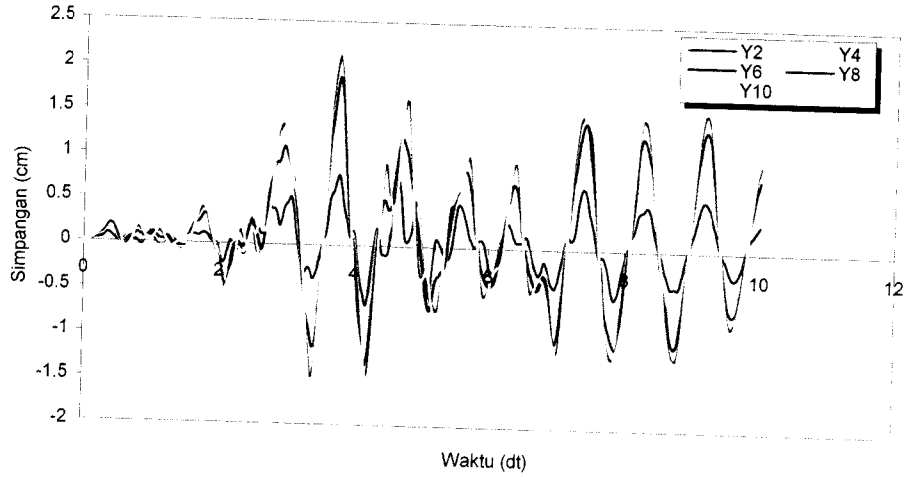
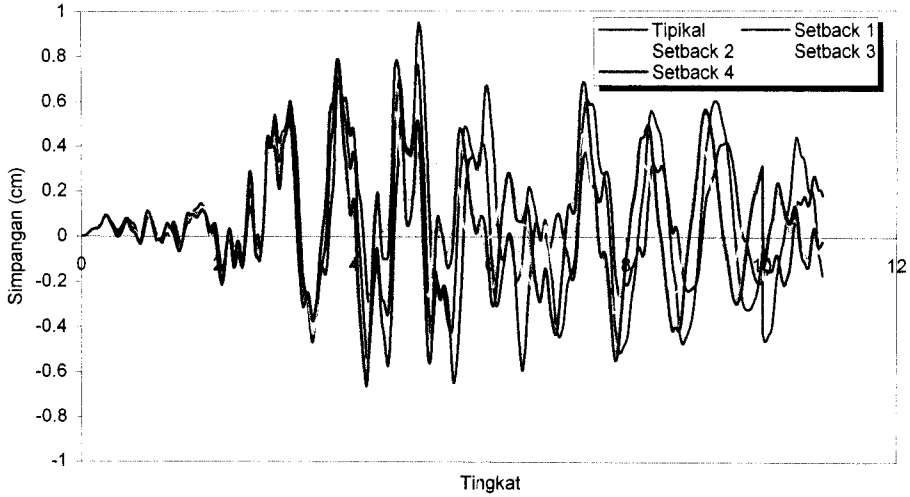
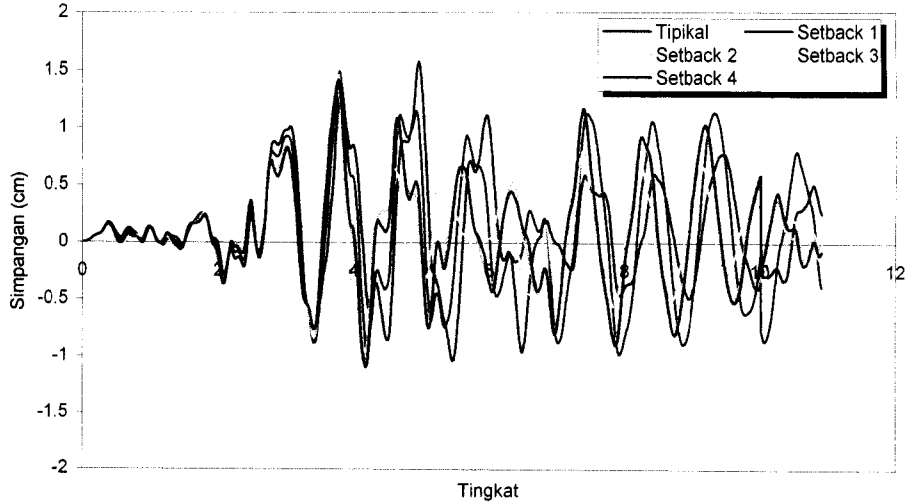


Setback 4

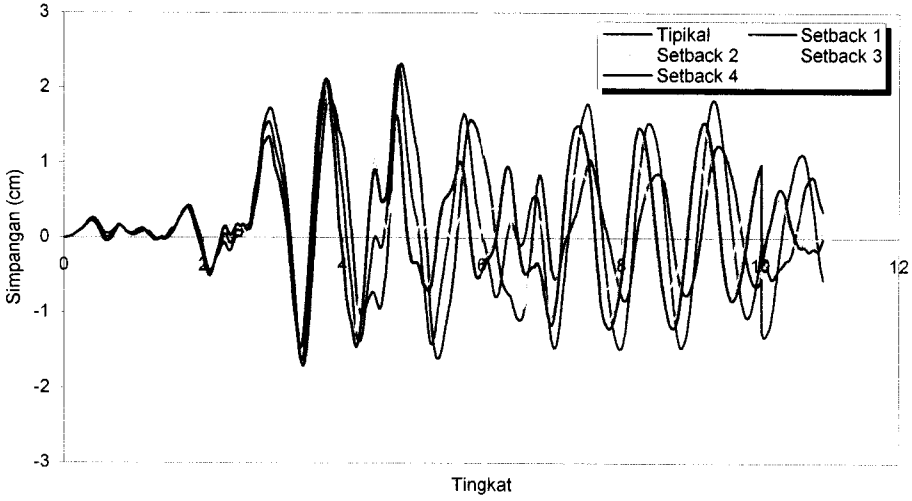
Gambar 5.26 Simpangan Struktur Tingkat 10 Akibat Gempa Koyna



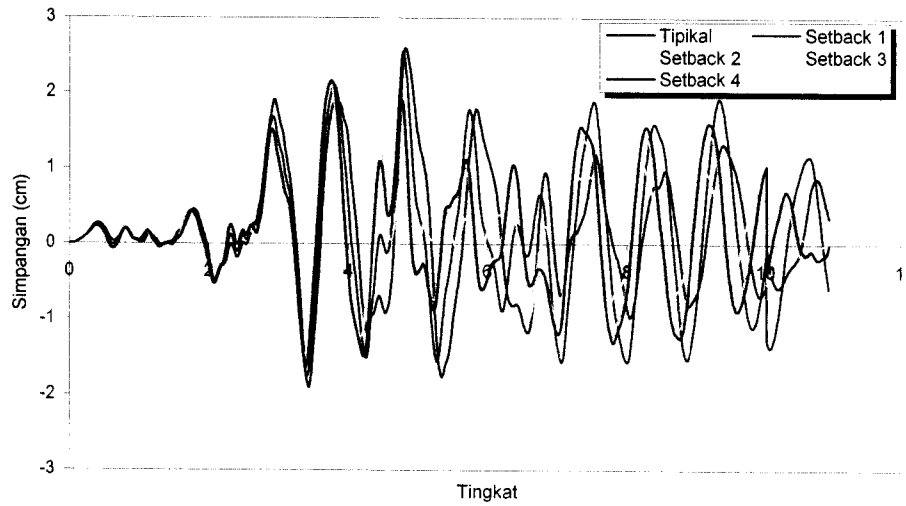
Tingkat 2



Tingkat 4

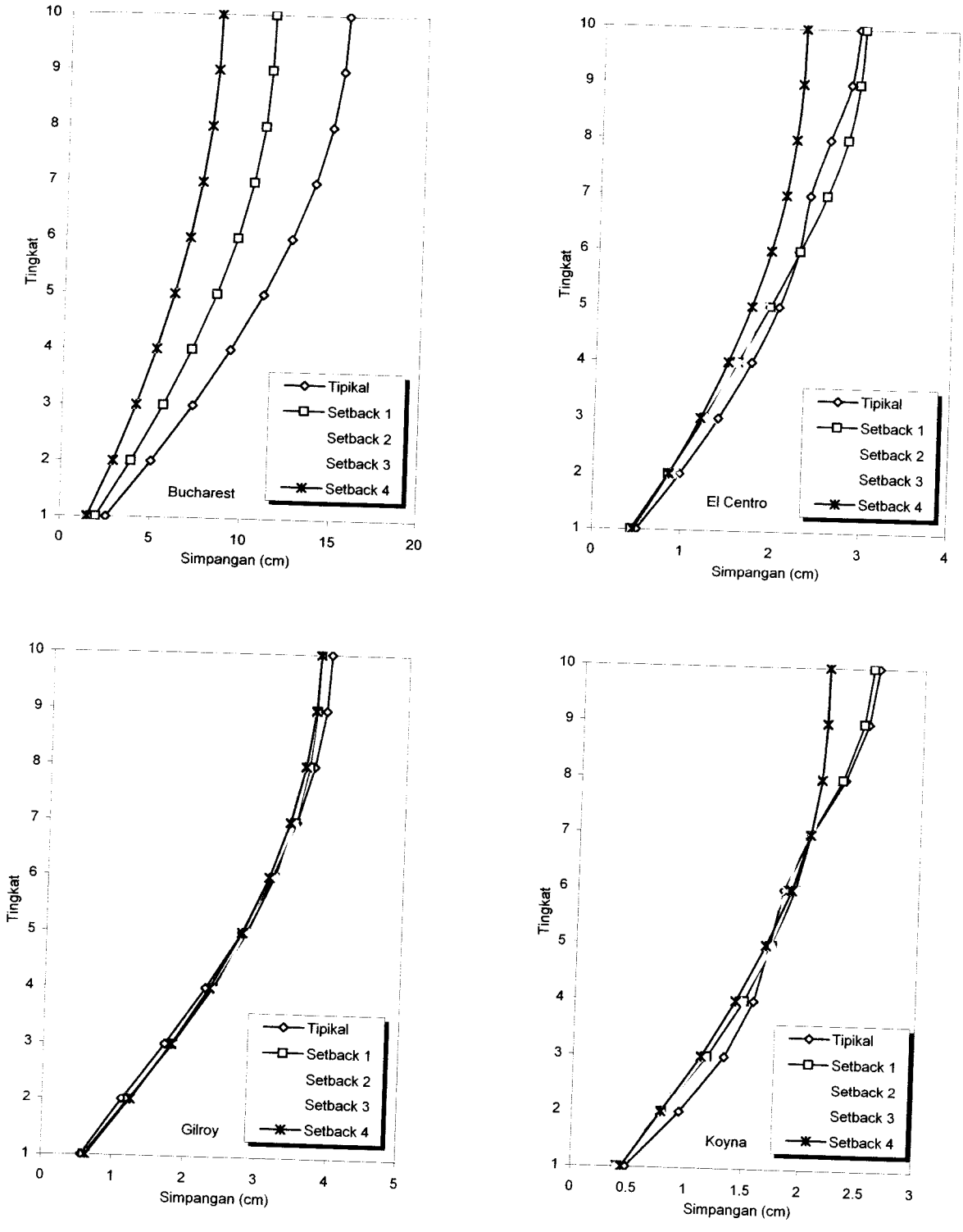


Tingkat 8

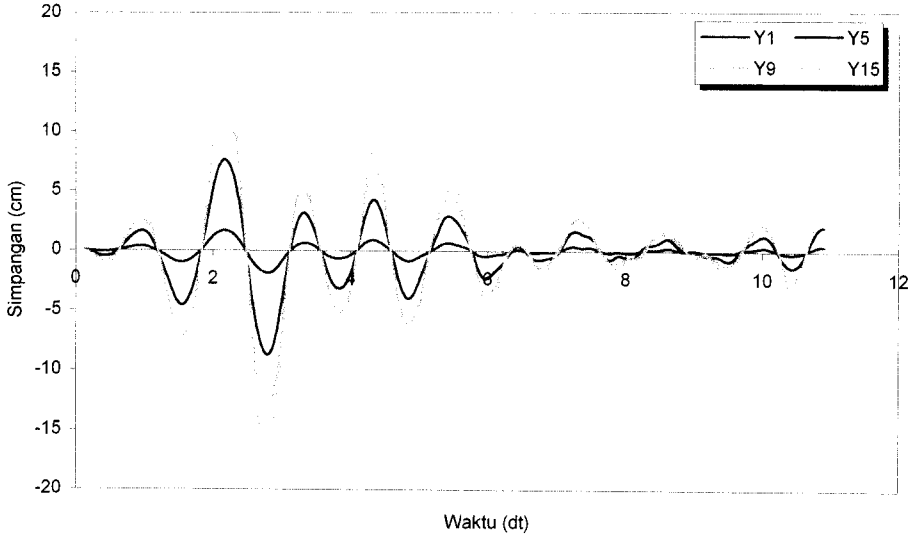


Tingkat 10

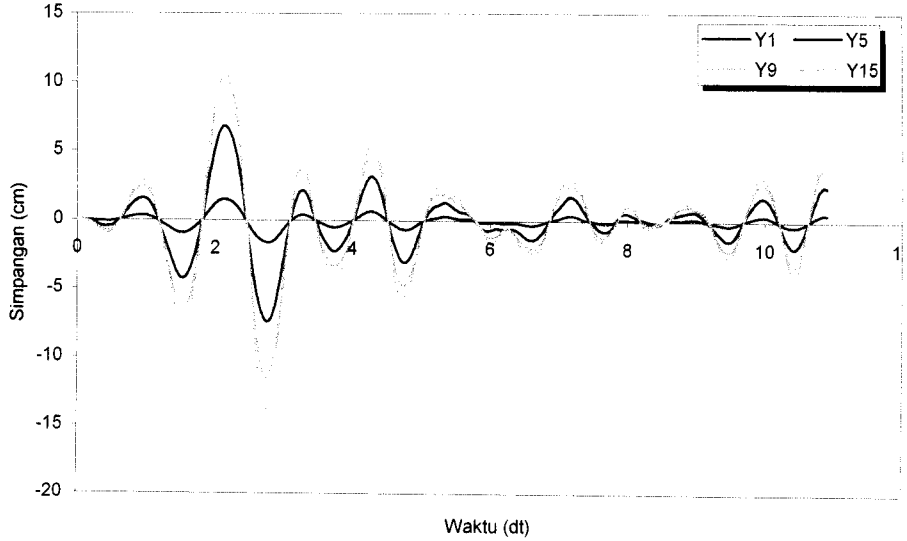
Gambar 5.27 Perbandingan Simpangan Struktur Tingkat 10 Akibat Gempa Koyna



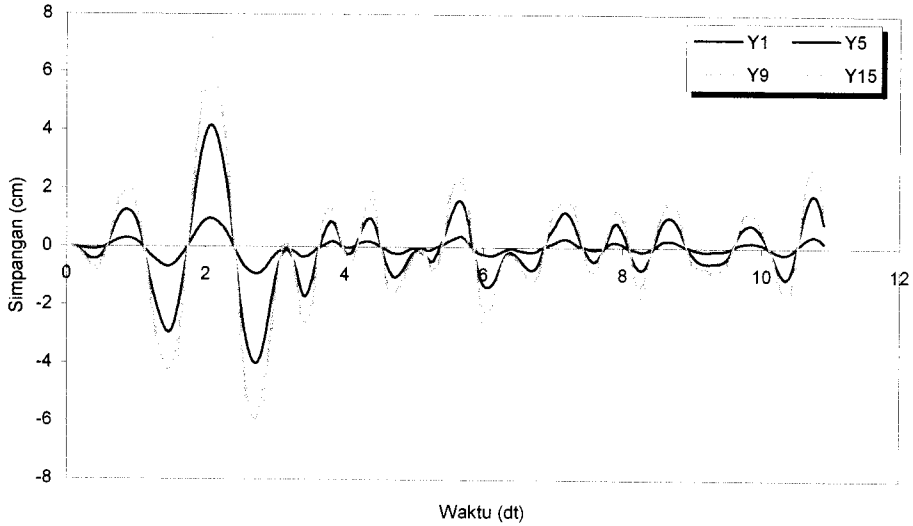
Gambar 5.28 Simpangan Maksimum Struktur Tingkat 10 Akibat 4 Gempa



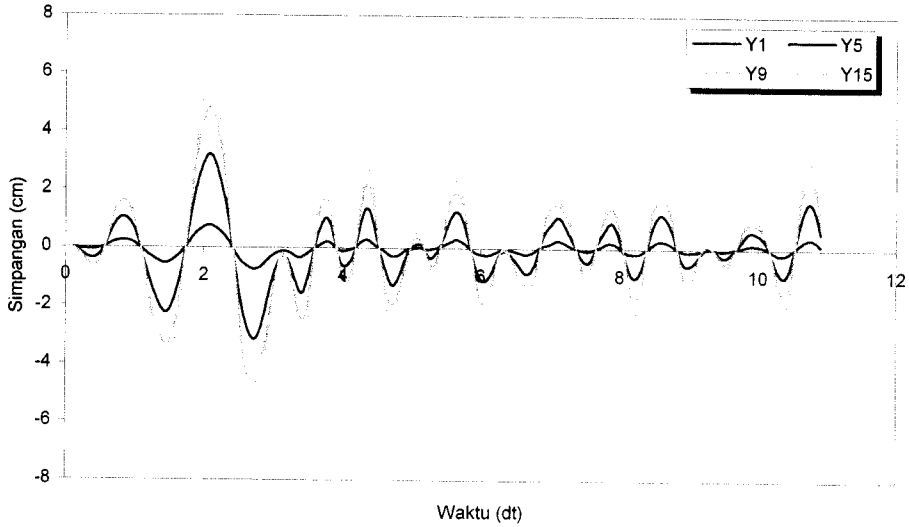
Tipikal



Setback 1

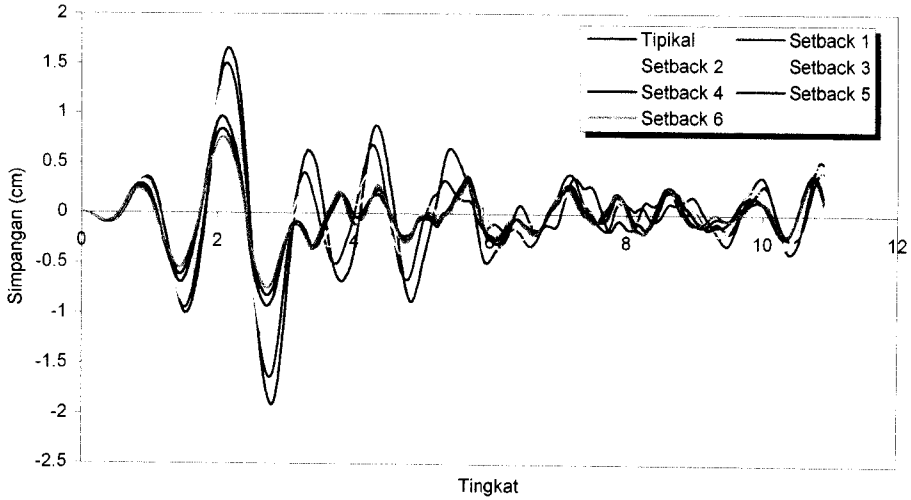


Setback 4

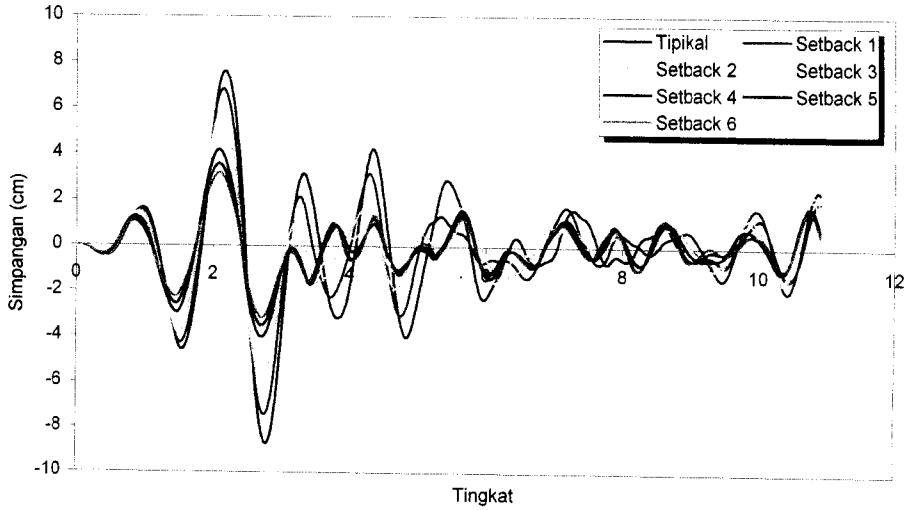


Setback 6

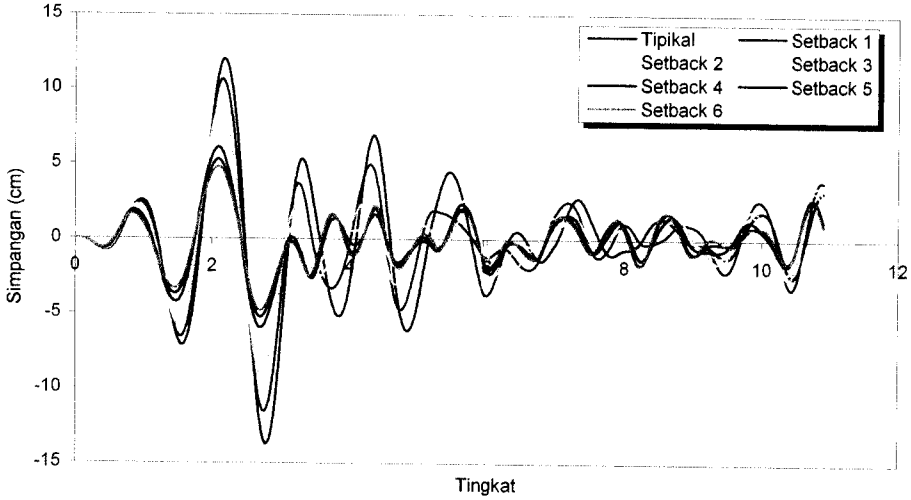
Gambar 5.29 Simpangan Struktur Tingkat 15 Akibat Gempa Bucharest



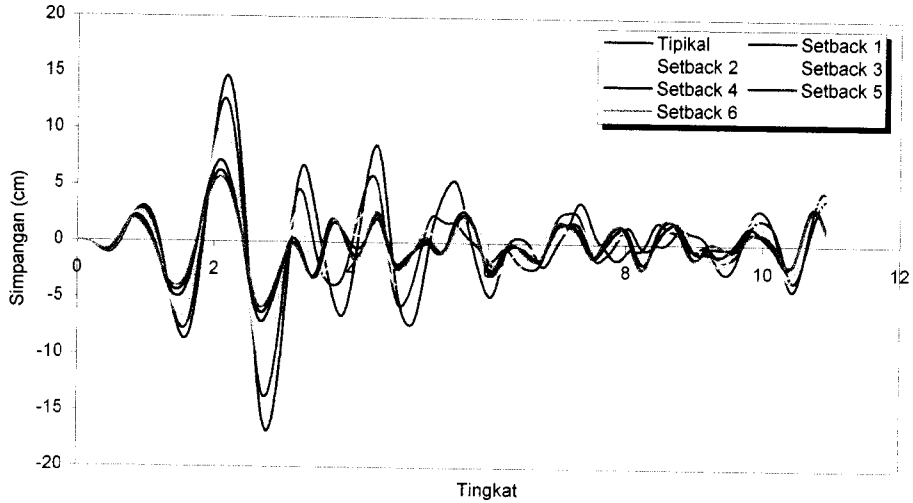
Tingkat 1



Tingkat 5

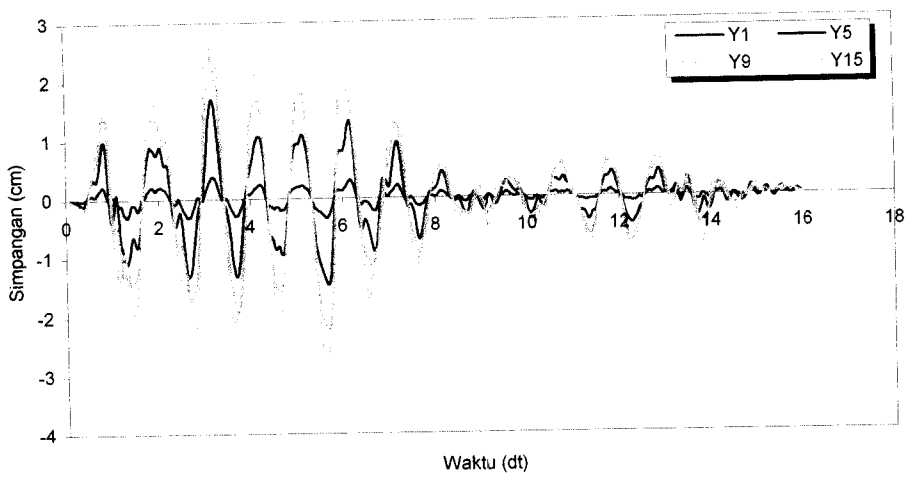


Tingkat 9

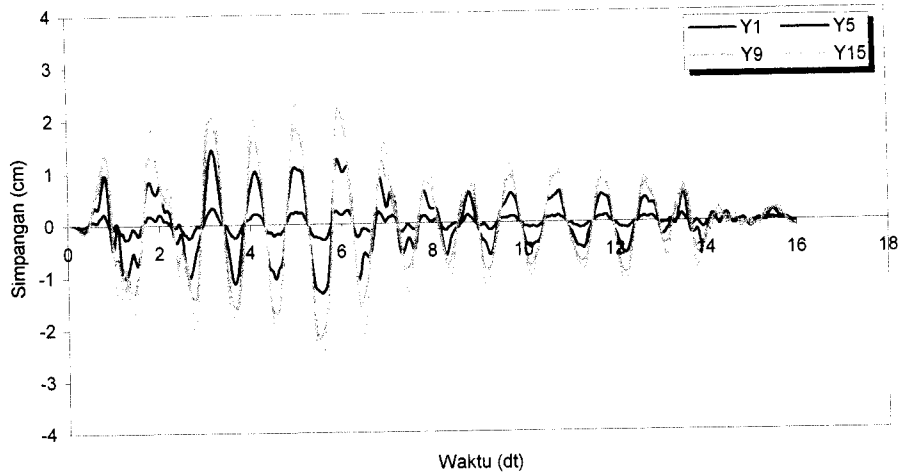


Tingkat 15

Gambar 5.30 Perbandingan Simpangan Struktur Tingkat 15 Akibat Gempa Bucharest



Tipikal



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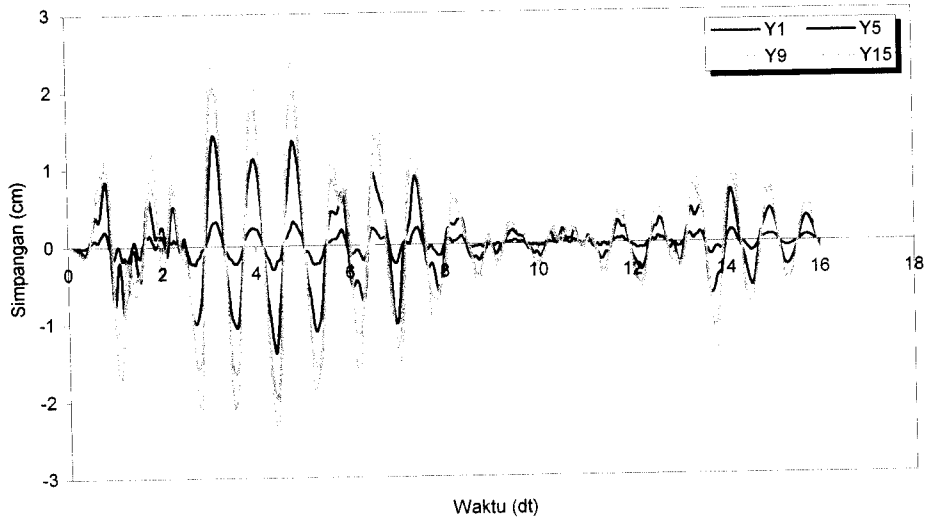
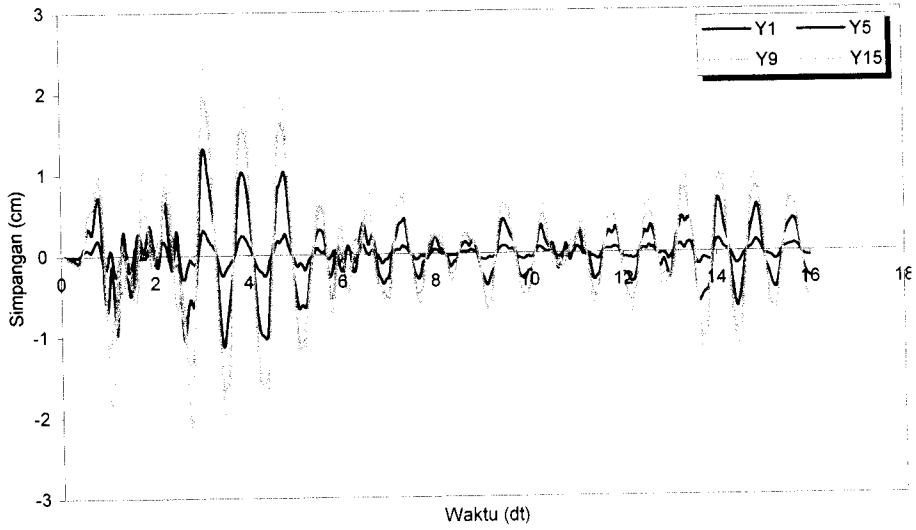
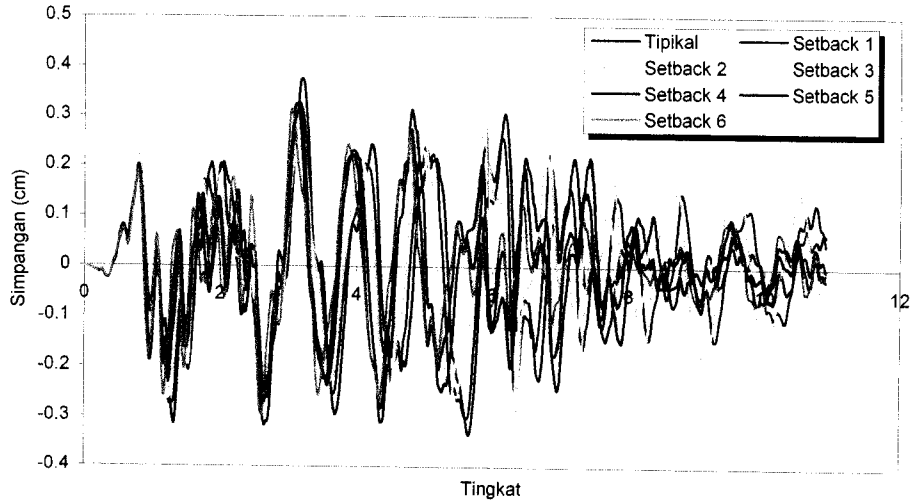


Setback 4

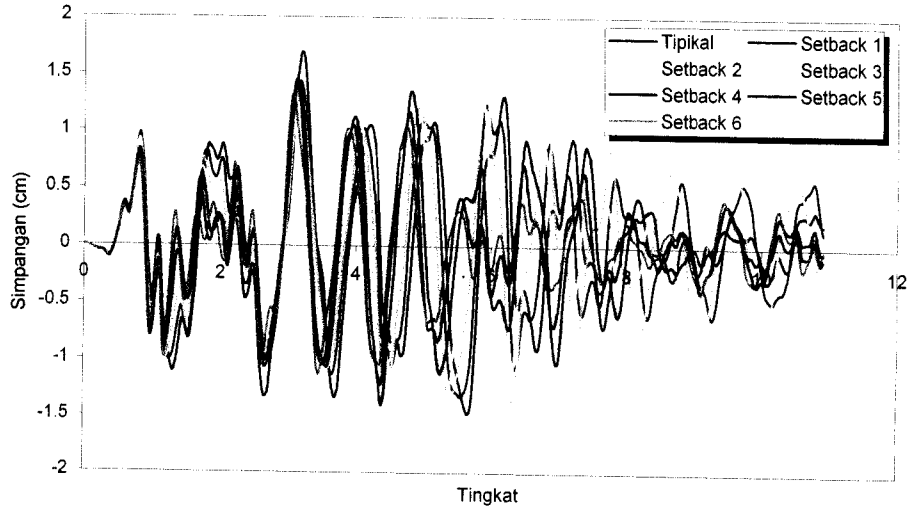


Setback 6

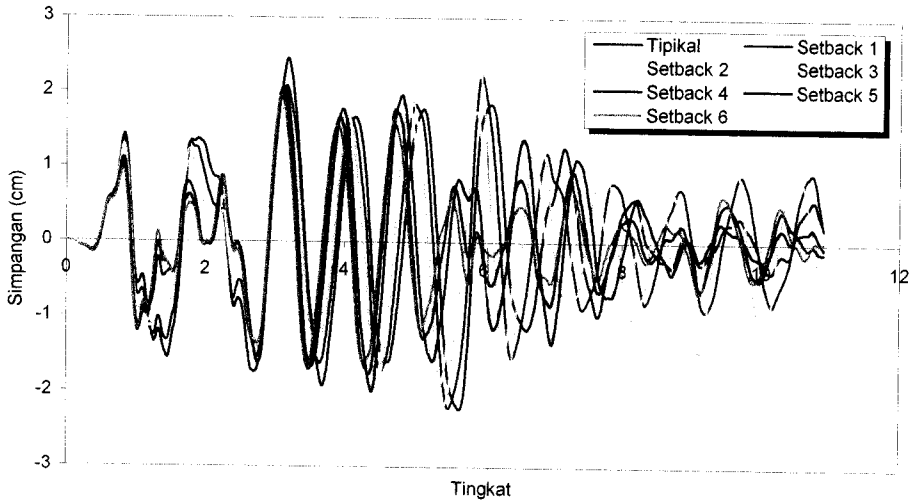
Gambar 5.31 Simpangan Struktur Tingkat 15 Akibat Gempa El Centro



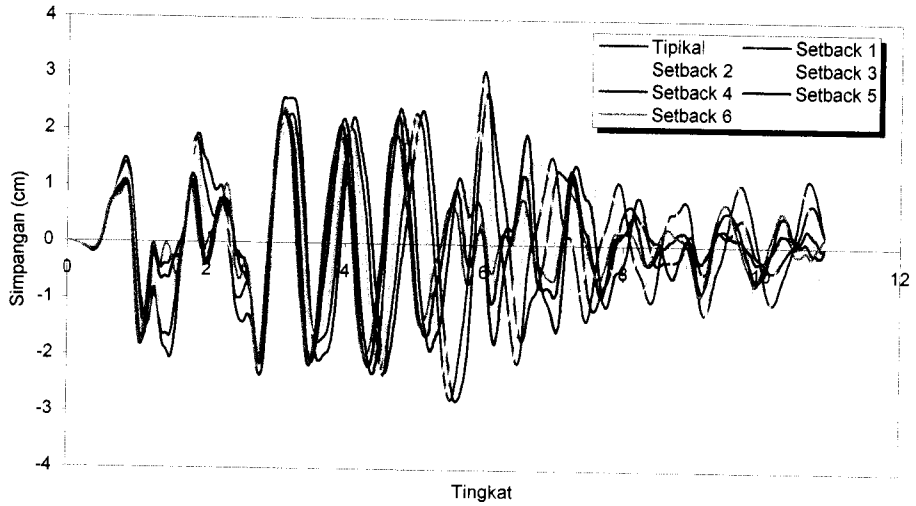
Tingkat 1



Tingkat 5

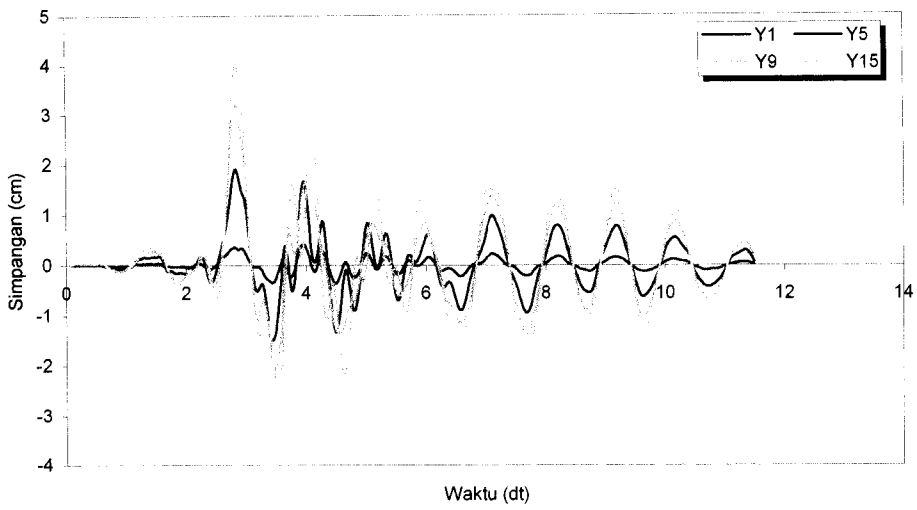


Tingkat 9

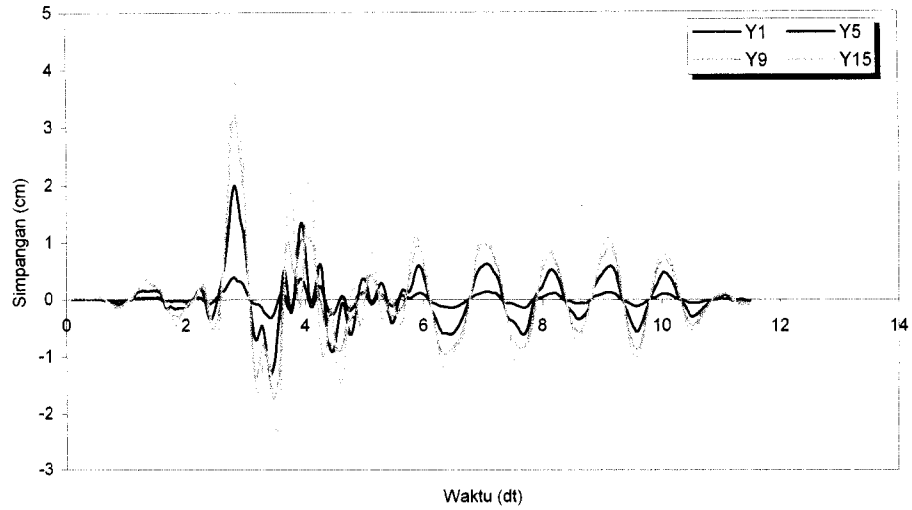


Tingkat 15

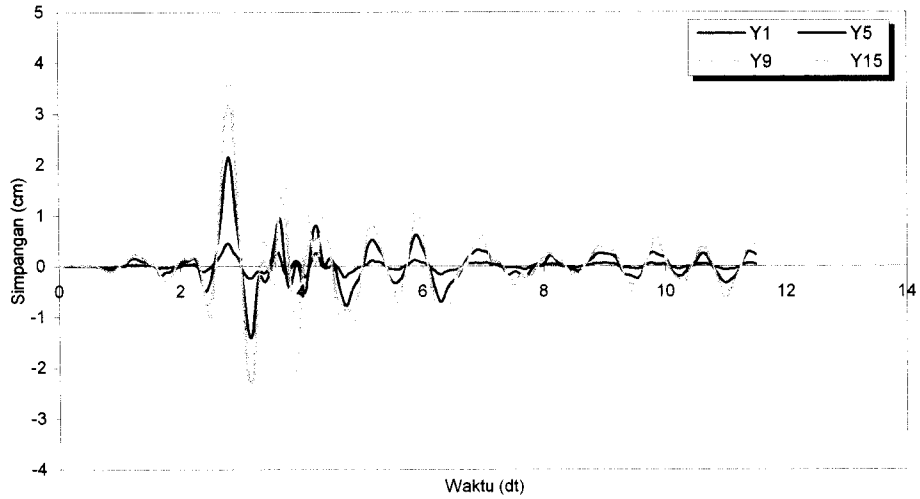
Gambar 5.32 Perbandingan Simpangan Struktur Tingkat 15 Akibat Gempa El Centro



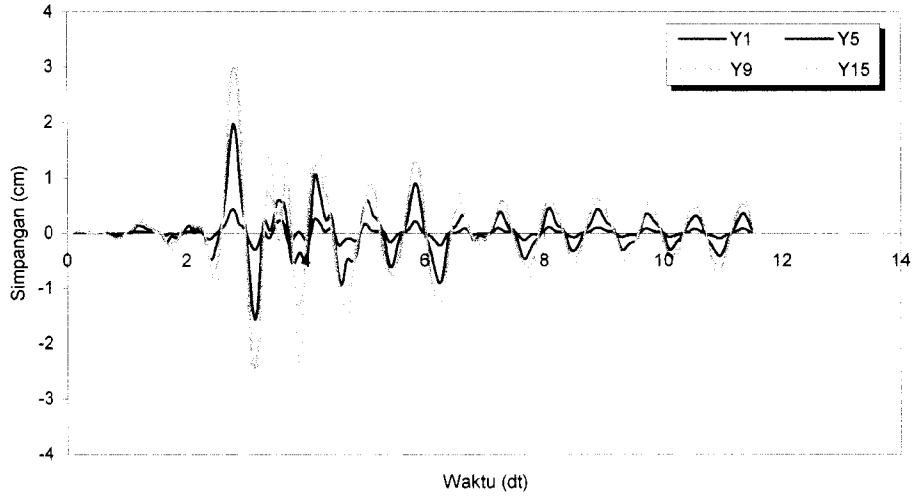
Tipikal



Setback 1

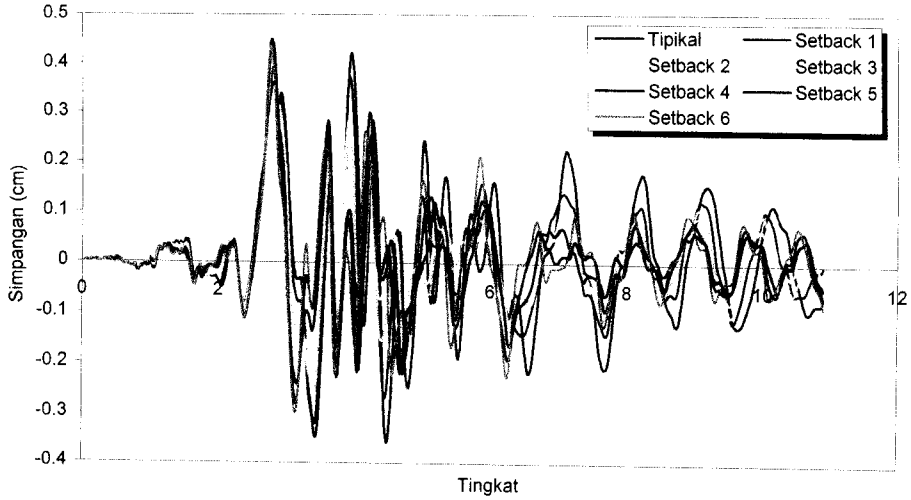


Setback 4

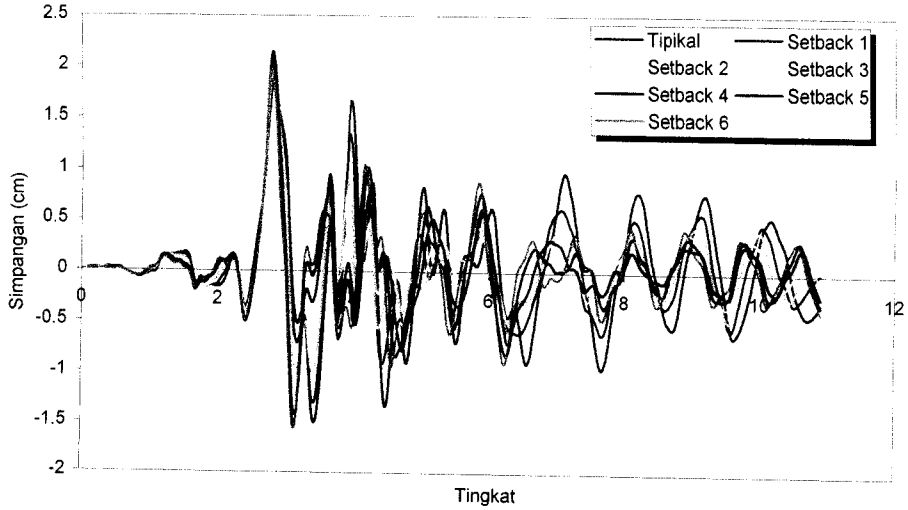


Setback 6

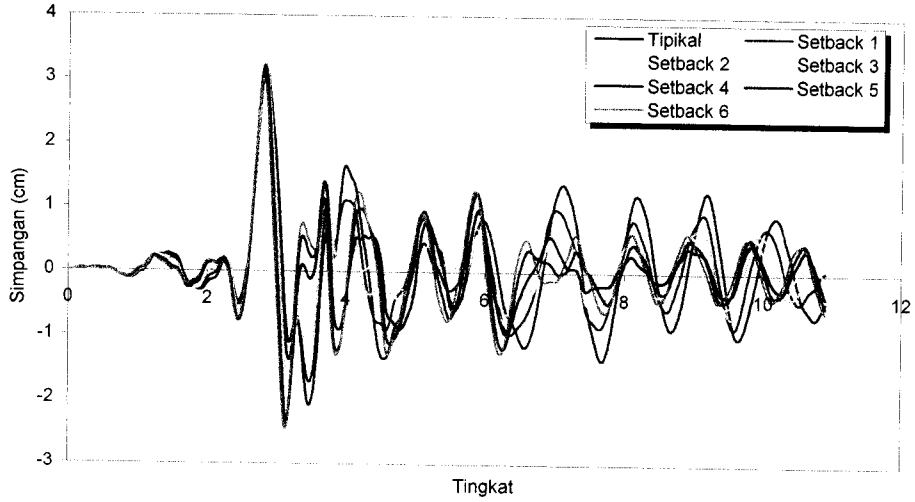
Gambar 5.33 Simpangan Struktur Tingkat 15 Akibat Gempa Gilroy



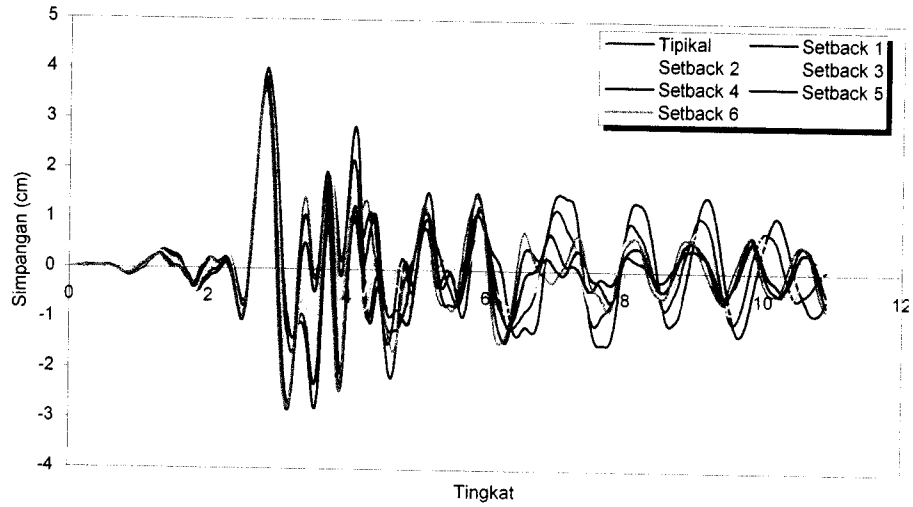
Tingkat 1



Tingkat 5

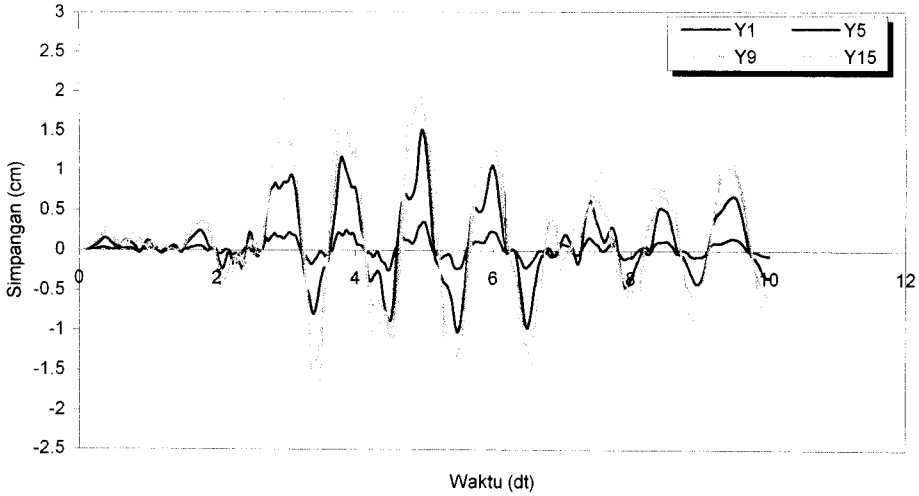


Tingkat 9

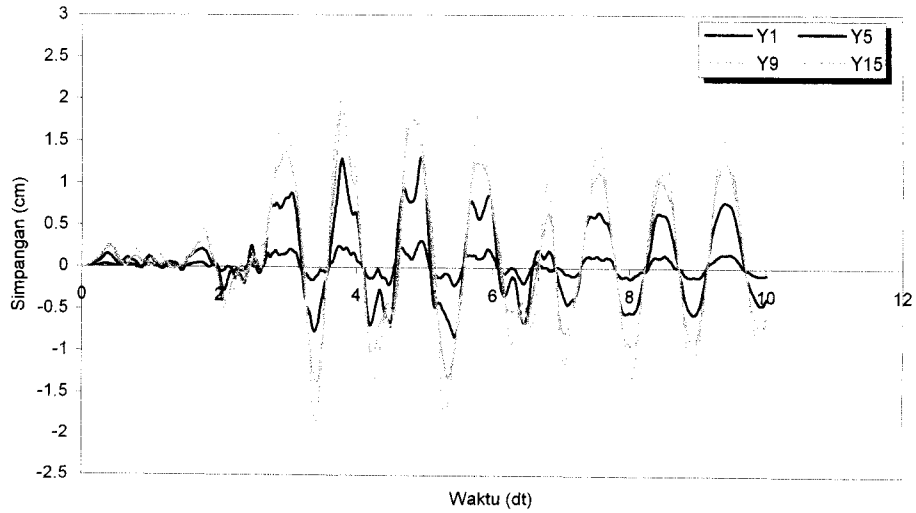


Tingkat 15

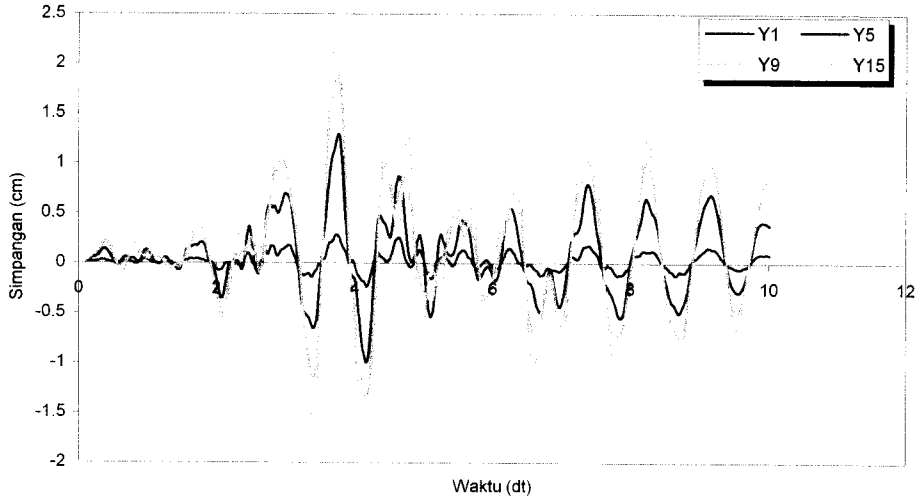
Gambar 5.34 Perbandingan Simpangan Struktur Tingkat 15 Akibat Gempa Gilroy



Tipikal



Setback 1



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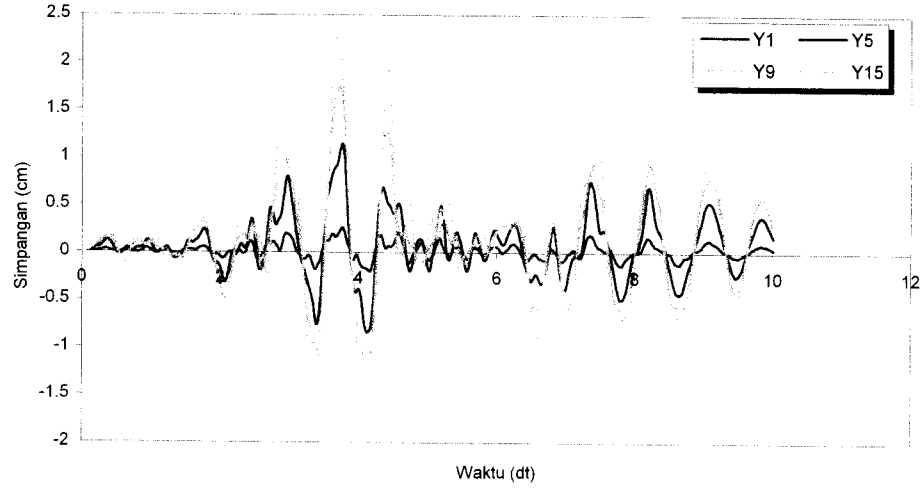
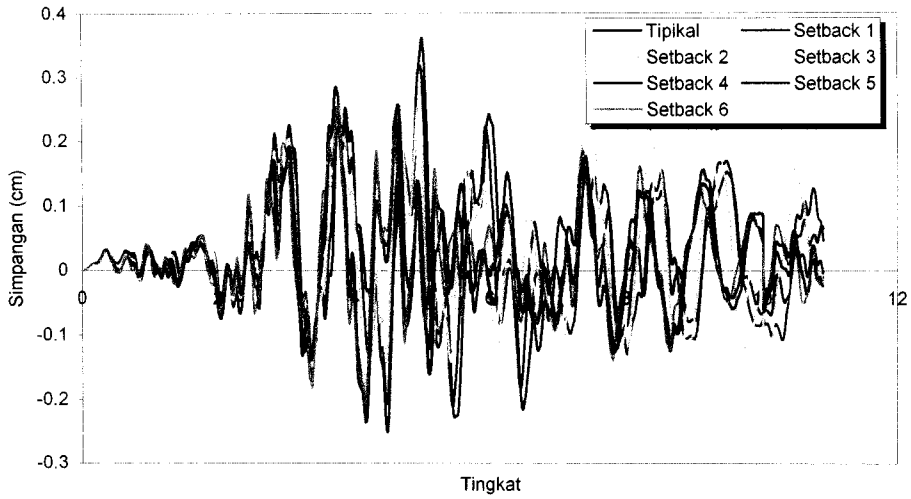
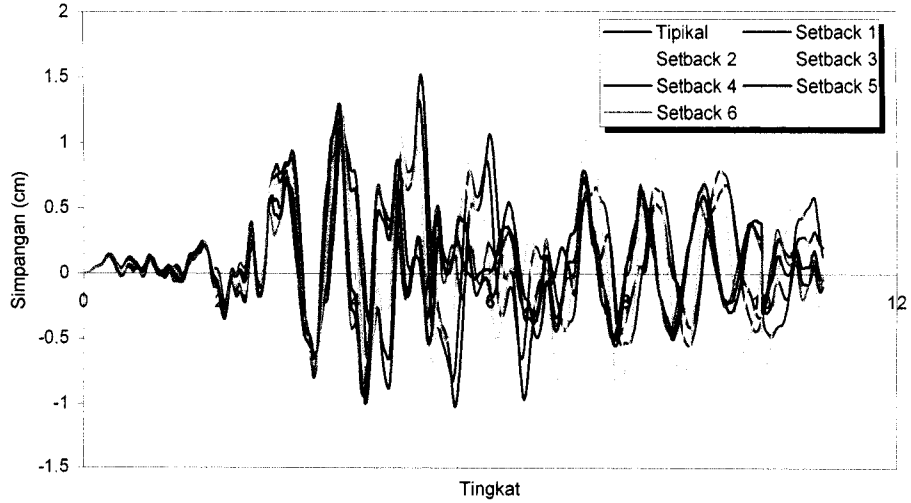


Setback 6

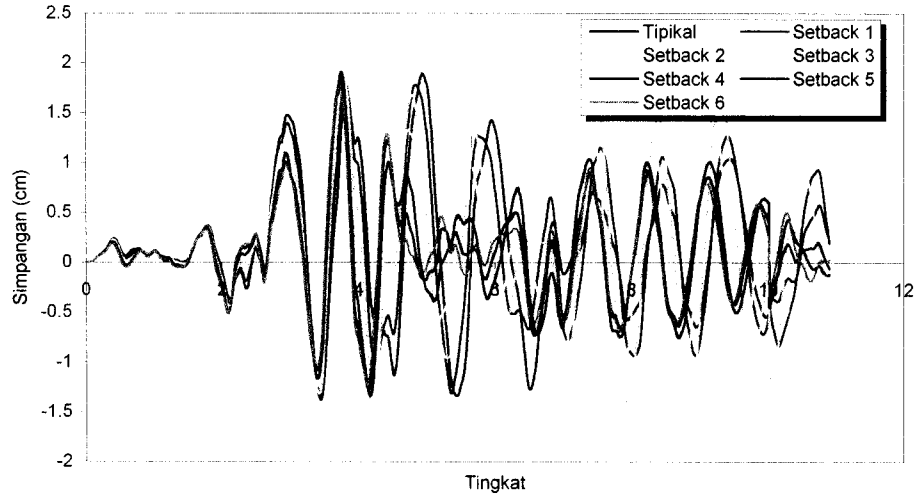
Gambar 5.35 Simpangan Struktur Tingkat 15 Akibat Gempa Koyna



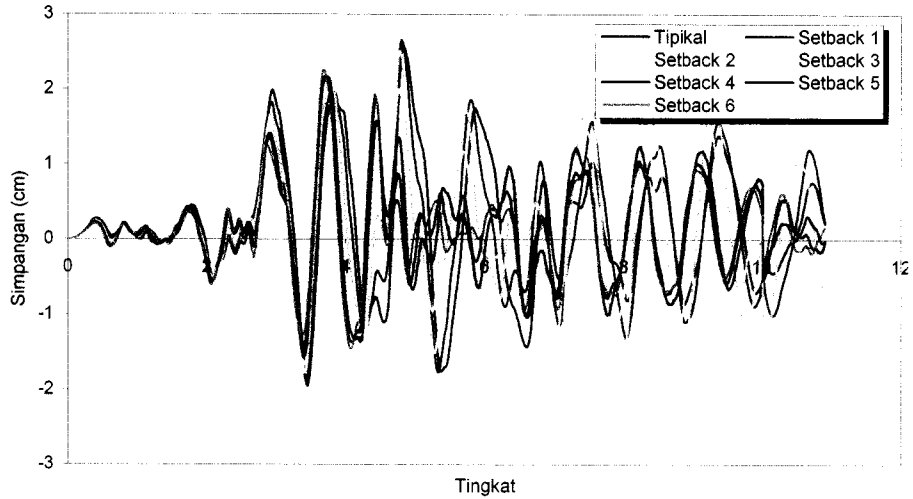
Tingkat 1



Tingkat 5

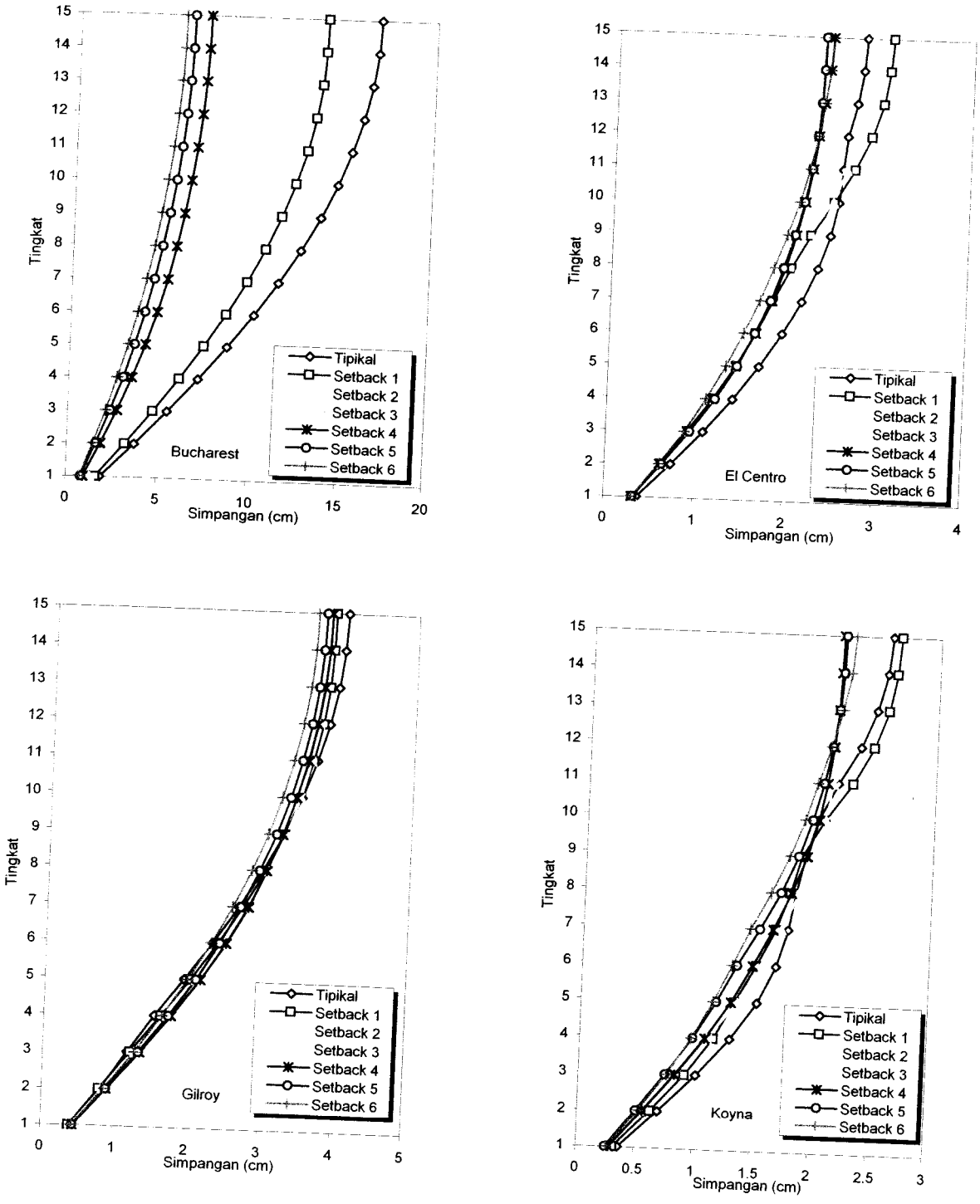


Tingkat 9

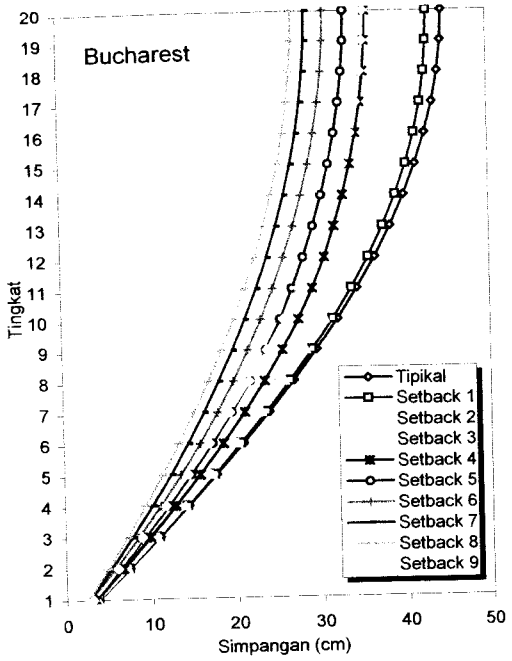


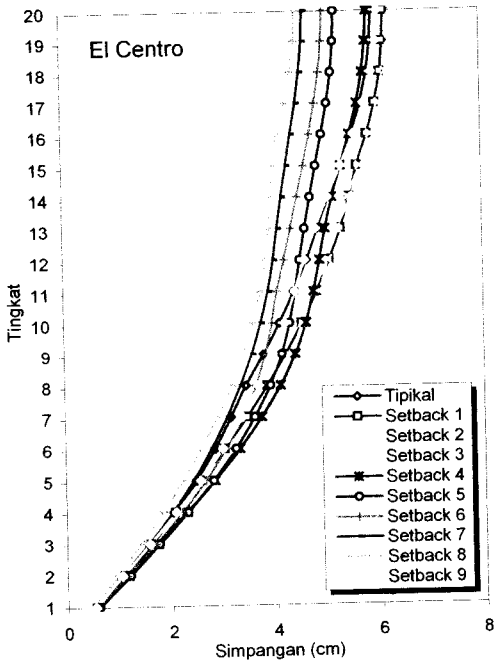
Tingkat 15

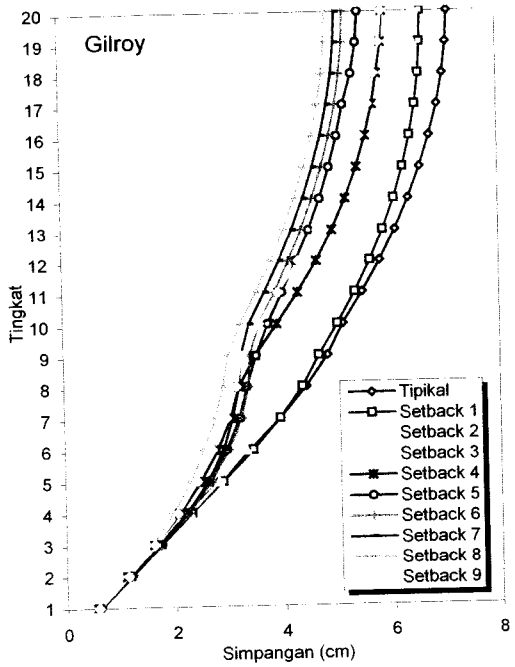
Gambar 5.36 Perbandingan Simpangan Struktur Tingkat 15 Akibat Gempa Koyna

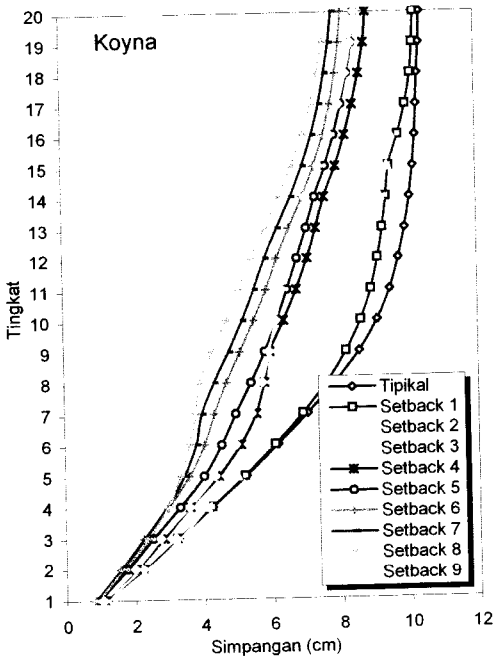


Gambar 5.37 Simpangan Maksimum Struktur Tingkat 15 Akibat 4 Gempa









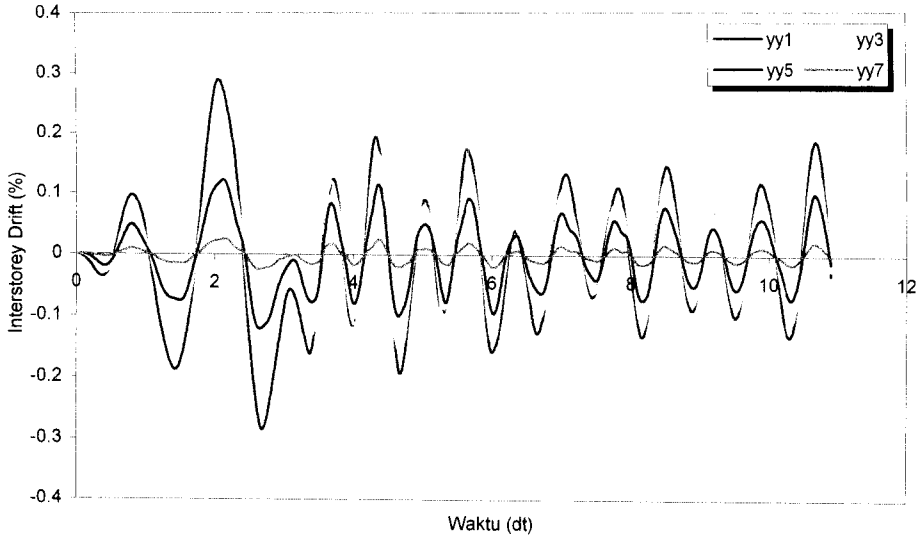
Gambar 5.38 Simpangan Maksimum Struktur Tingkat 20 Akibat 4 Gempa

5.4.3 Simpangan Antar Tingkat (*Interstorey Drift*)

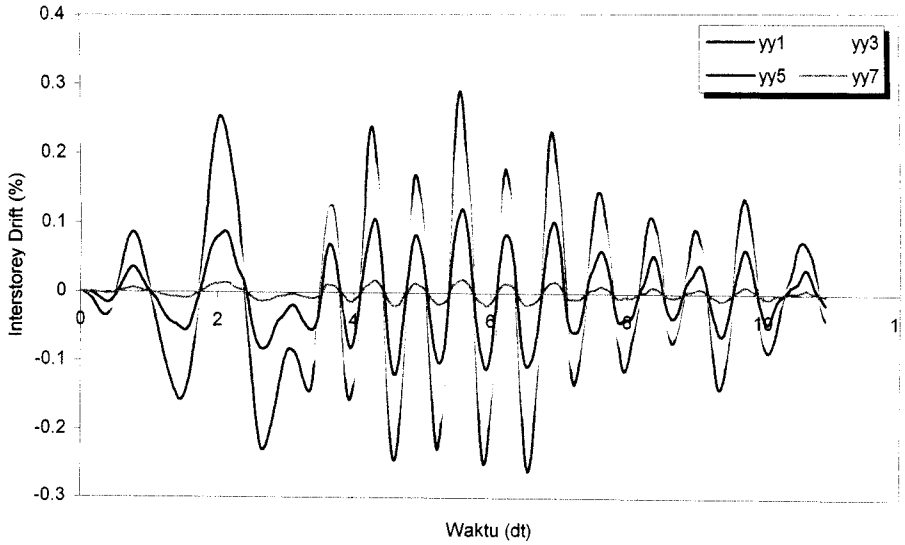
Simpangan antar tingkat *(Interstorey Drift)* dihitung berdasarkan atas persamaan (3.52). Dari program ini disajikan nilai-nilai simpangan antar tingkat *(Interstorey Drift)* untuk struktur bangunan tingkat 7, 10, 15 dan 20 dengan 4 variasi gempa pada Gambar 5.39 sampai dengan Gambar 5.66. Dengan memperhatikan Gambar 5.39 sampai dengan Gambar 5.66 tersebut, dapat kita lihat bahwa simpangan antar tingkat *(Interstorey Drift)* yang dinormalisasi menunjukkan *Interstorey Drift* akibat gempa Bucharest mempunyai nilai terbesar. Hal ini dikarenakan percepatan maksimum(A_{maks}) gempa Bucharest mendekati nilai 0,2g sehingga skala gempa mendekati 1. Simpangan antar tingkat *(Interstorey Drift)* semakin ke atas nilainya semakin kecil karena rasio simpangan antar tingkat semakin ke atas semakin mengecil.

Nilai simpangan antar tingkat *(Interstorey Drift)* akan mengecil pada tingkat dimana terdapat pengurangan massa dan kekakuan secara vertikal (setback vertikal). Ini sama halnya seperti simpangan, karena memang simpangan antar tingkat *(Interstorey Drift)* merupakan selisih antara simpangan suatu tingkat dengan simpangan tingkat di bawahnya dibagi tinggi tiap tingkat.

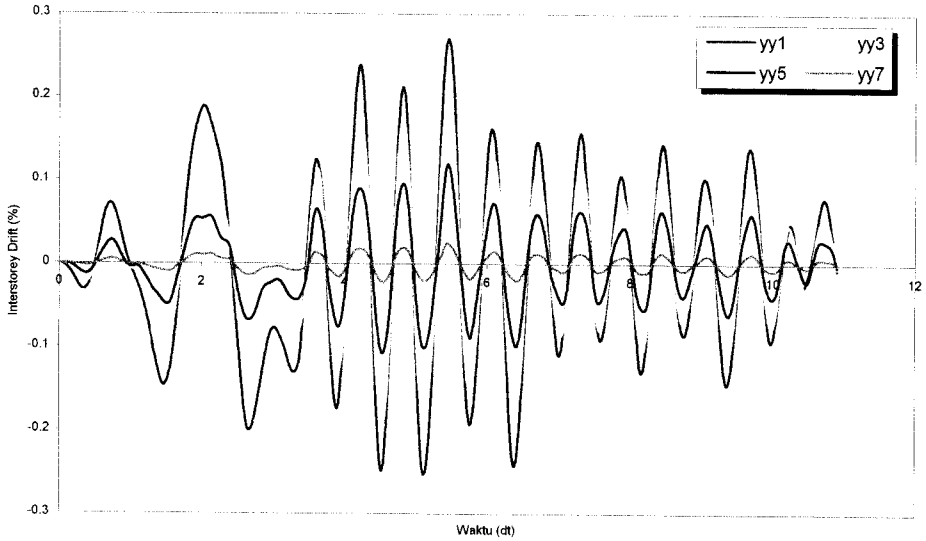
Nilai simpangan antar tingkat *(Interstorey Drift)* akan semakin besar pada bangunan bertingkat yang semakin tinggi. Hal ini disebabkan karena semakin tinggi suatu bangunan maka akan semakin fleksibel. Sehingga semakin rendah (kaku) suatu bangunan maka akan semakin kecil nilai simpangan antar tingkatnya *(Interstorey Drift)*. Nilai simpangan antar tingkat *(Interstorey Drift)* memenuhi syarat dari batas ultimit gedung, yaitu 0,005 dari tinggi tingkat (2 cm).



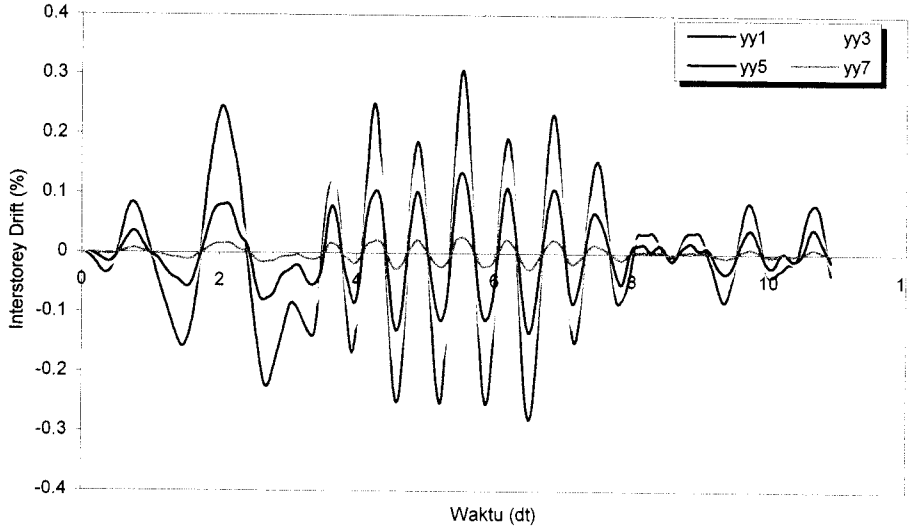
Tipikal



Setback 1

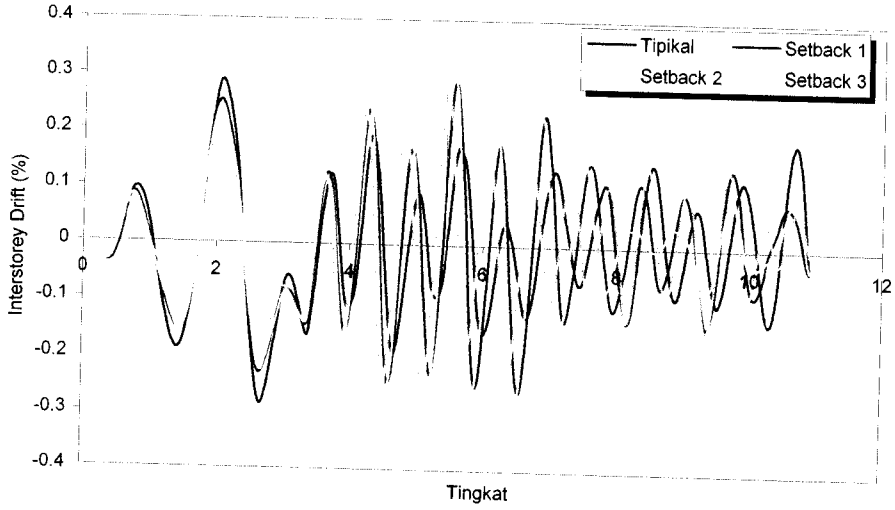


Setback 2

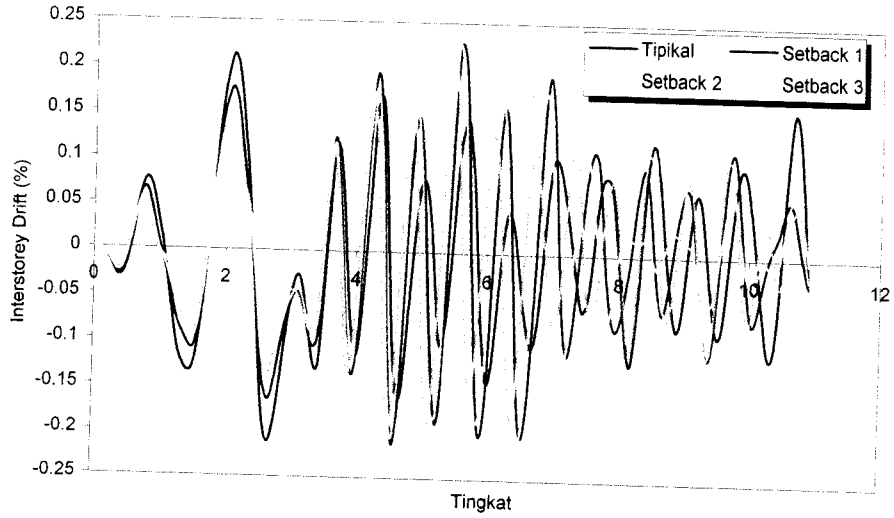


Setback 3

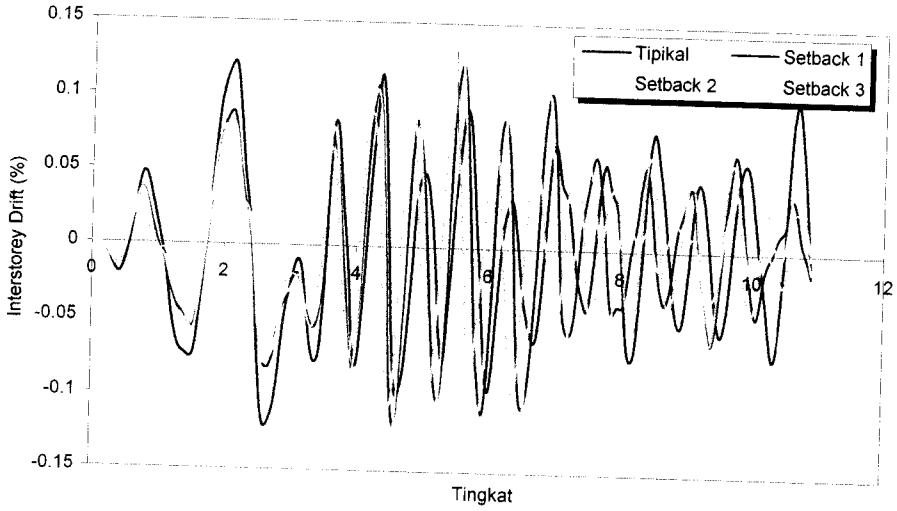
Gambar 5.39 Interstorey Drift Struktur Tingkat 7 Akibat Gempa Bucharest



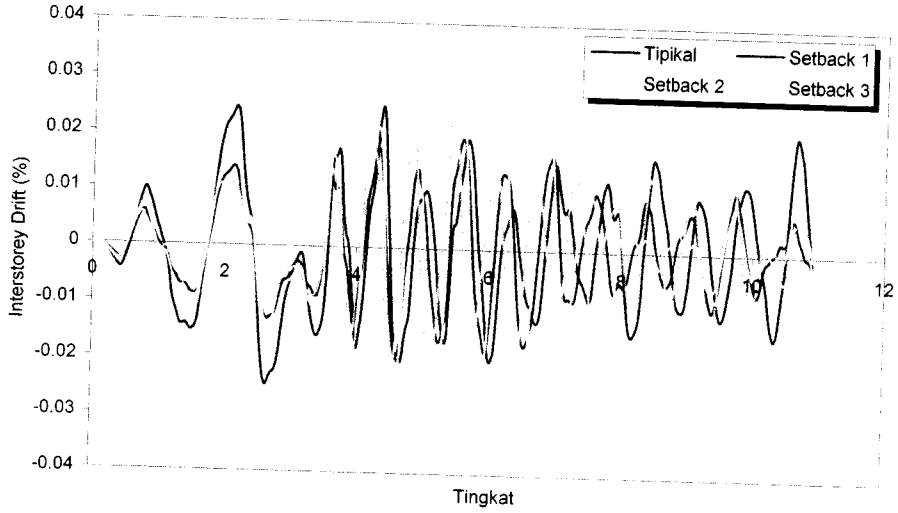
Tingkat 1



Tingkat 3

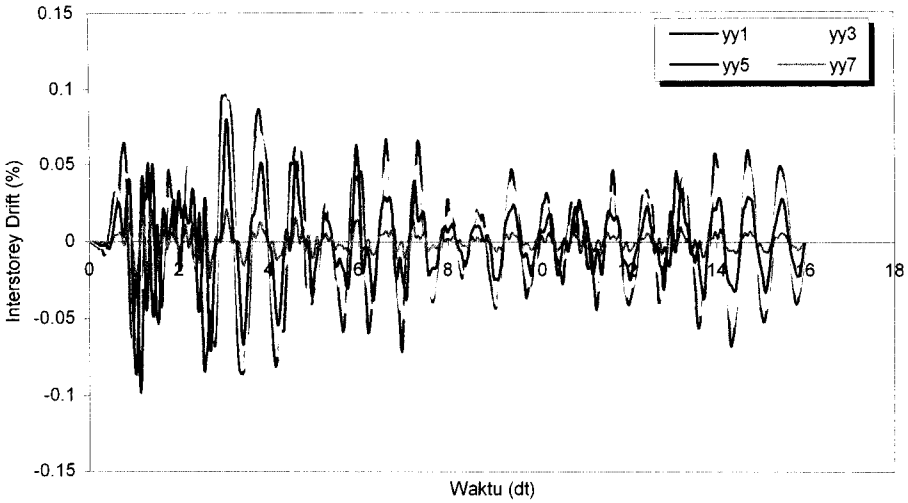


Tingkat 5

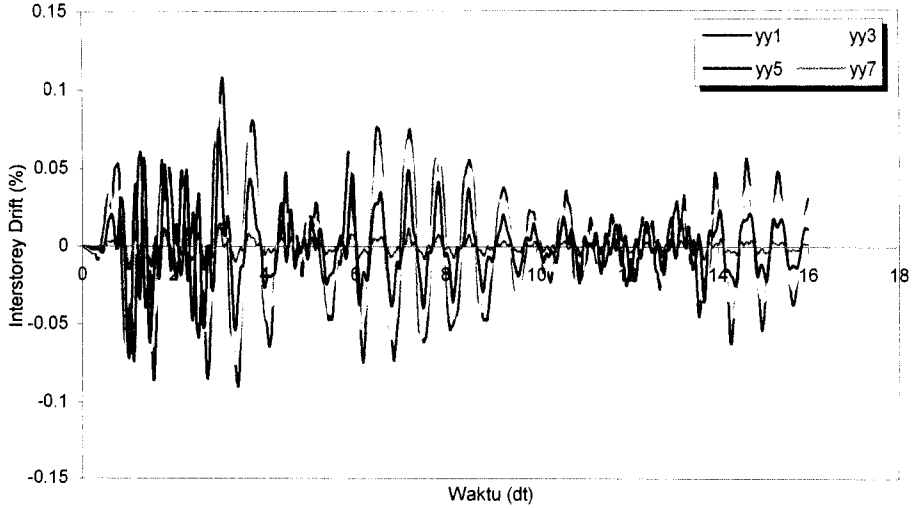


Tingkat 7

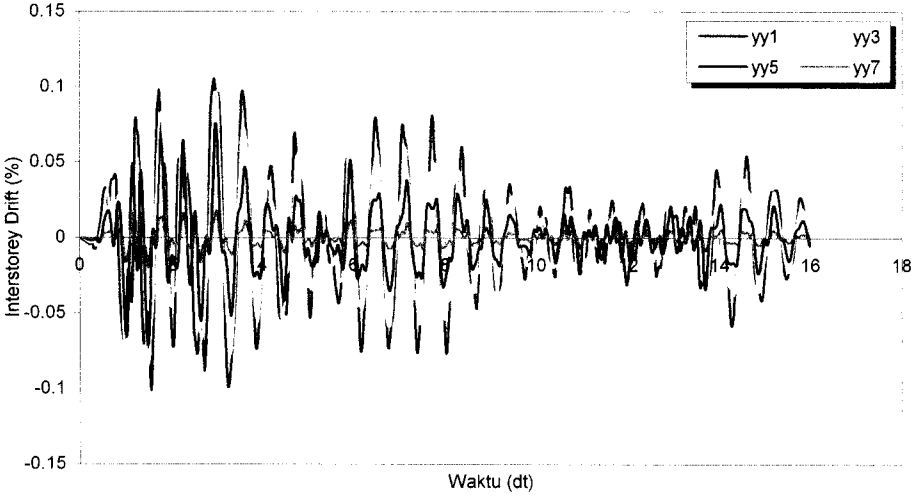
Gambar 5.40 Perbandingan Interstorey Drift Struktur Tingkat 7 Akibat Gempa Bucharest



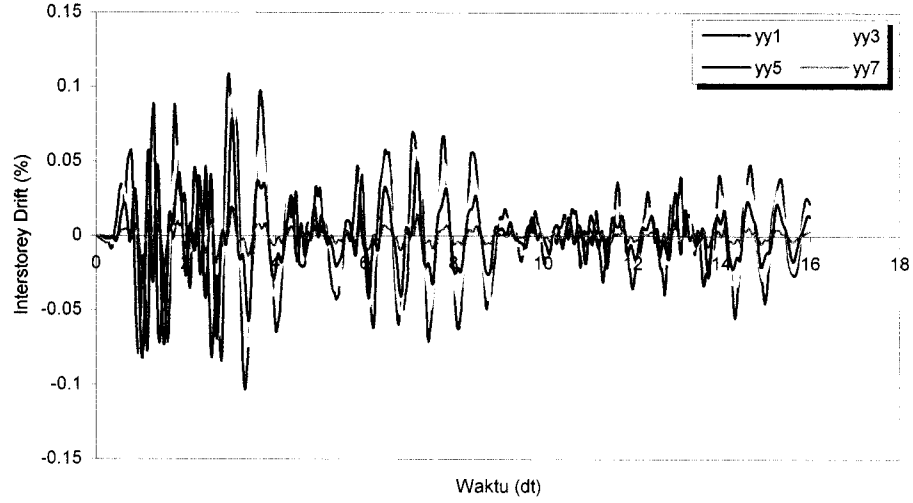
Tipikal



Setback 1

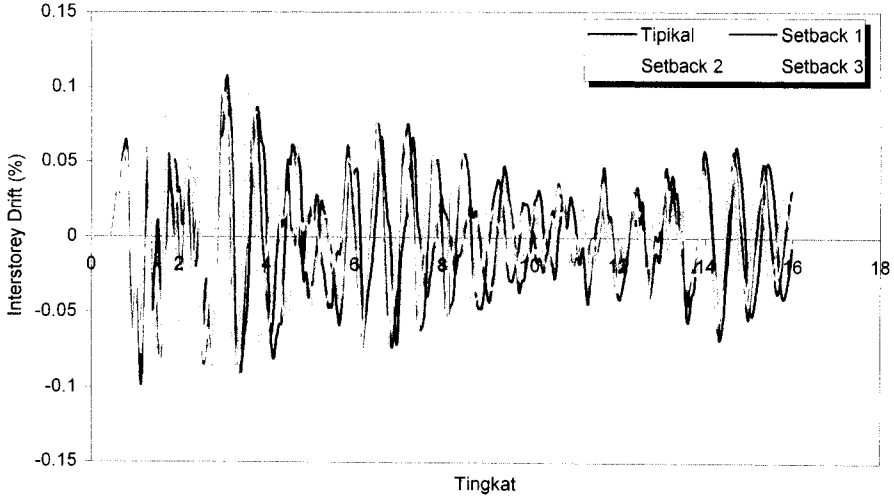


Setback 2

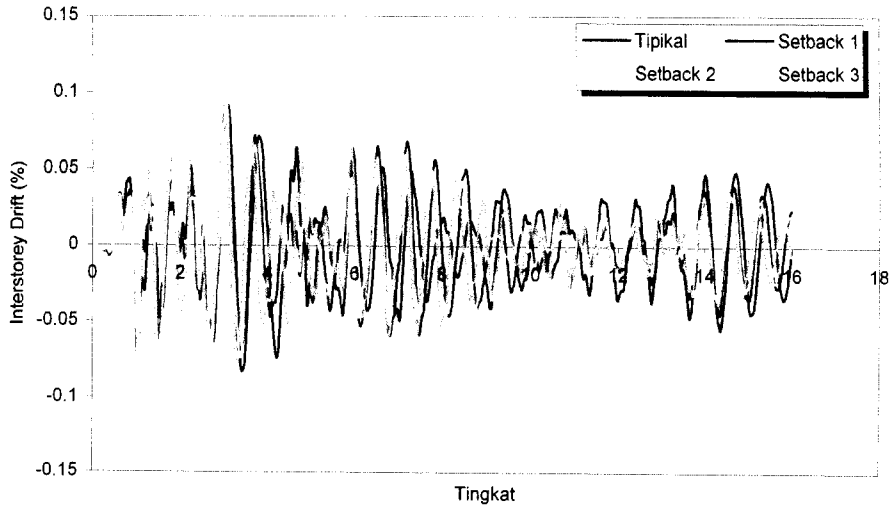


Setback 3

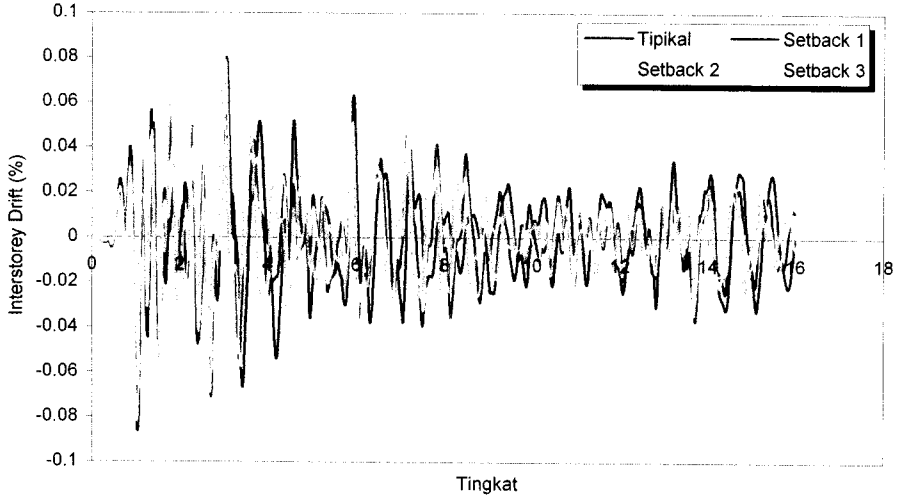
Gambar 5.41 Interstorey Drift Struktur Tingkat 7 Akibat Gempa El Centro



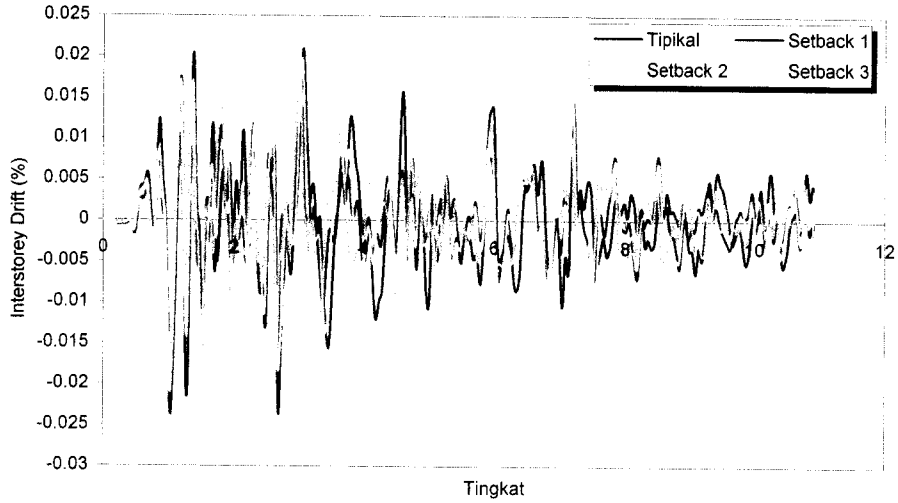
Tingkat 1



Tingkat 3

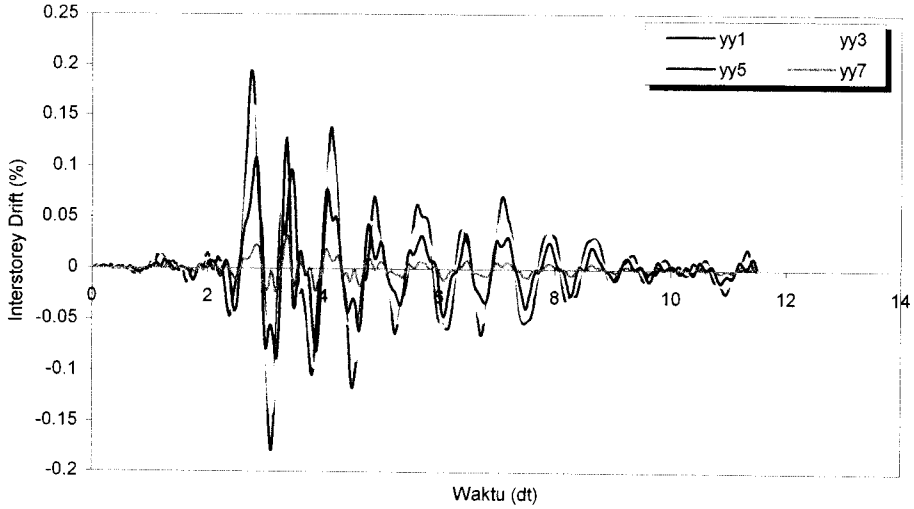


Tingkat 5

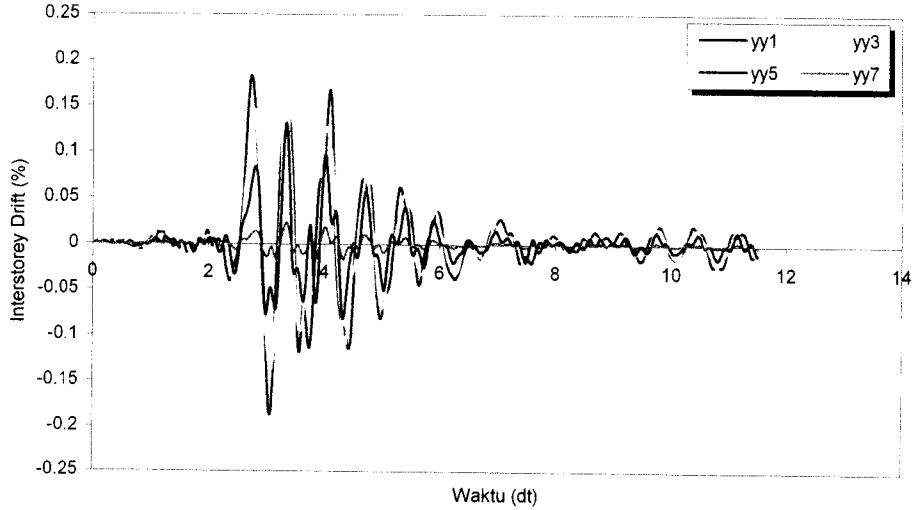


Tingkat 7

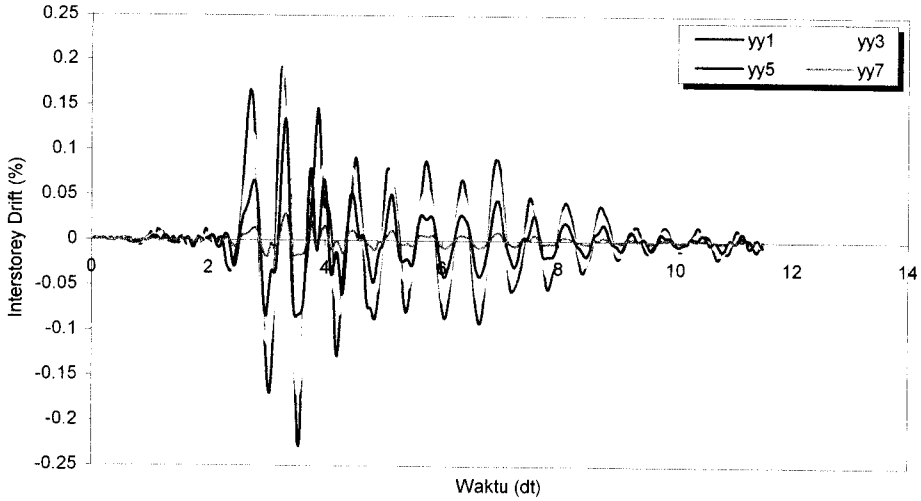
Gambar 5.42 Perbandingan Interstorey Drift Struktur Tingkat 7 Akibat Gempa El Centro



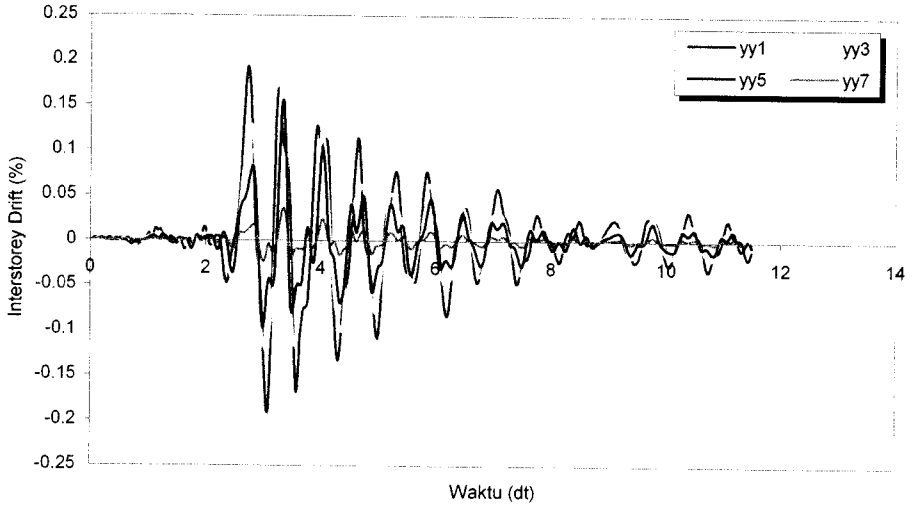
Tipikal



Setback 1

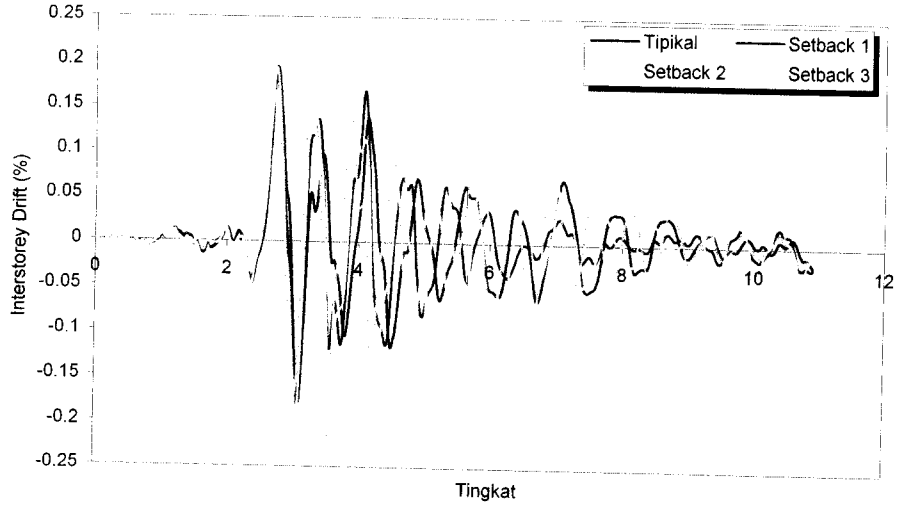


Setback 2

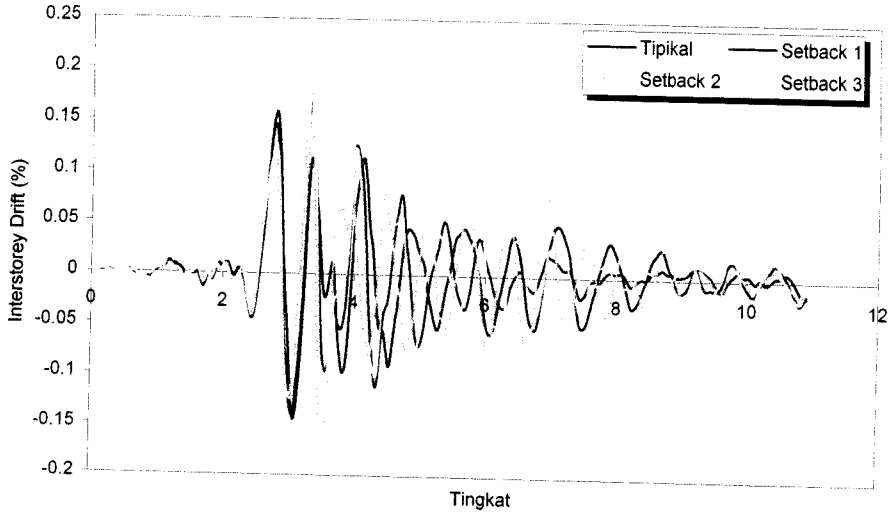


Setback 3

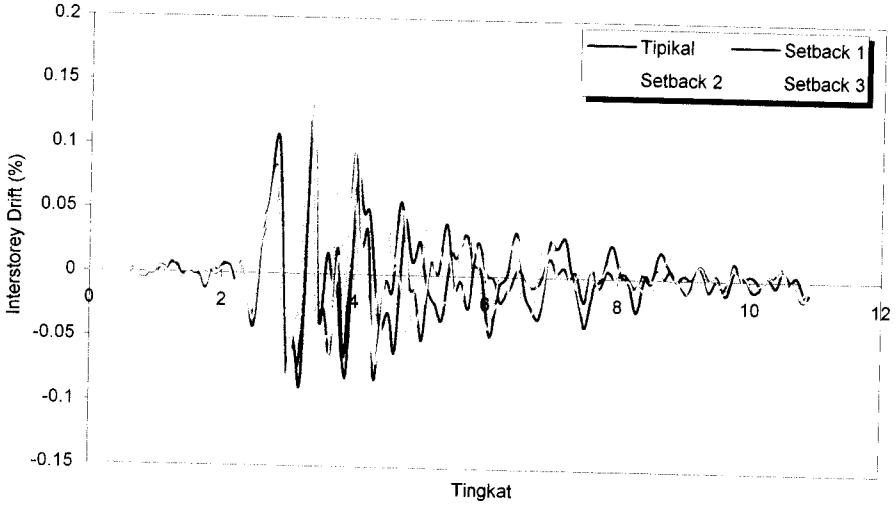
Gambar 5.43 Interstorey Drift Struktur Tingkat 7 Akibat Gempa Gilroy



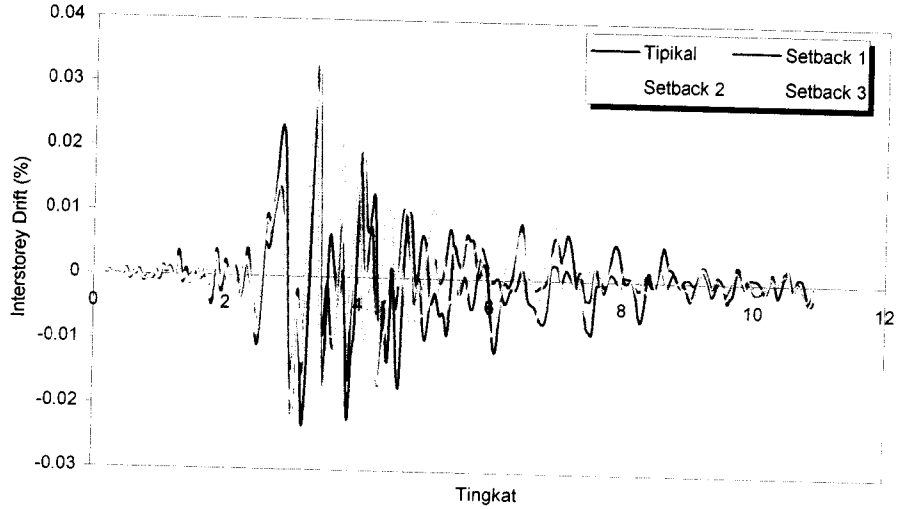
Tingkat 1



Tingkat 3

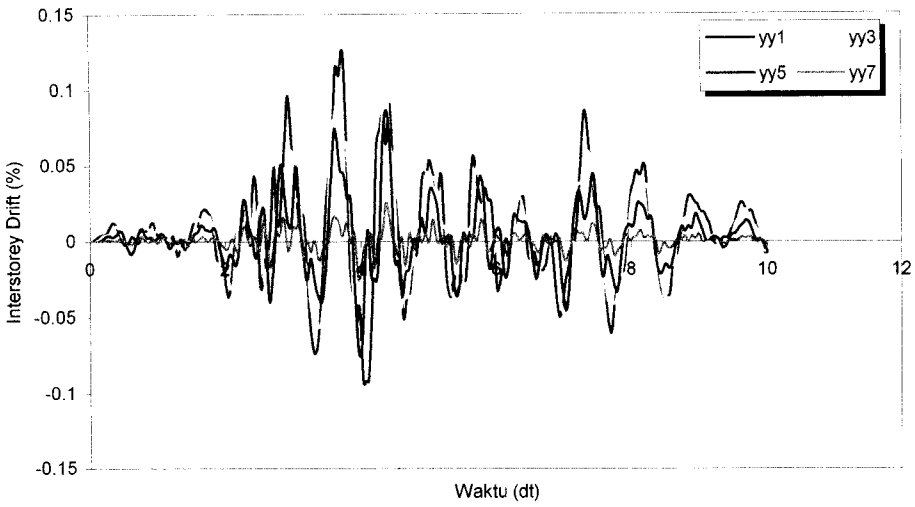


Tingkat 5

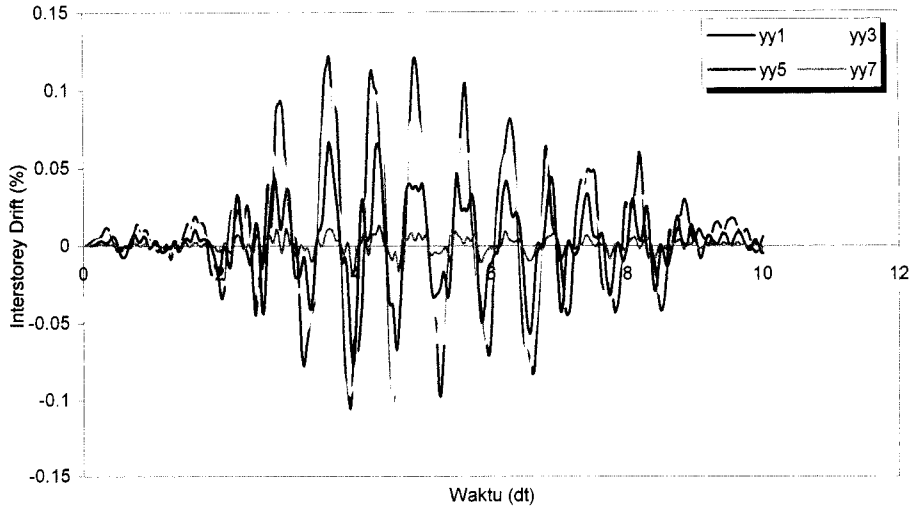


Tingkat 7

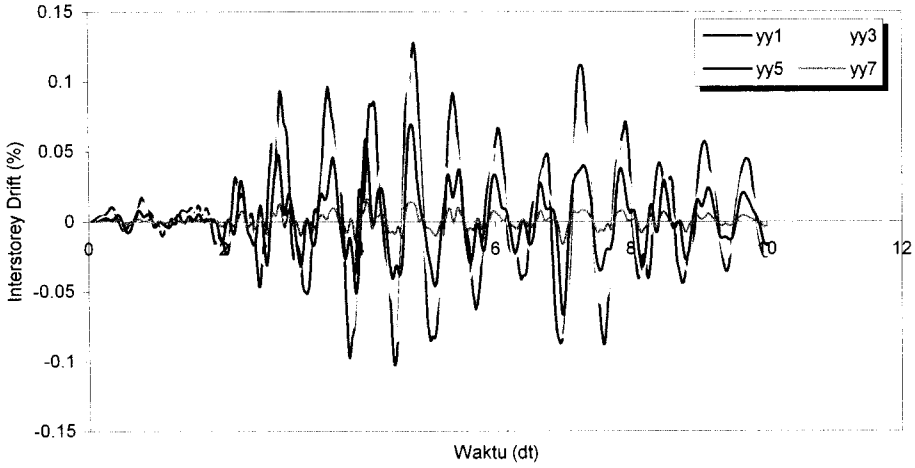
Gambar 5.44 Perbandingan Interstorey Drift Struktur Tingkat 7 Akibat Gempa Gilroy



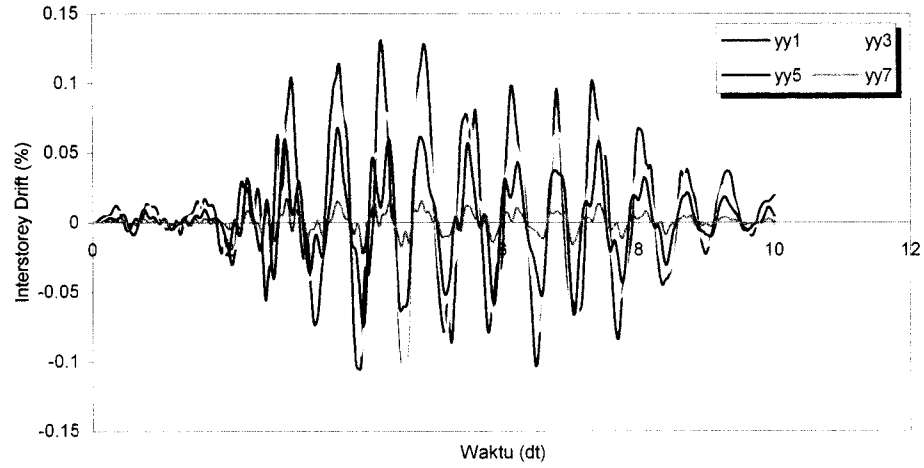
Tipikal



Setback 1

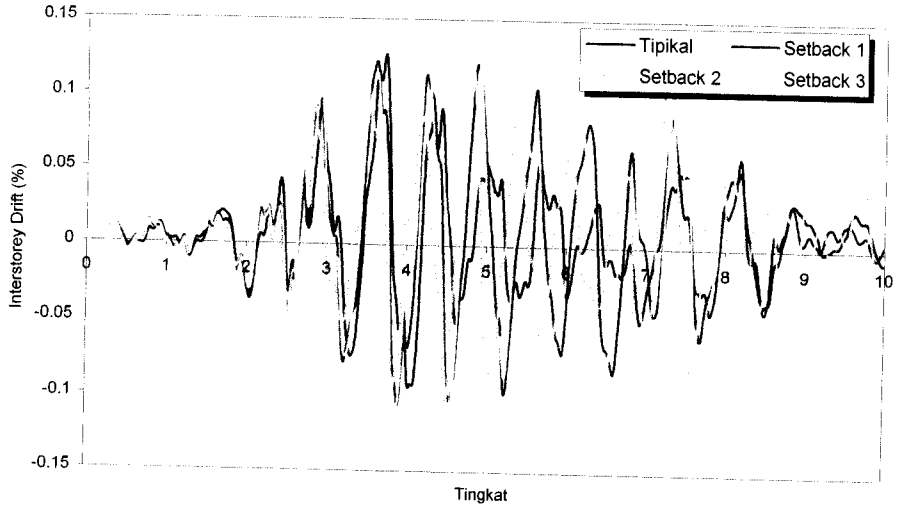


Setback 2

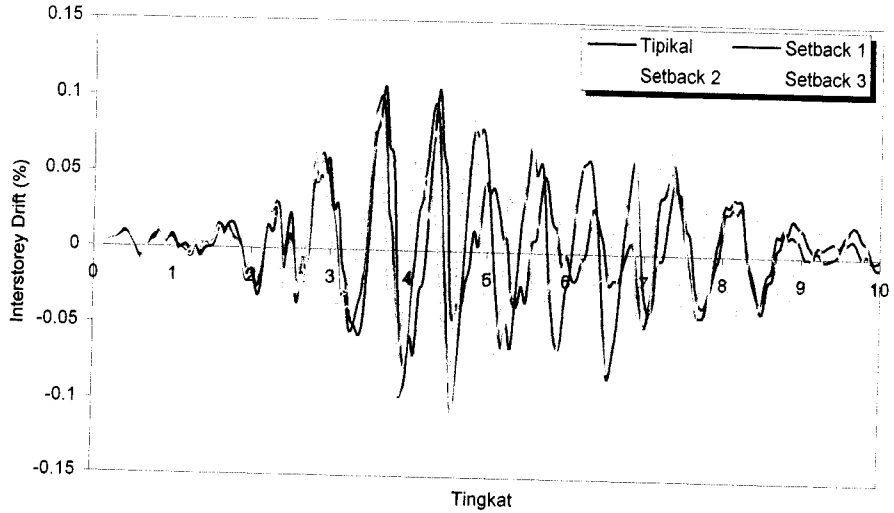


Setback 3

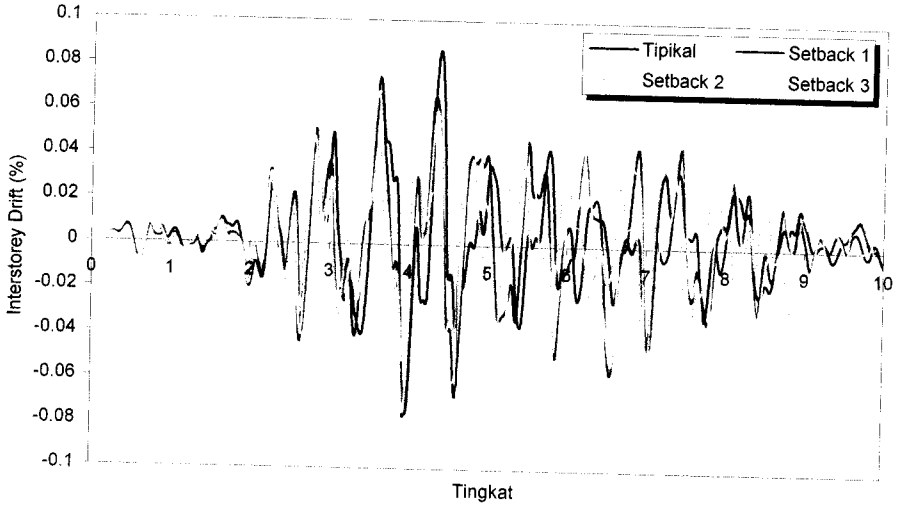
Gambar 5.45 Interstorey Drfit Struktur Tingkat 7 Akibat Gempa Koyna



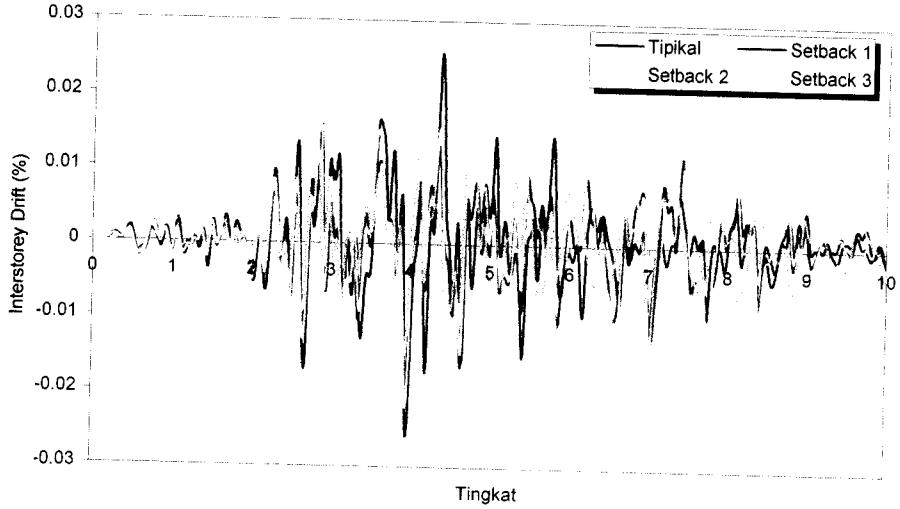
Tingkat 1



Tingkat 3

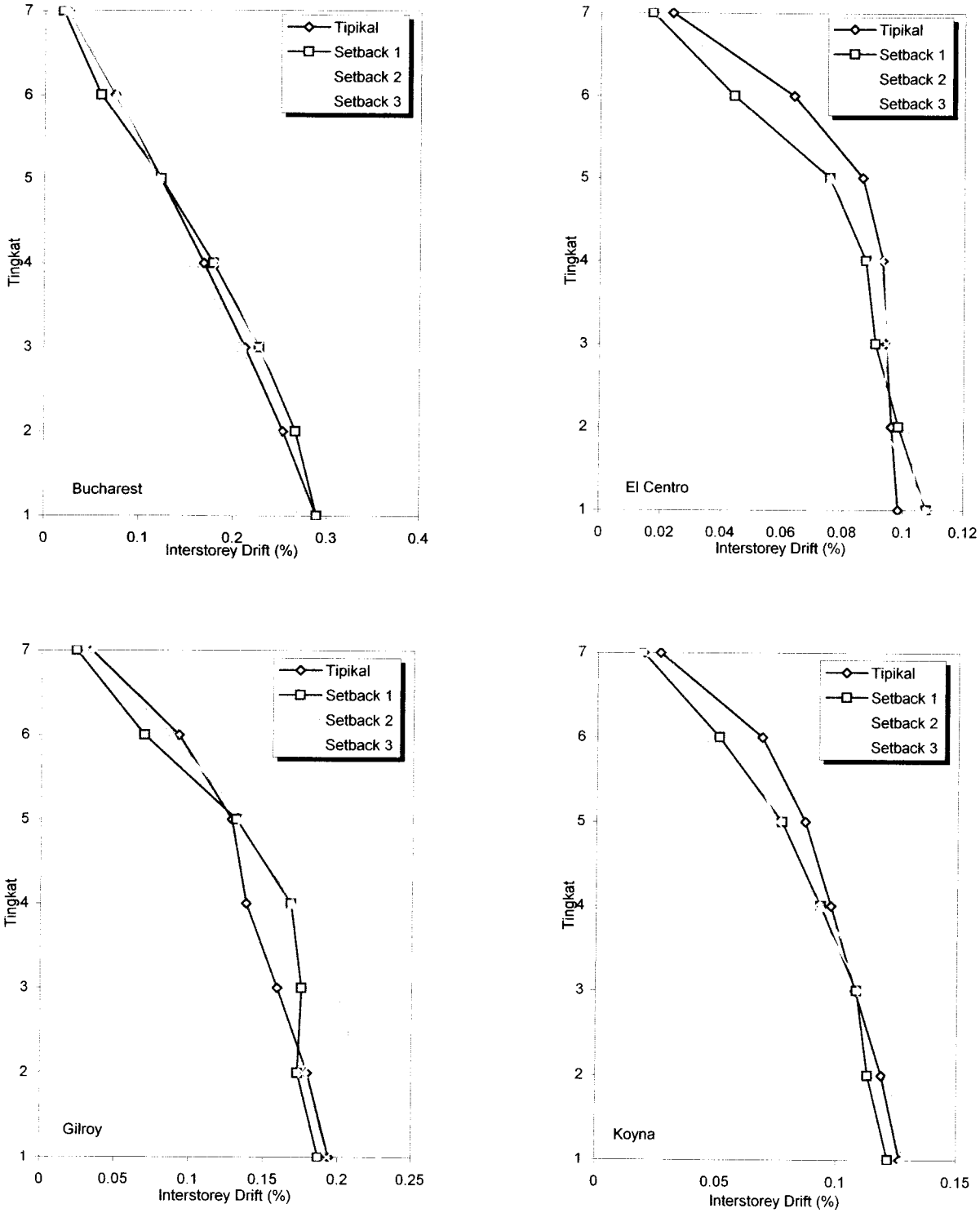


Tingkat 5

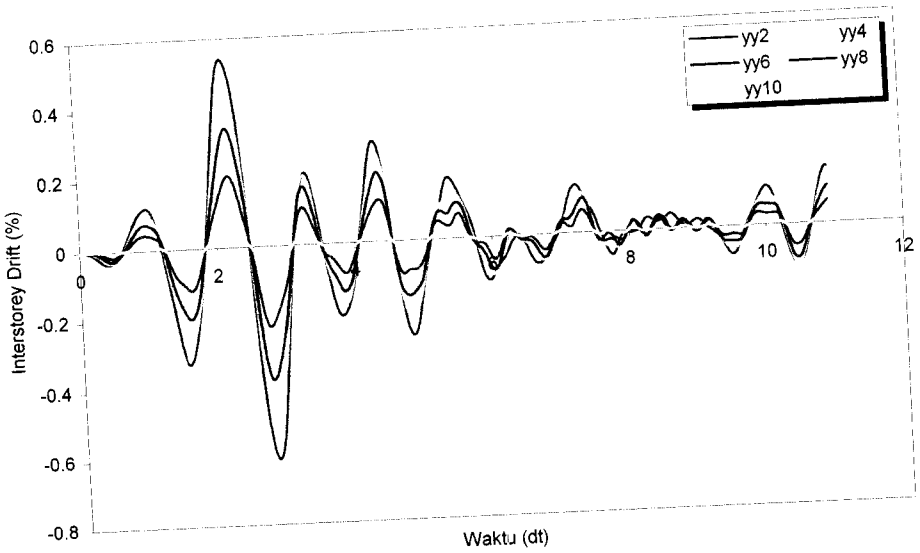


Tingkat 7

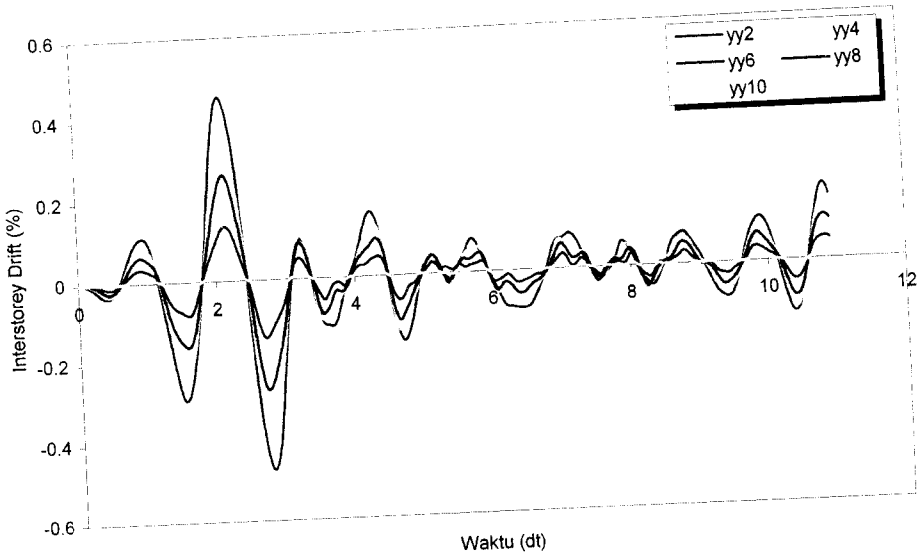
Gambar 5.46 Perbandingan Interstorey Drift Struktur Tingkat 7 Akibat Gempa Koyna



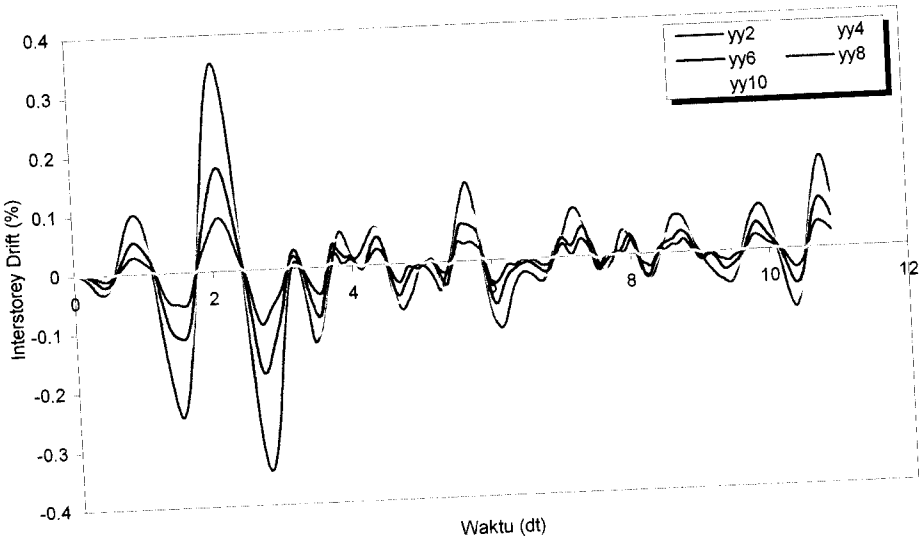
Gambar 5.47 Interstorey Drift Maksimum Struktur Tingkat 7 Akibat 4 Gempa



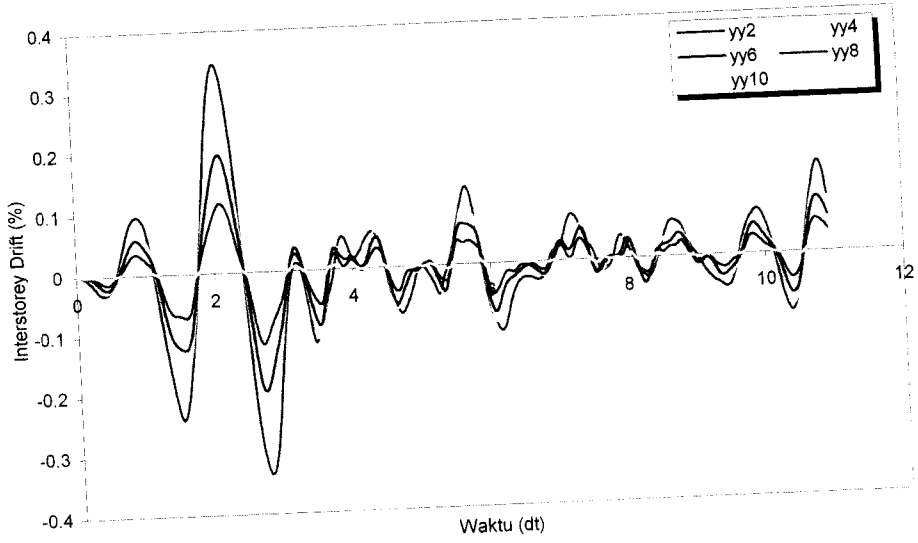
Tipikal



Setback 1

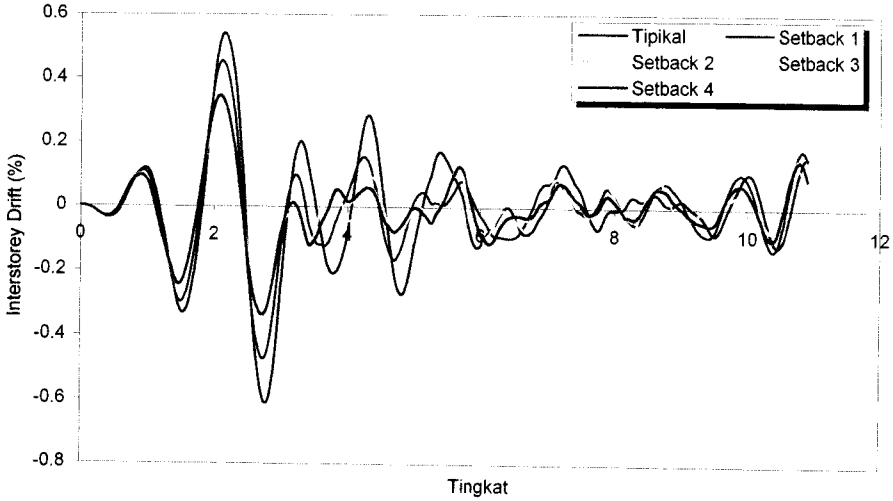


Setback 2

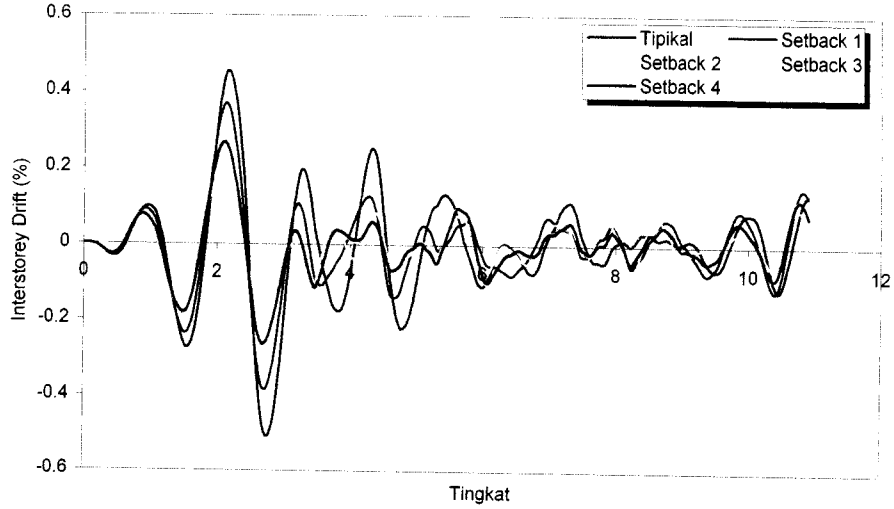


Setback 4

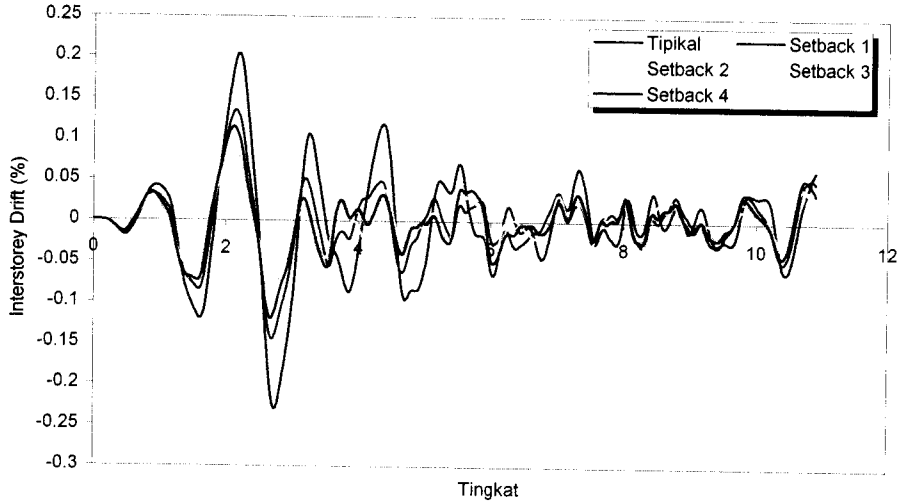
Gambar 5.48 Interstorey Drift Struktur Tingkat 10 Akibat Gempa Bucharest



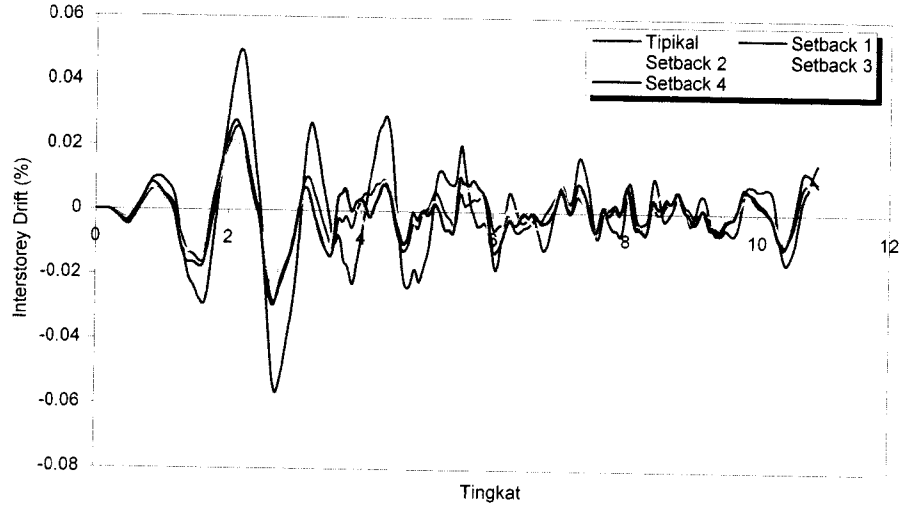
Tingkat 2



Tingkat 4

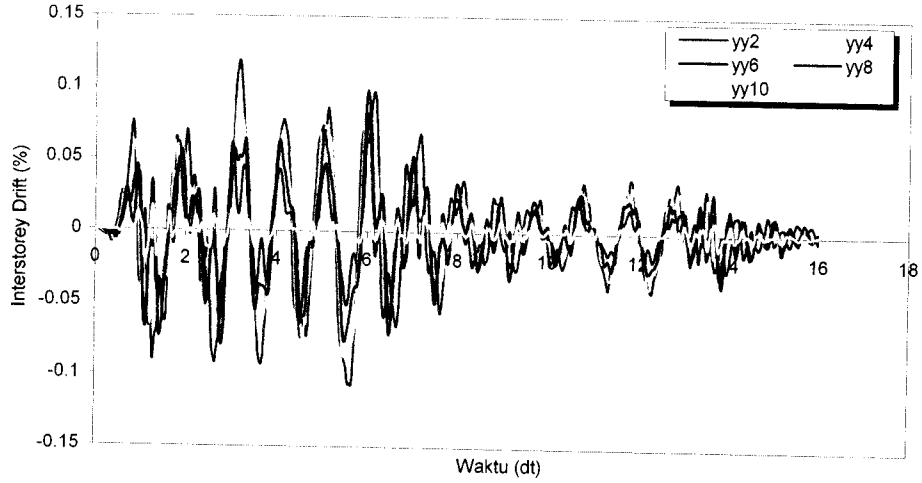


Tingkat 8

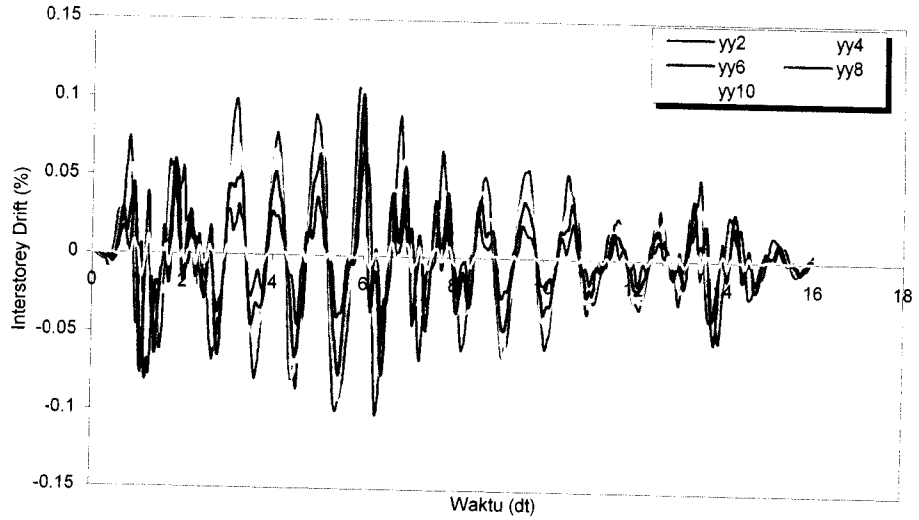


Tingkat 10

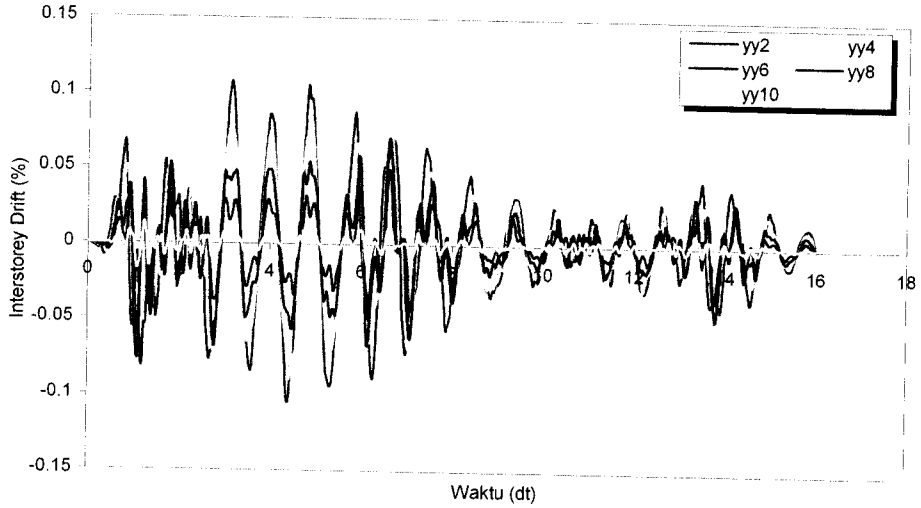
Gambar 5.49 Perbandingan Interstorey Drift Struktur Tingkat 10 Akibat Gempa Bucharest



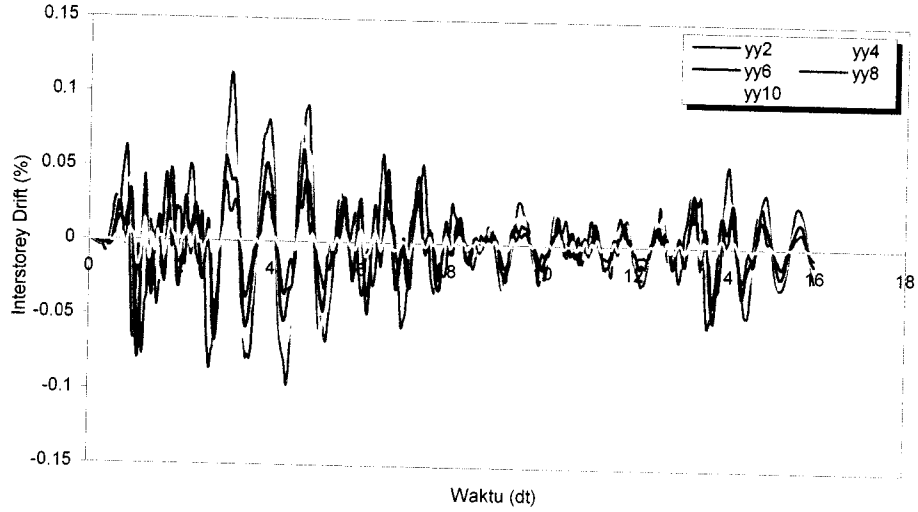
Tipikal



Setback 1

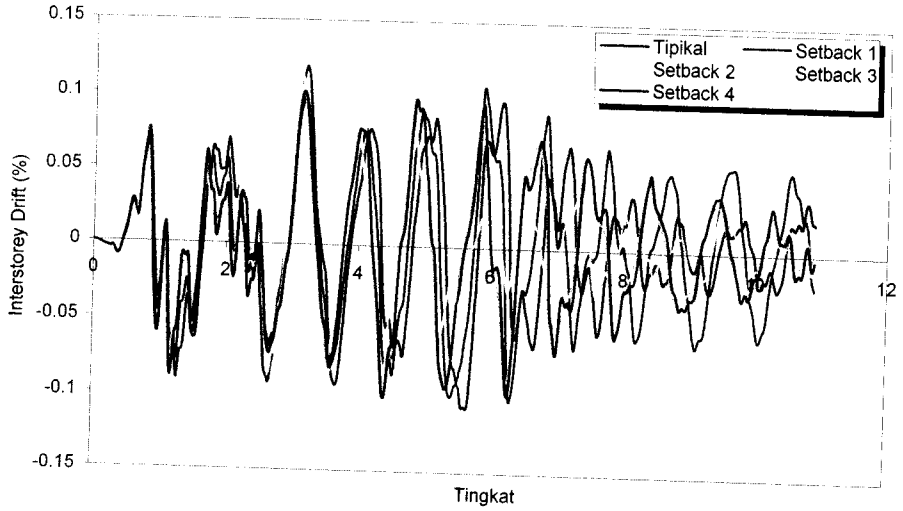


Setback 2

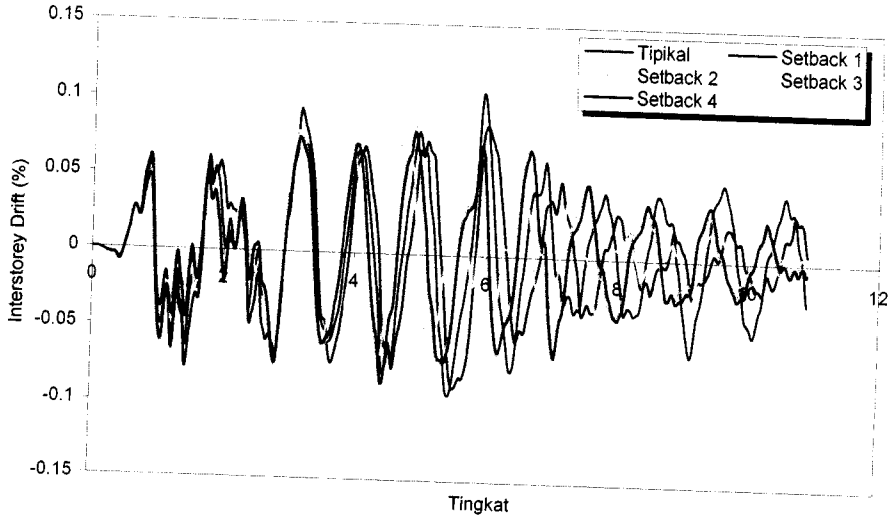


Setback 3

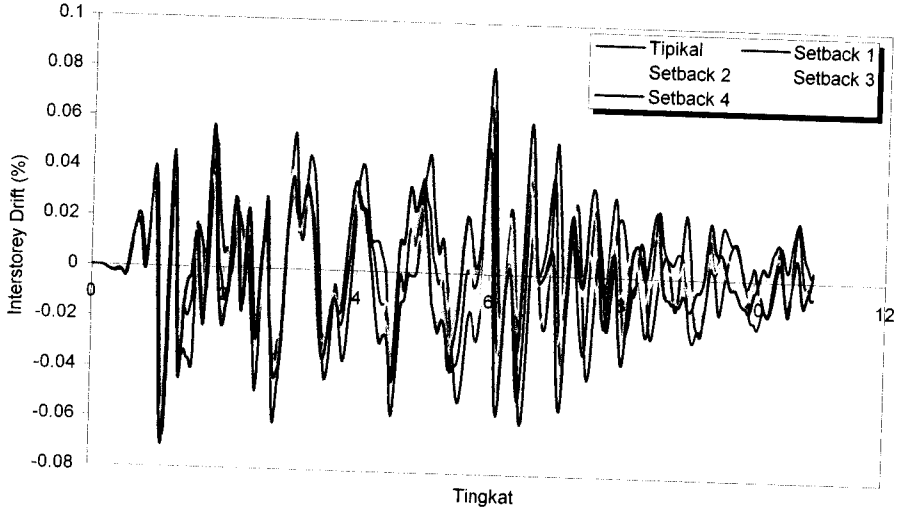
Gambar 5.50 Interstorey Drift Struktur Tingkat 10 Akibat Gempa El Centro



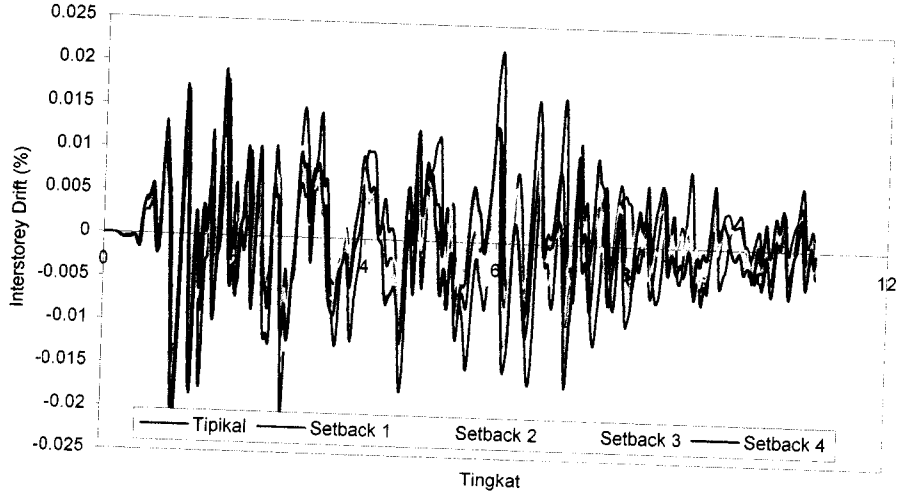
Tingkat 2



Tingkat 4

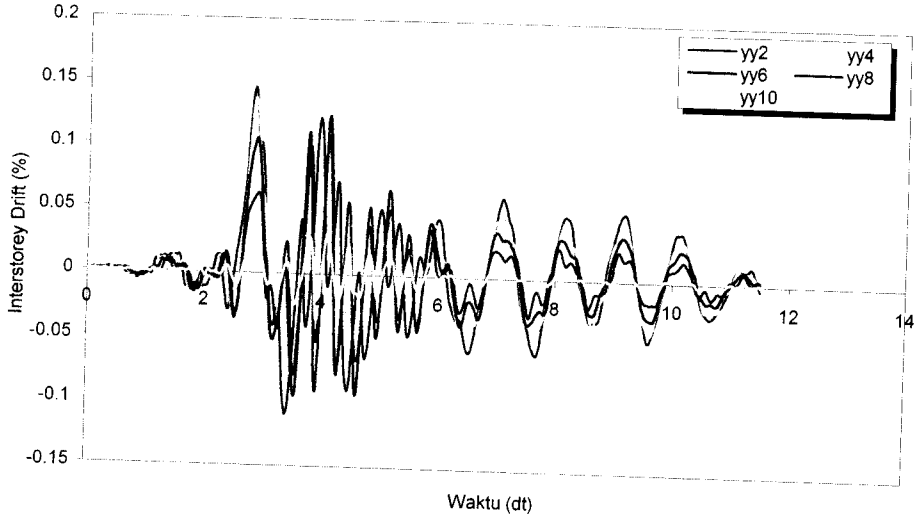


Tingkat 8

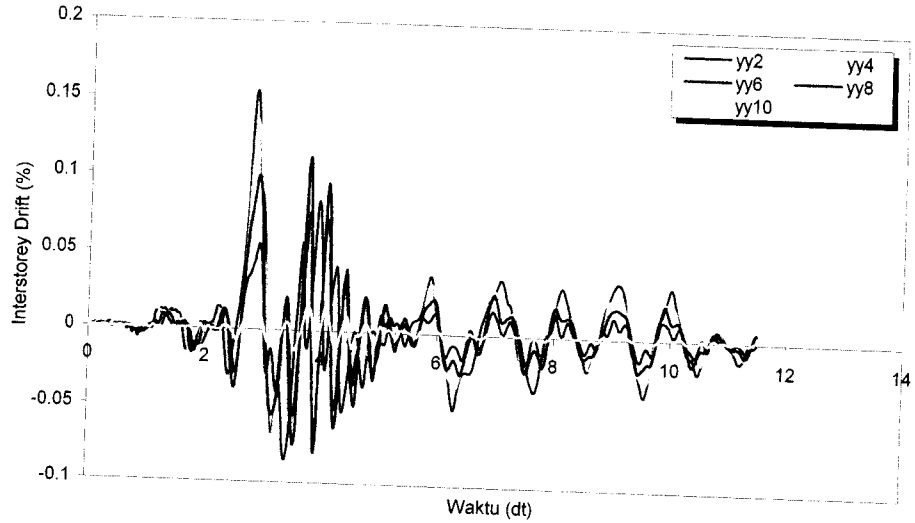


Tingkat 10

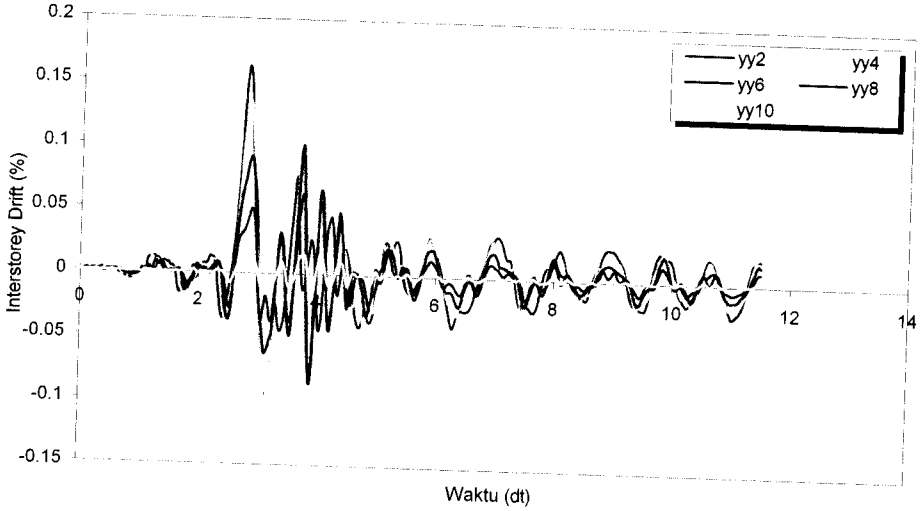
Gambar 5.51 Perbandingan Interstorey Drift Struktur Tingkat 10 Akibat Gempa El Centro



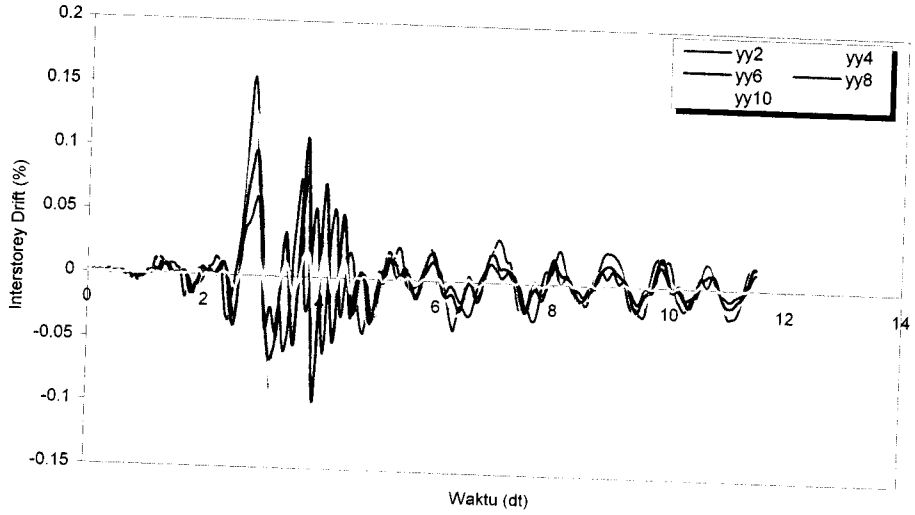
Tipikal



Setback 1

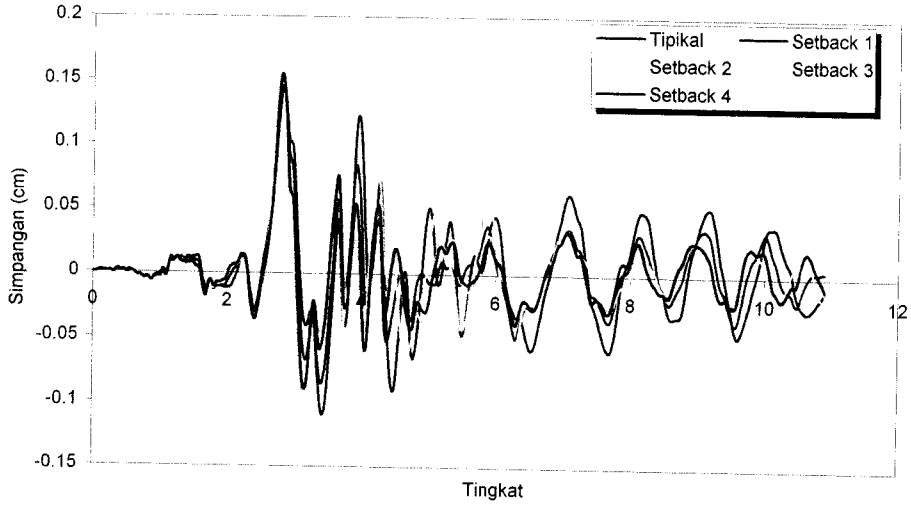


Setback 2

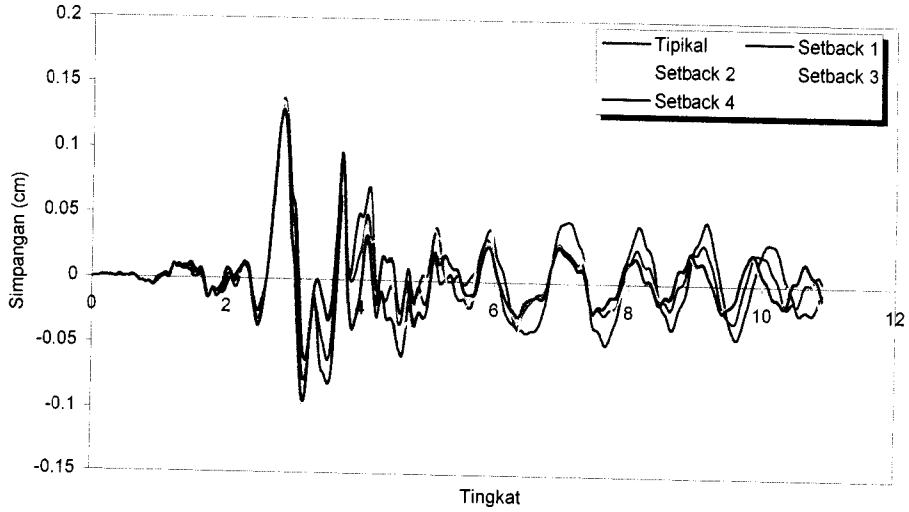


Setback 4

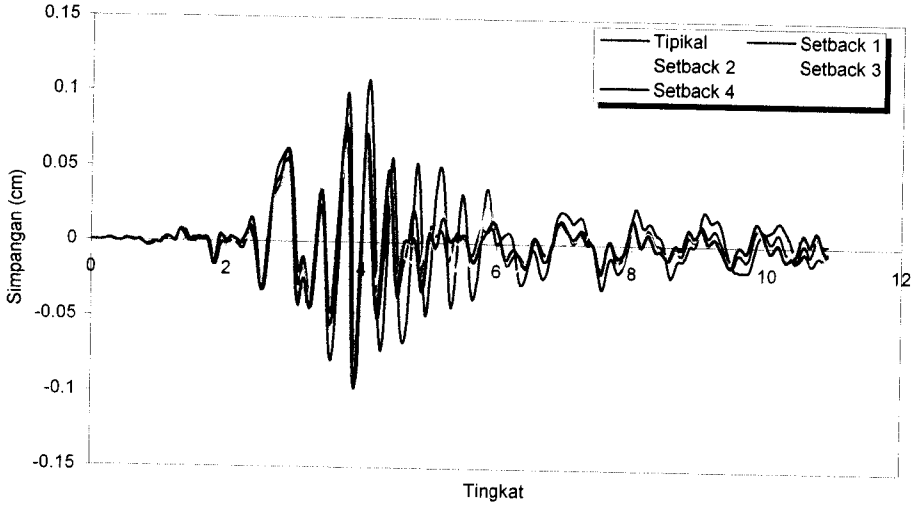
Gambar 5.52 Interstorey Drift Struktur Tingkat 10 Akibat Gempa Gilroy



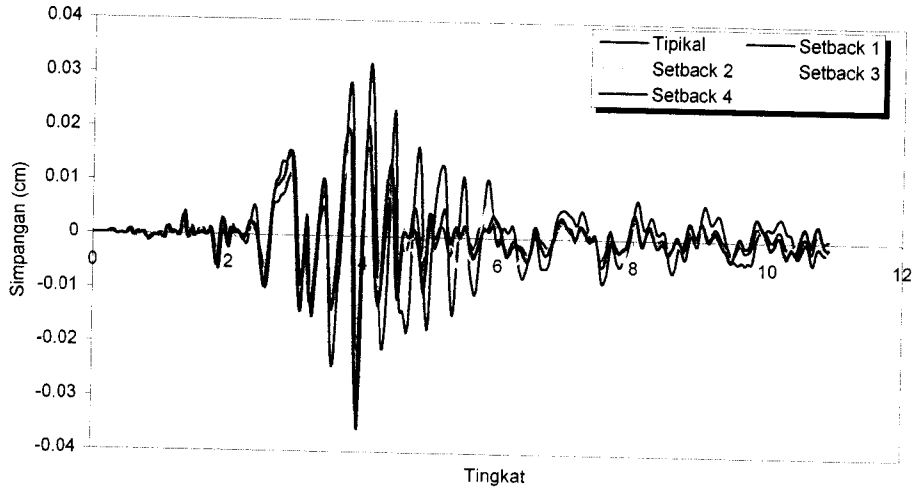
Tingkat 2



Tingkat 4

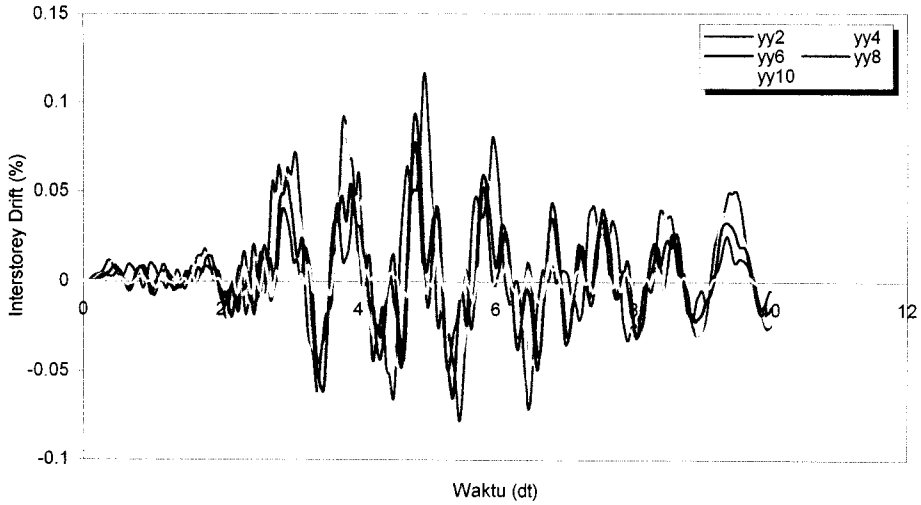


Tingkat 8

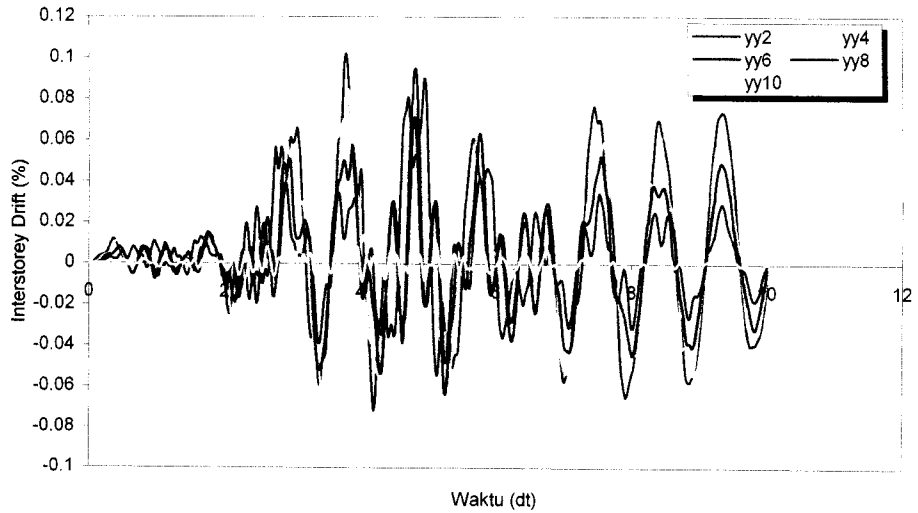


Tingkat 10

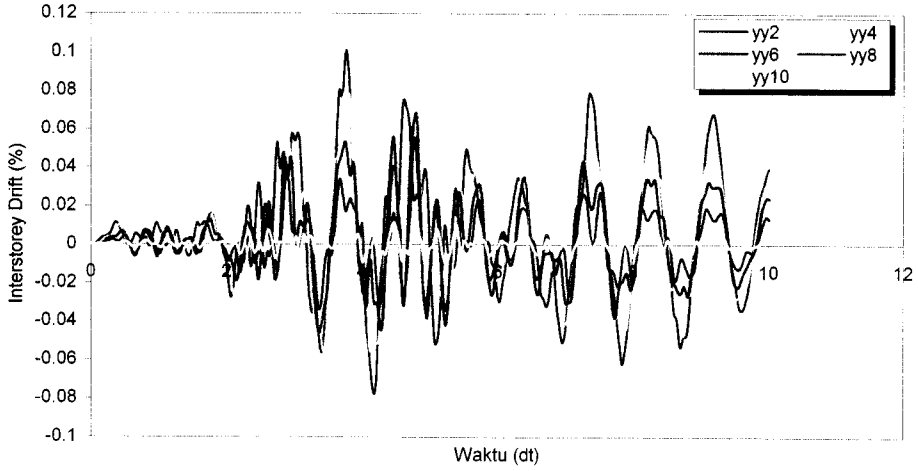
Gambar 5.53 Perbandingan Interstorey Drift Struktur Tingkat 10 Akibat Gempa Gilroy



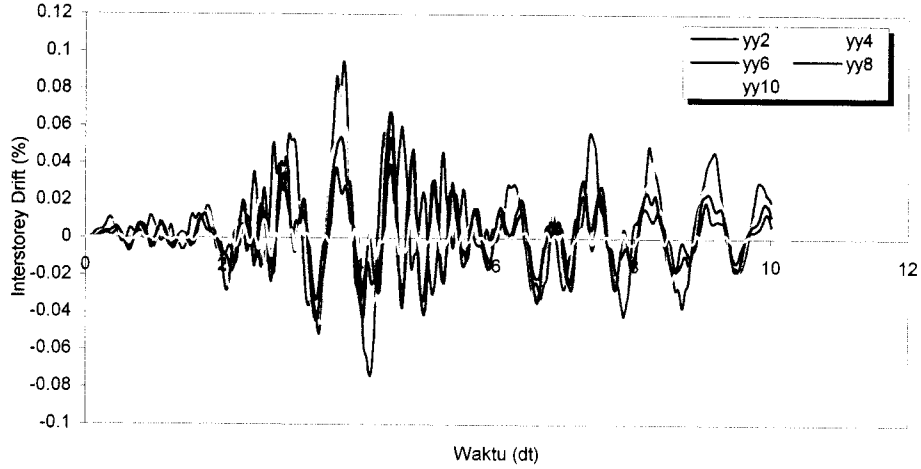
Tipikal



Setback 1

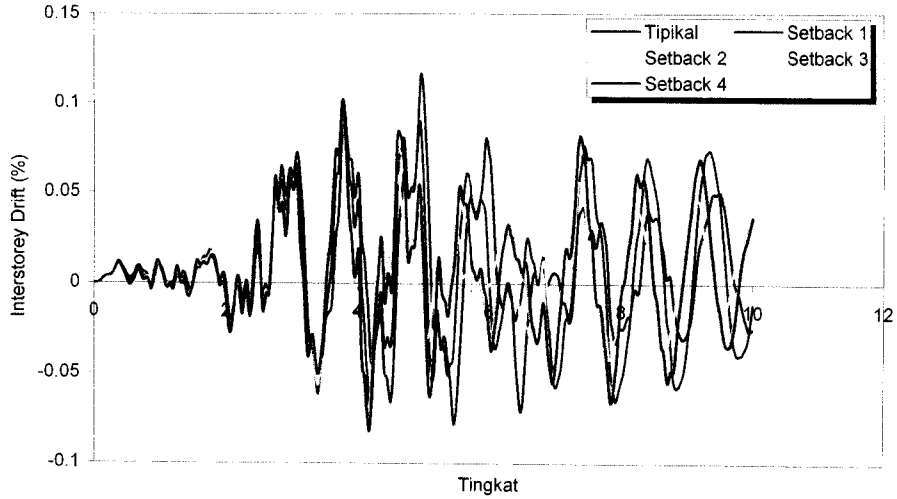


Setback 2

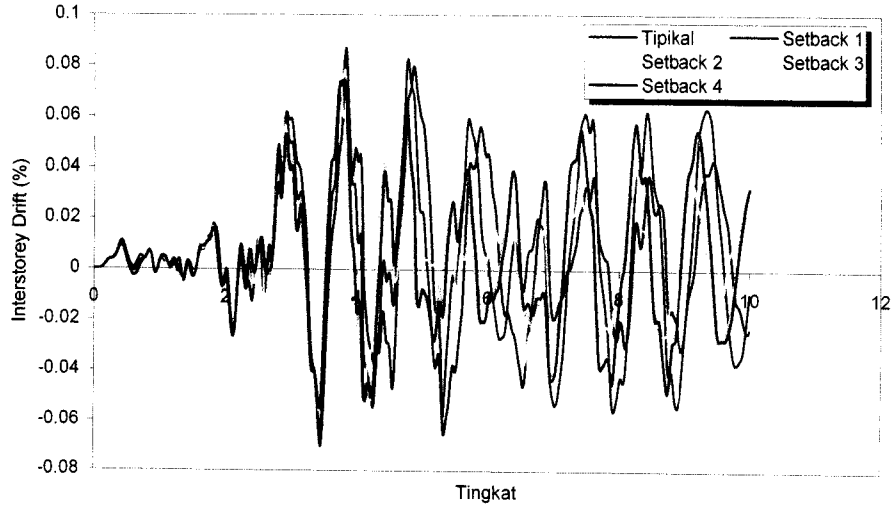


Setback 3

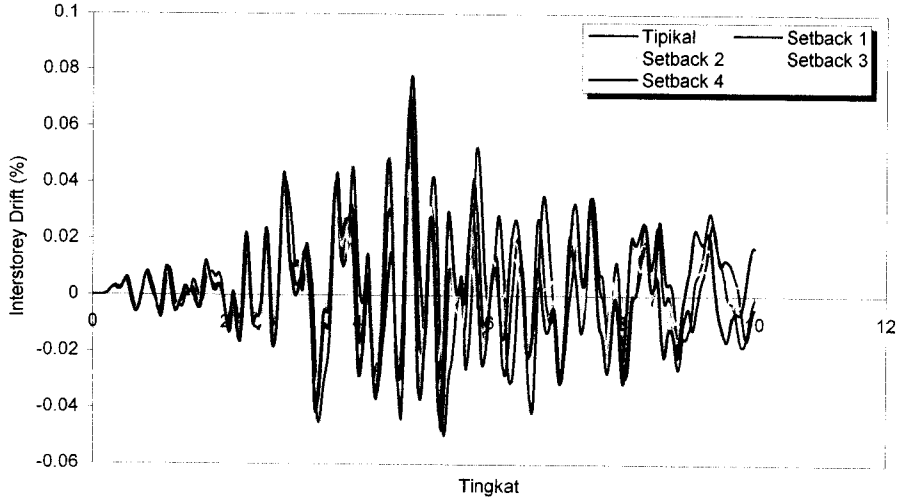
Gambar 5.54 Interstorey Drift Struktur Tingkat 10 Akibat Gempa Koyna



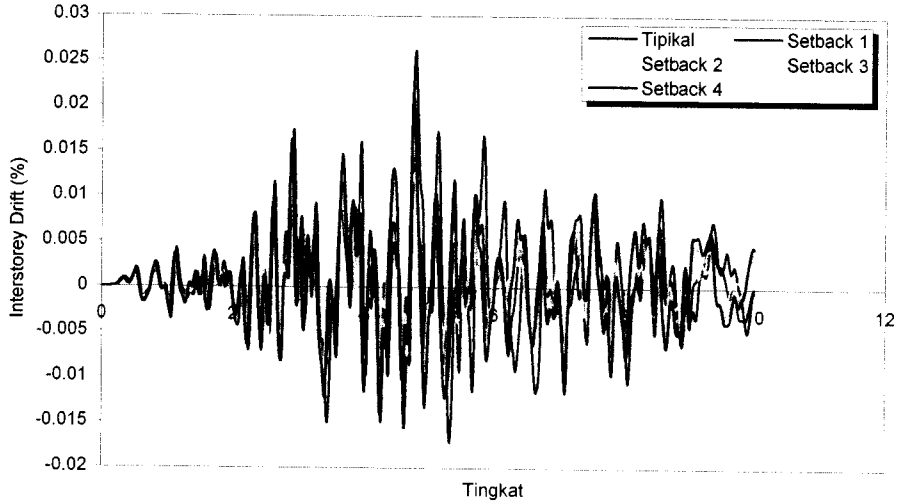
Tingkat 2



Tingkat 4

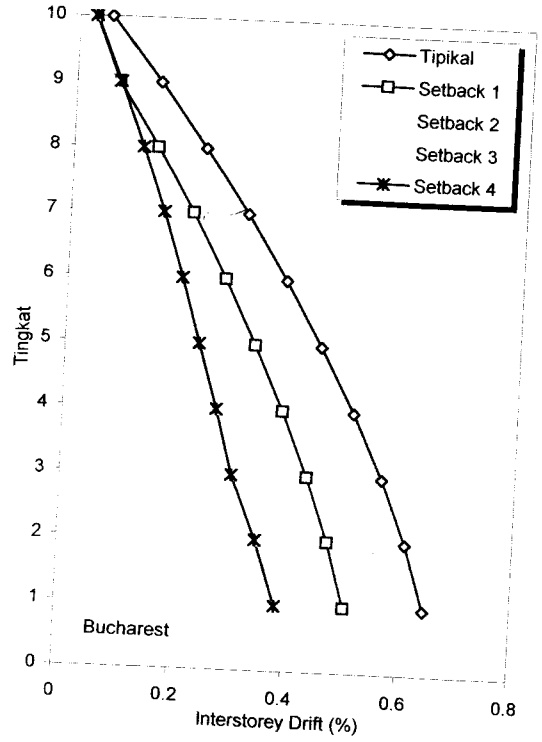


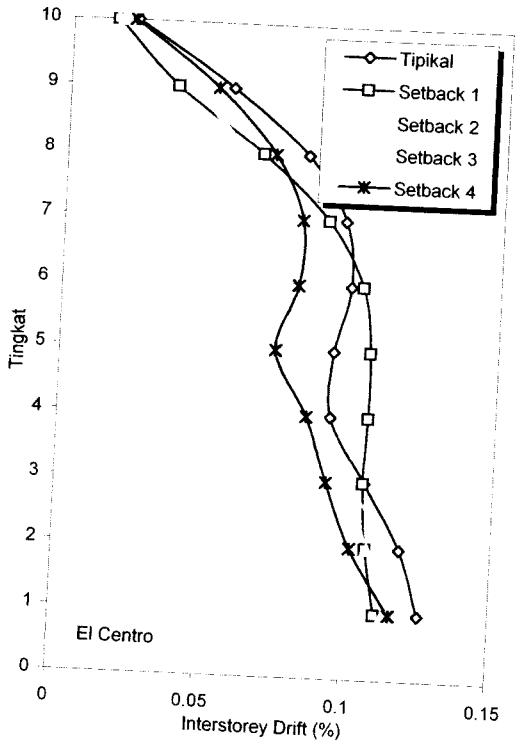
Tingkat 8

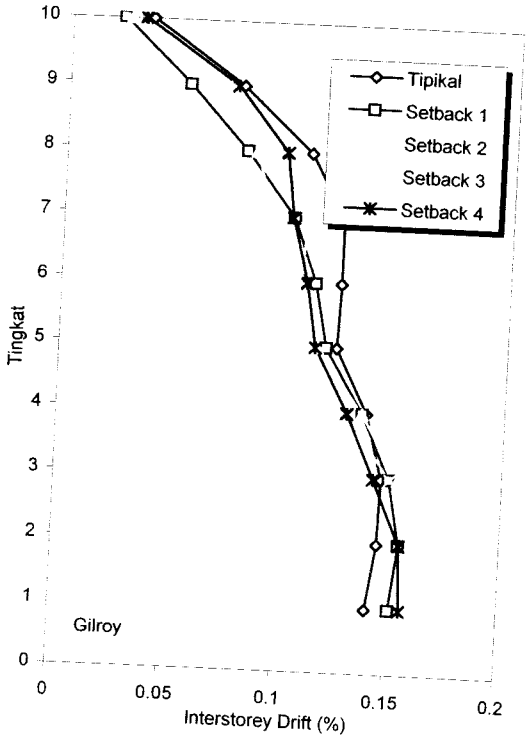


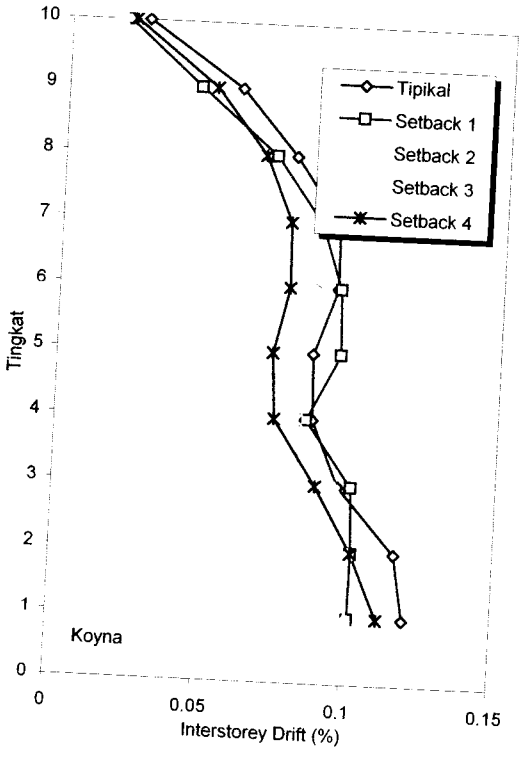
Tingkat 10

Gambar 5.55 Perbandingan Interstorey Drift Struktur Tingkat 10 Akibat Gempa Koyna

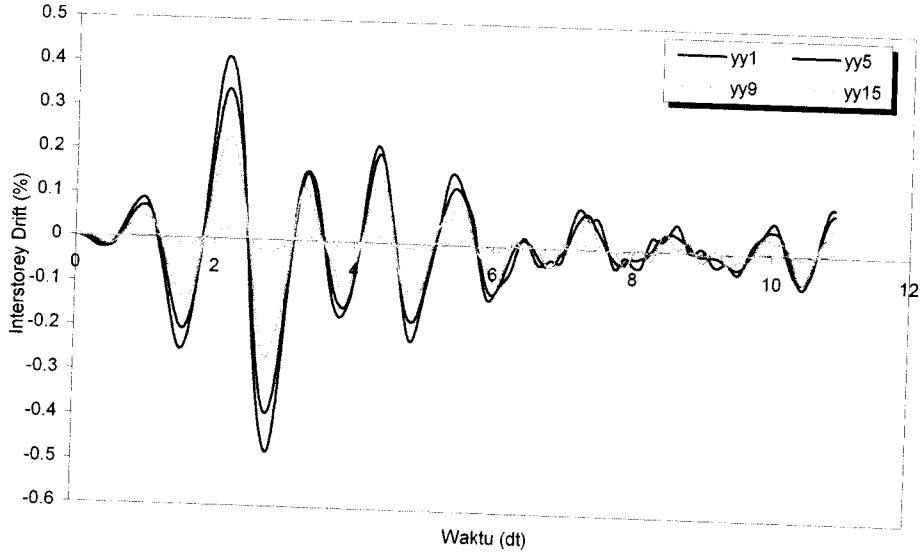




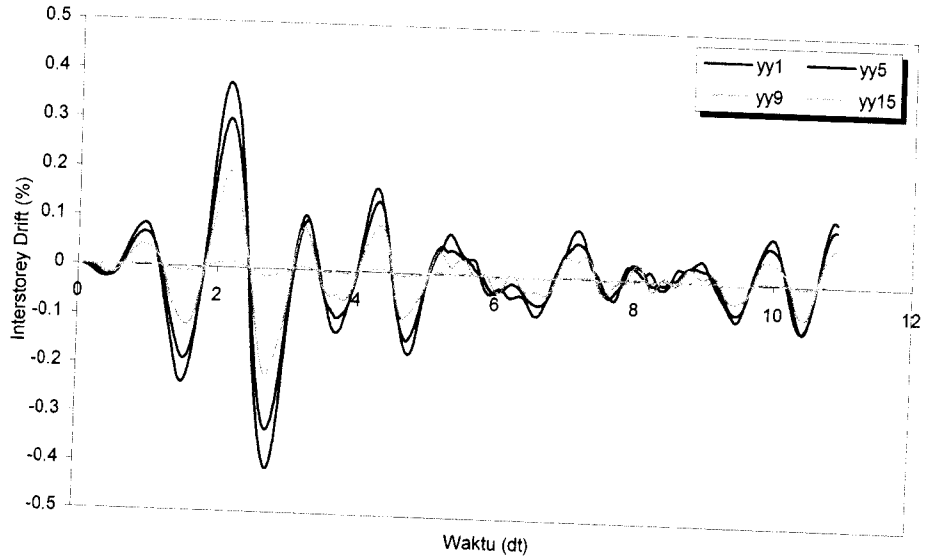




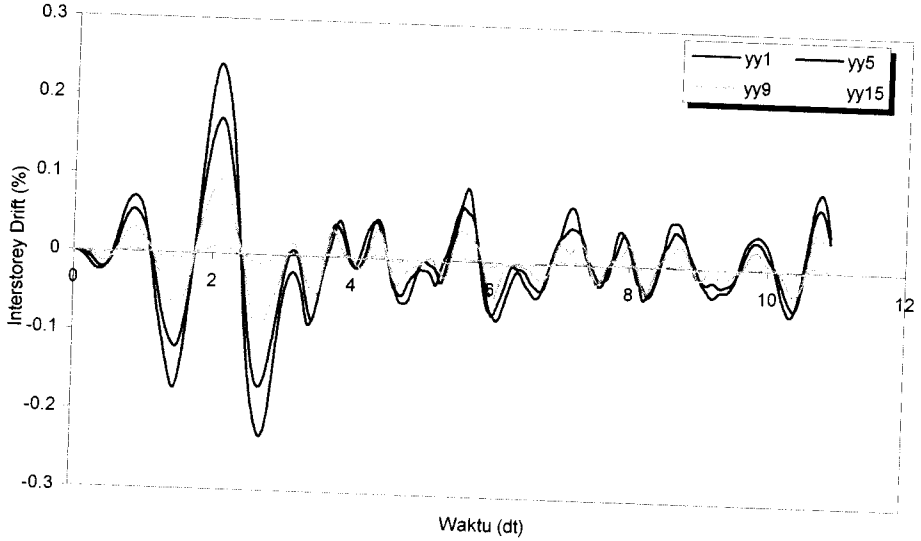
Gambar 5.56 Interstorey Drift Struktur Tingkat 10 Akibat Gempa Koyna



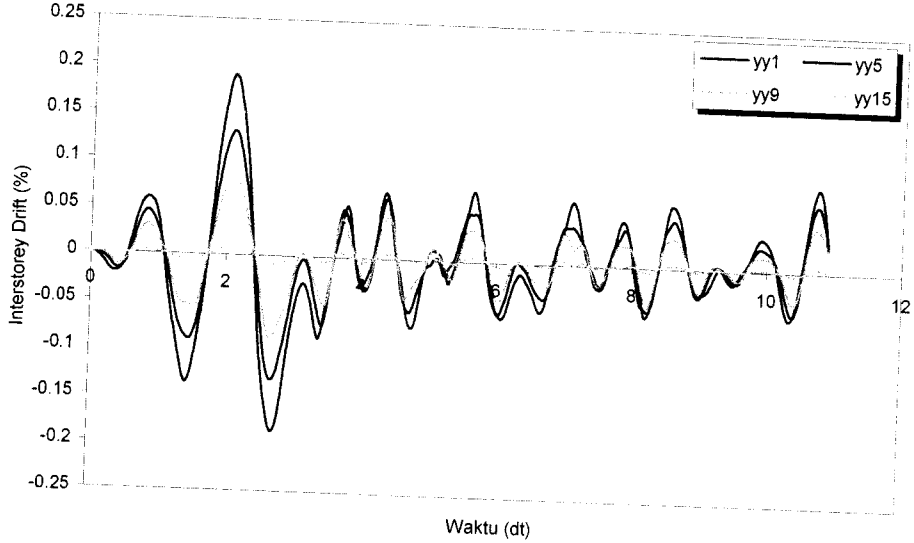
Tipikal



Setback 1

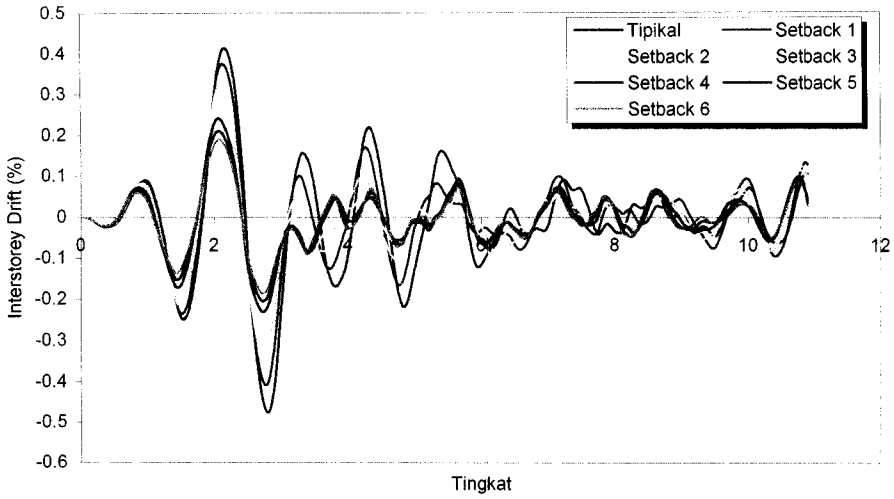


Setback 4

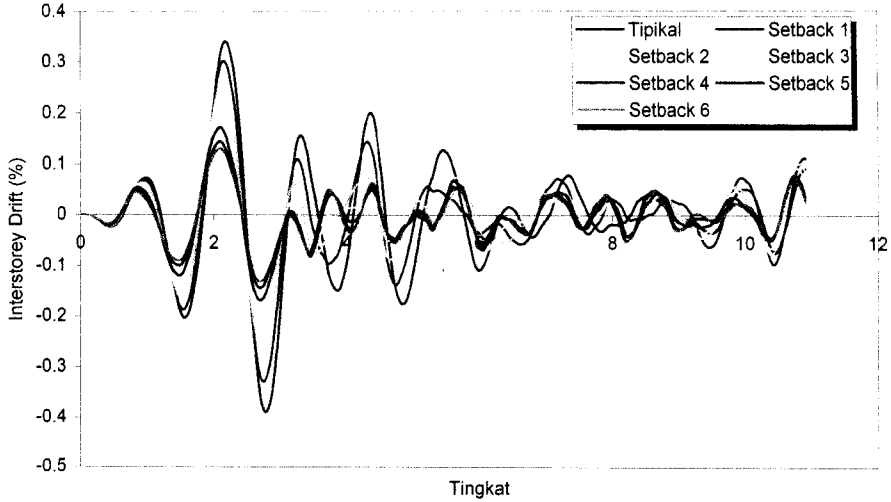


Setback 6

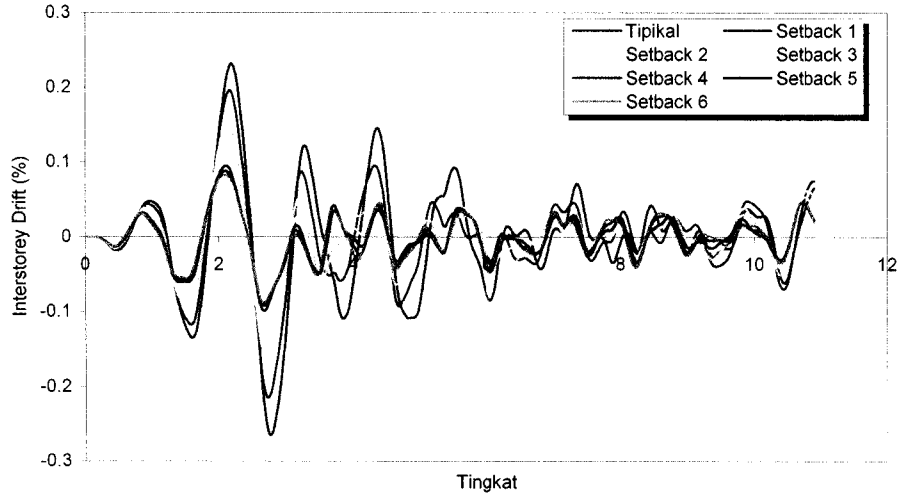
Gambar 5.57 Interstorey Drift Struktur Tingkat 15 Akibat Gempa Bucharest



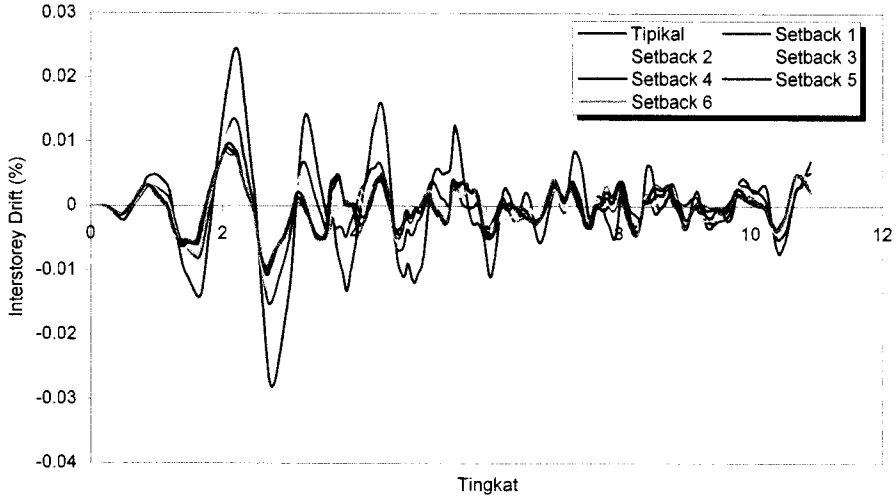
Tingkat 1



Tingkat 5

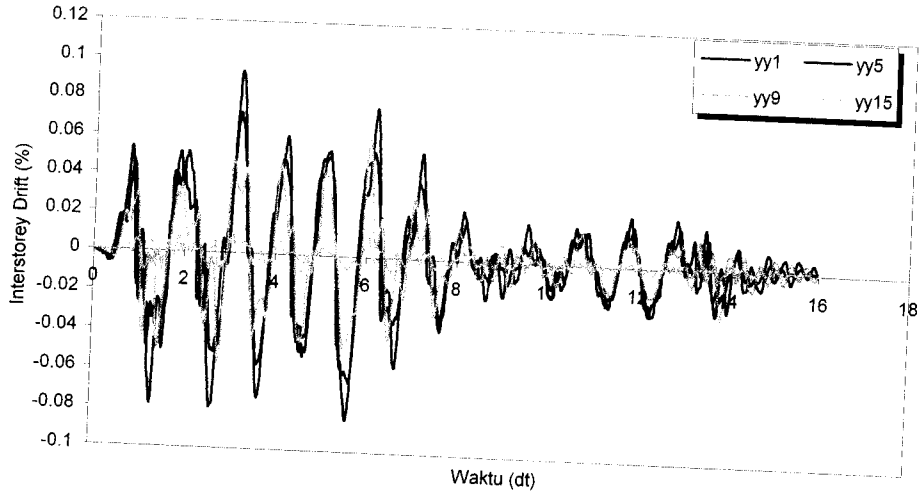


Tingkat 9

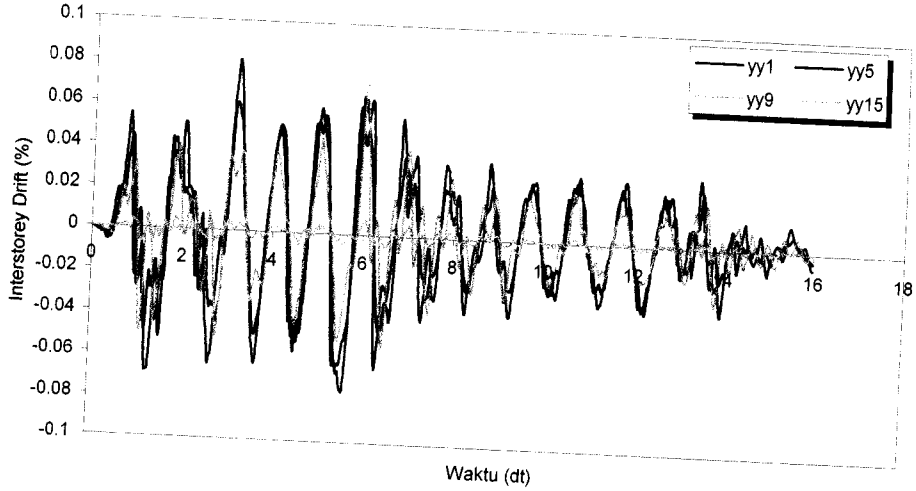


Tingkat 15

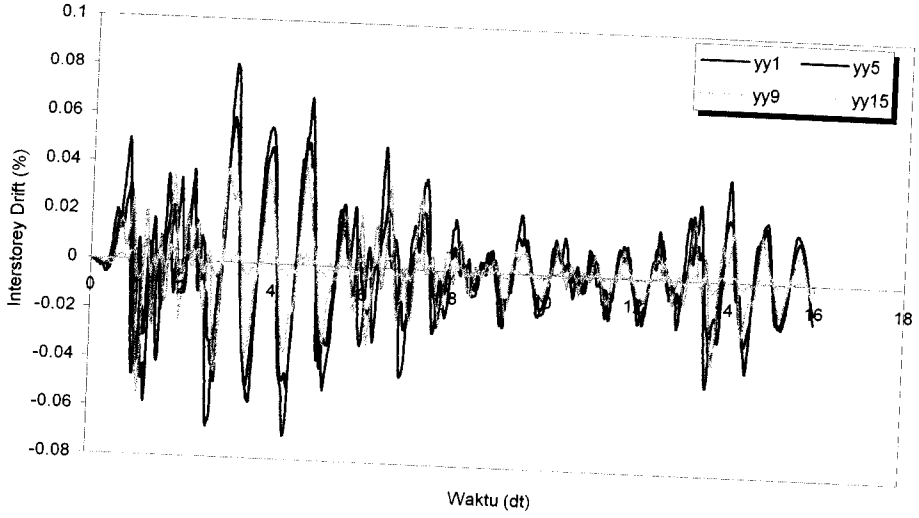
Gambar 5.58 Perbandingan Interstorey Drift Struktur Tingkat 15 Akibat Gempa Bucharest



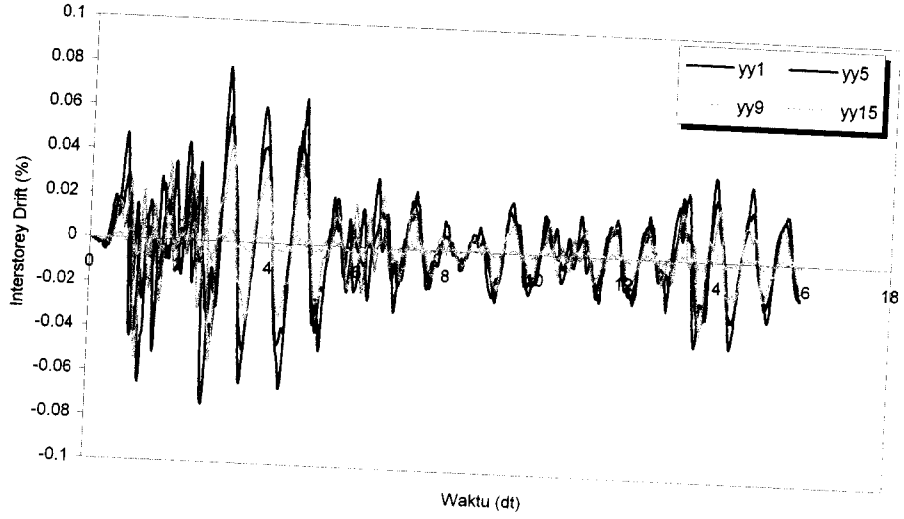
Tipikal



Setback 1

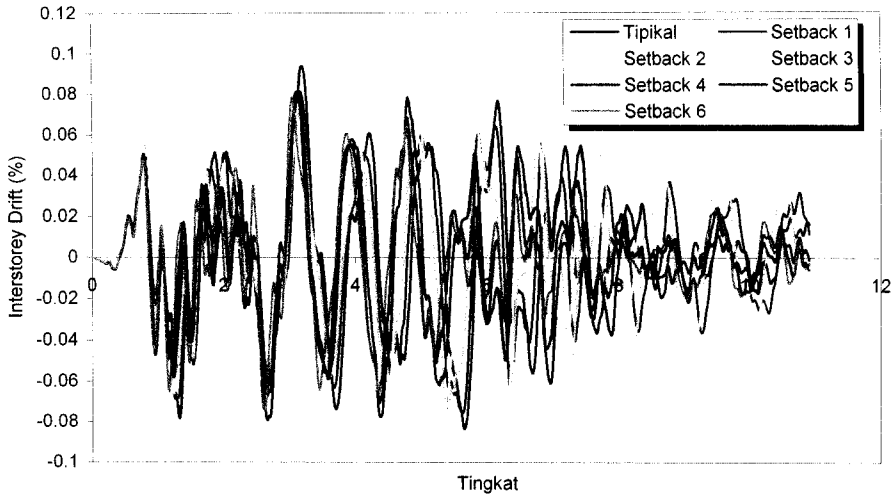


Setback 5

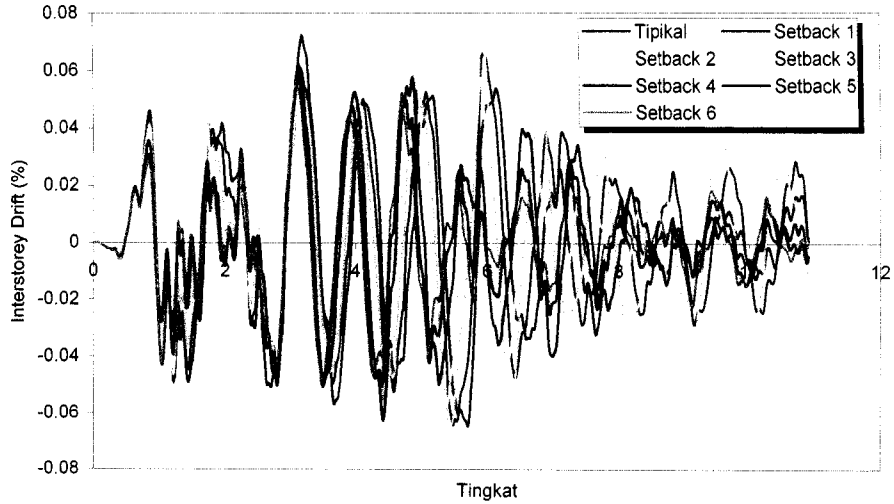


Setback 6

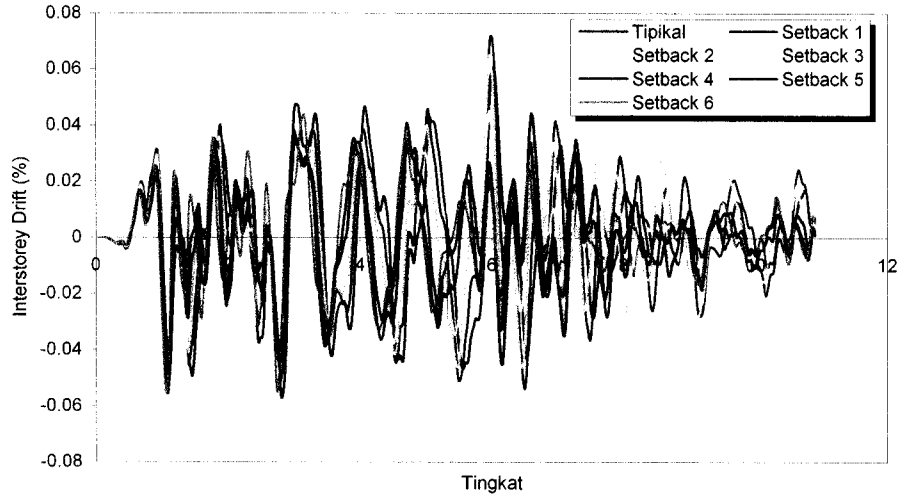
Gambar 5.59 Interstorey Drift Struktur Tingkat 15 Akibat Gempa El Centro



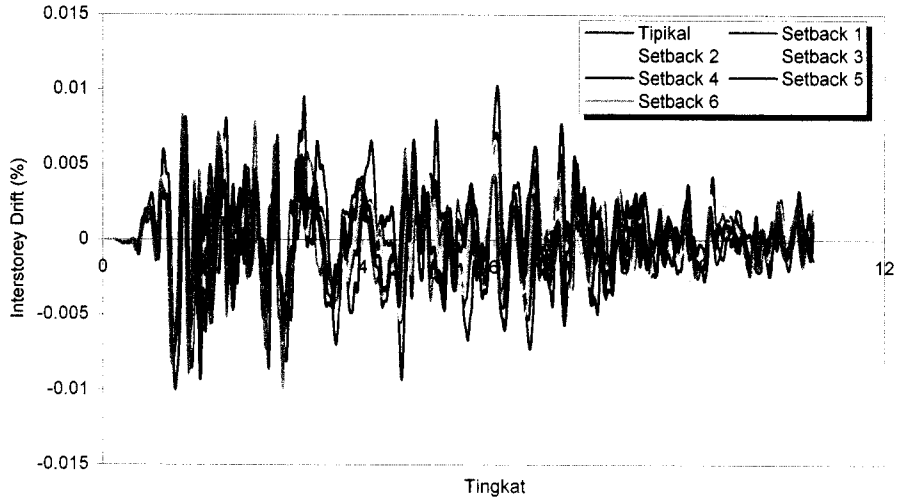
Tingkat 1



Tingkat 5

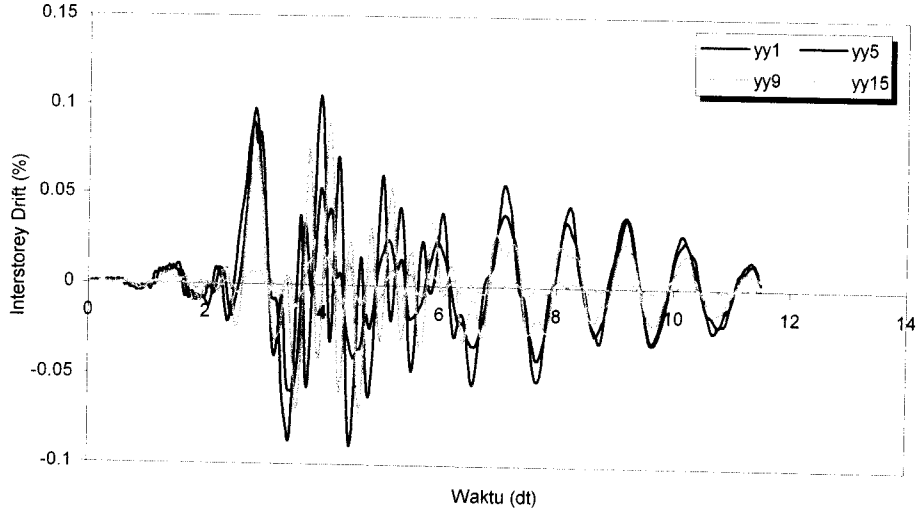


Tingkat 9

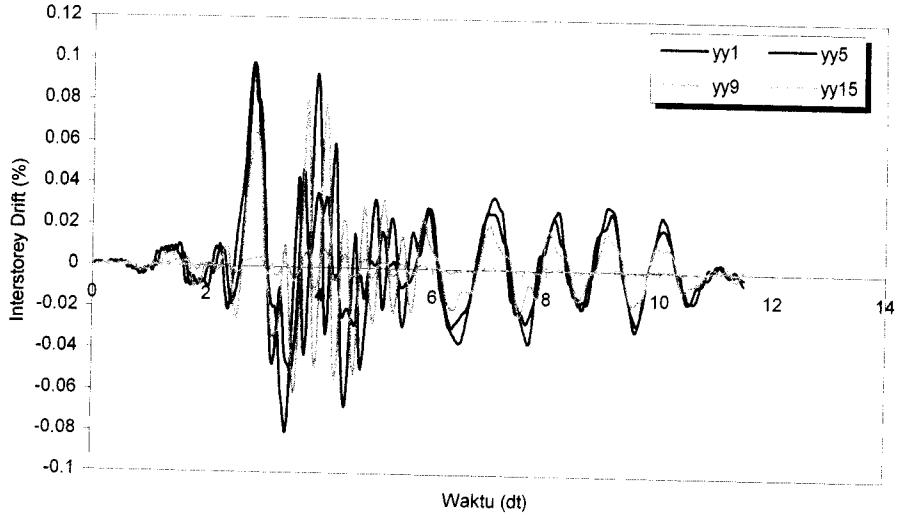


Tingkat 15

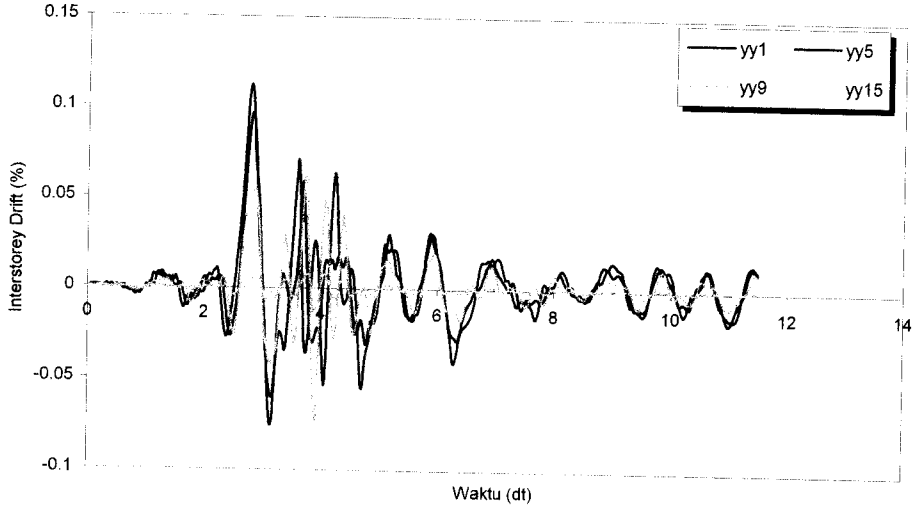
Gambar 5.60 Perbandingan Interstorey Drift Struktur Tingkat 15 Akibat Gempa El Centro



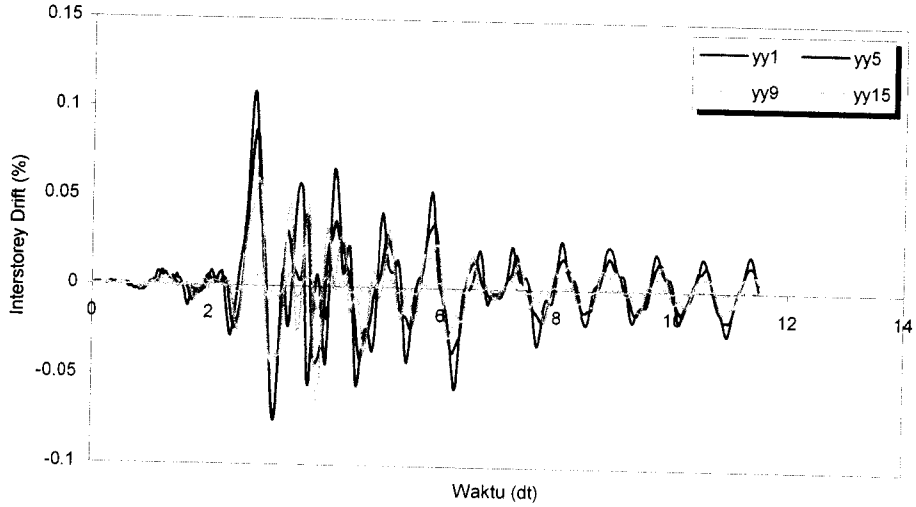
Tipikal



Setback 1

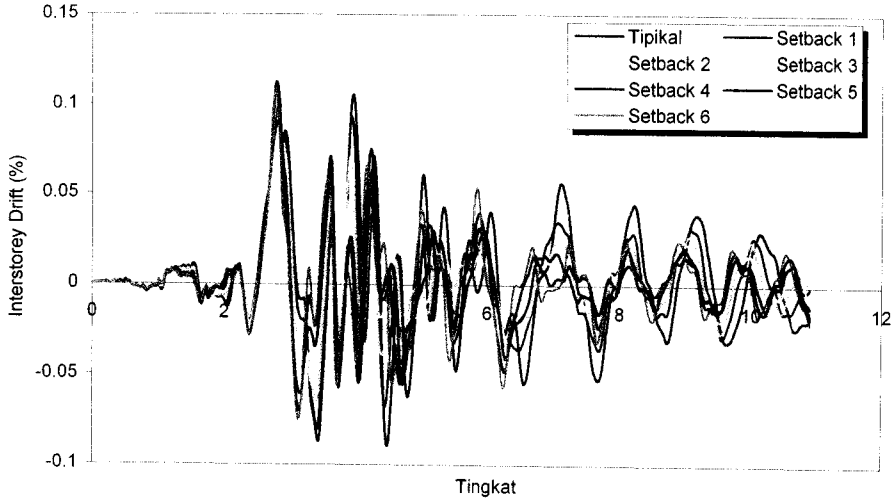


Setback 4

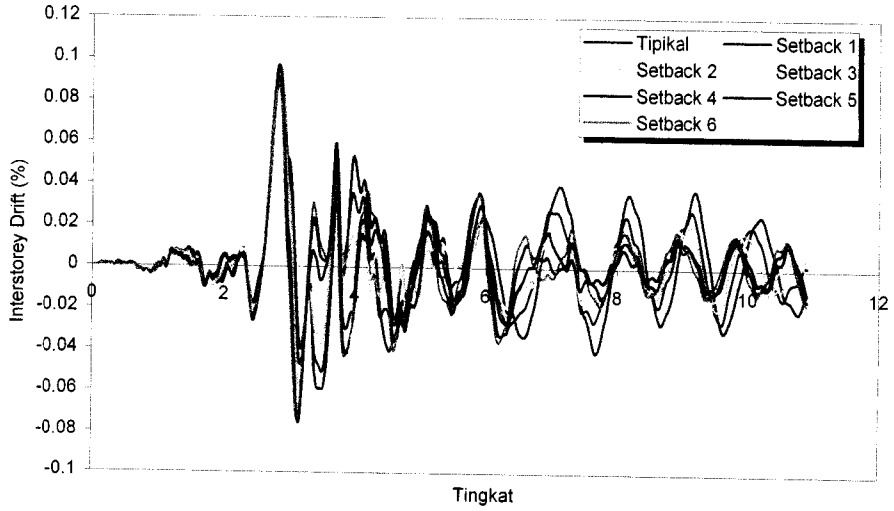


Setback 6

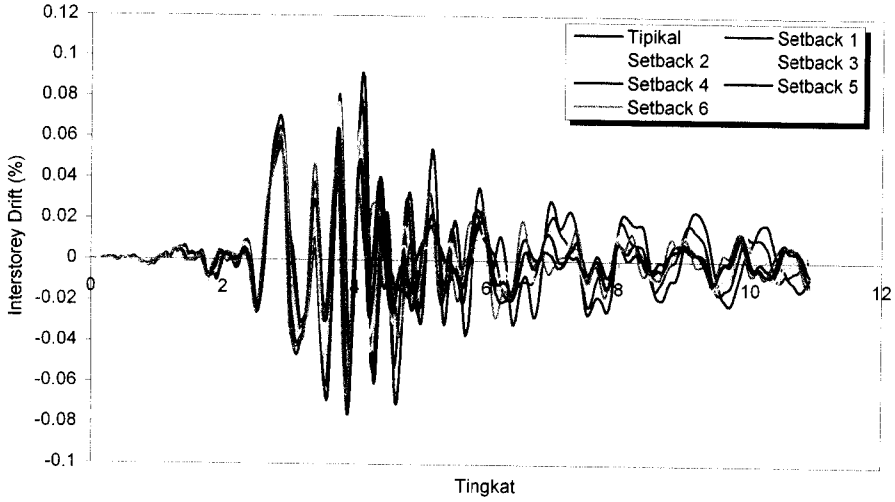
Gambat 5.61 Interstorey Drift Struktur Tingkat 15 Akibat Gempa Gilroy



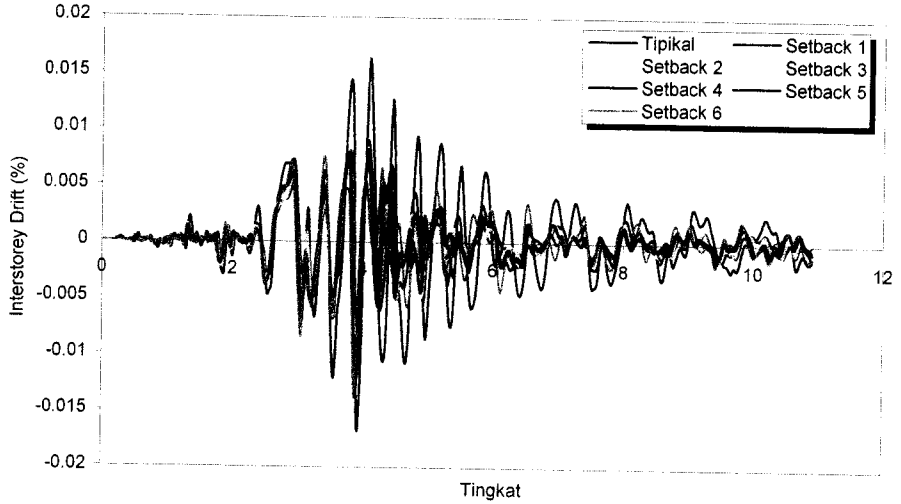
Tingkat 1



Tingkat 5

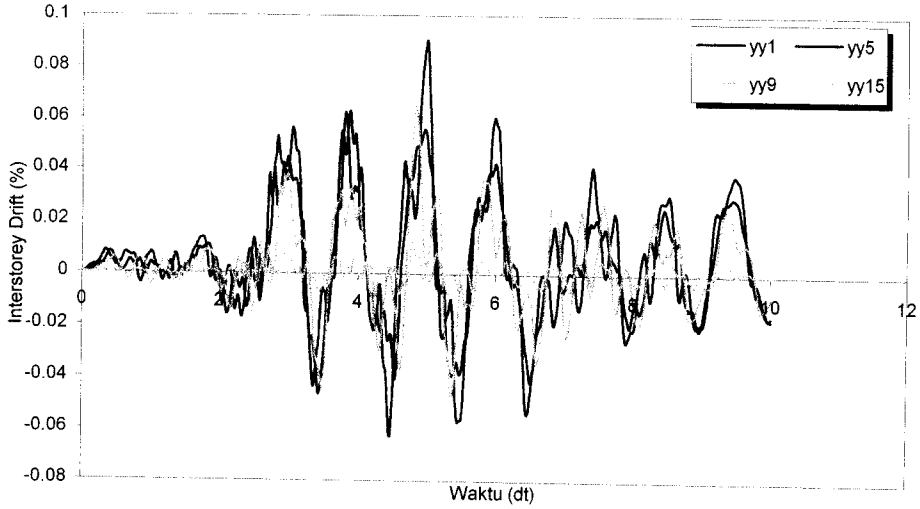


Tingkat 9

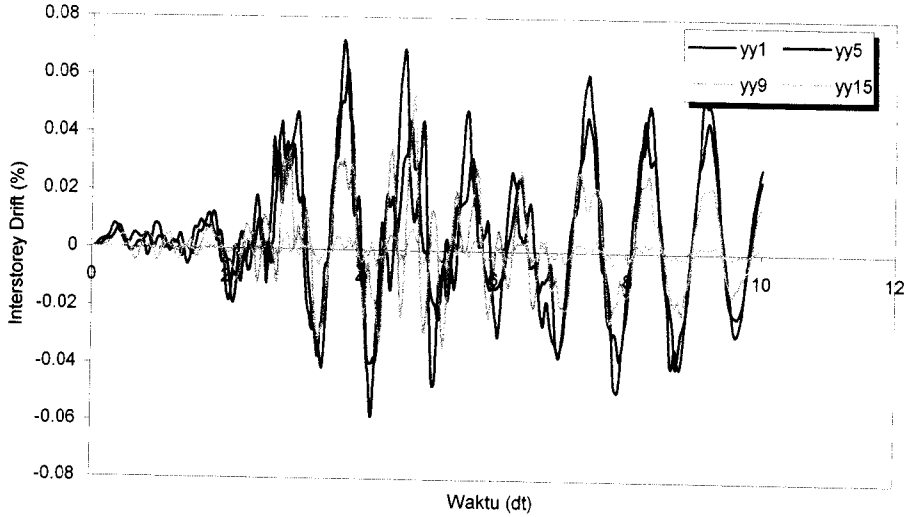


Tingkat 15

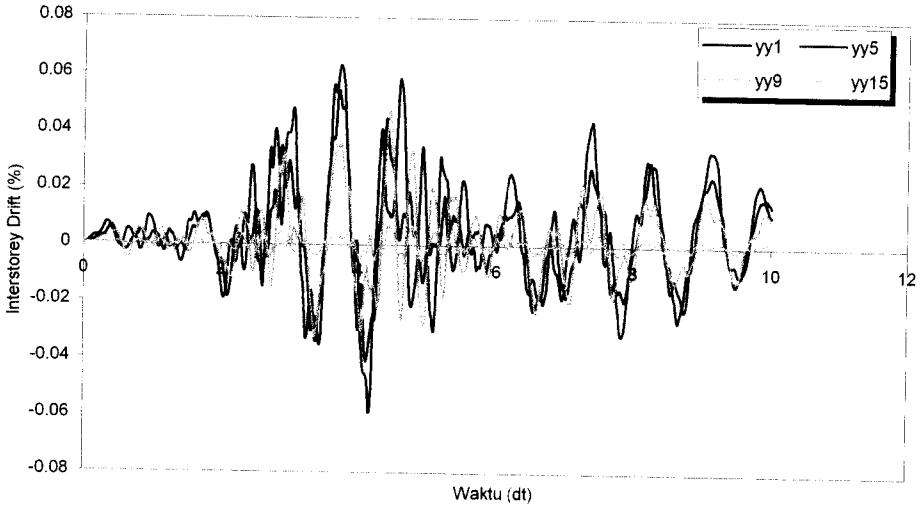
Gambar 5.62 Perbandingan Interstorey Drift Struktur Tingkat 15 Akibat Gempa Gilroy



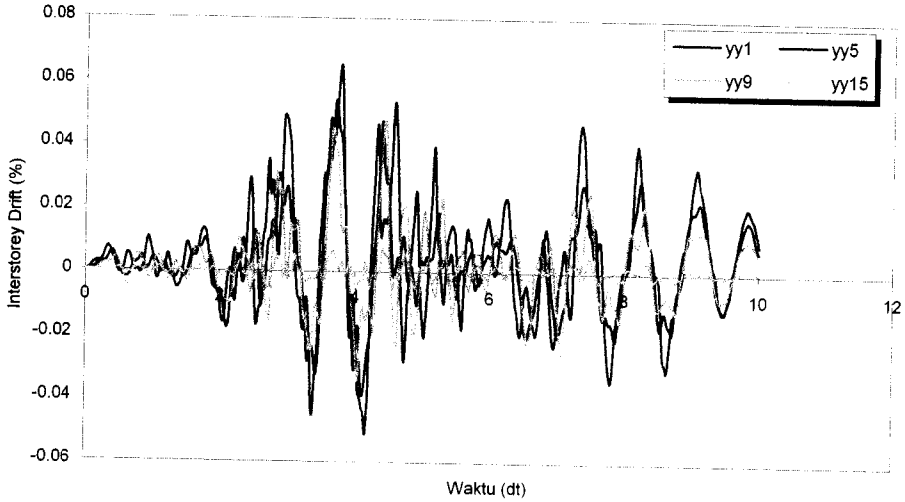
Tipikal



Setback 3

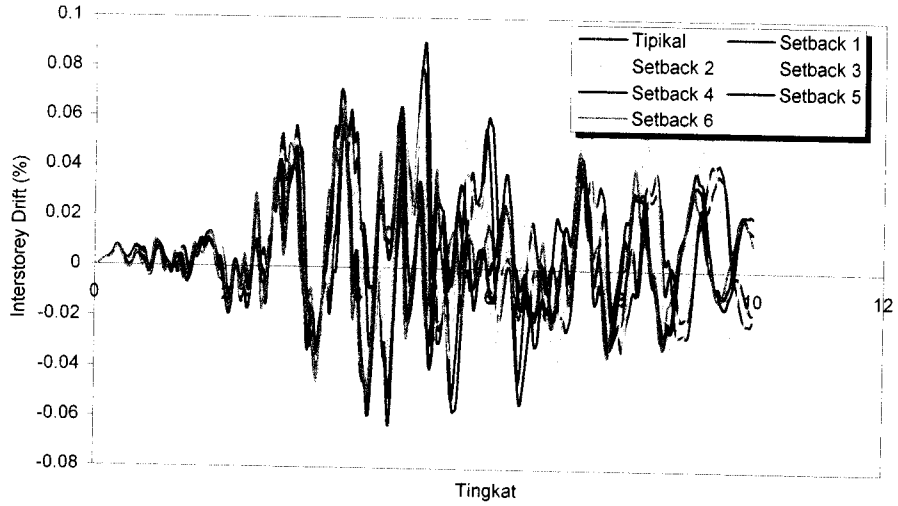


Setback 5

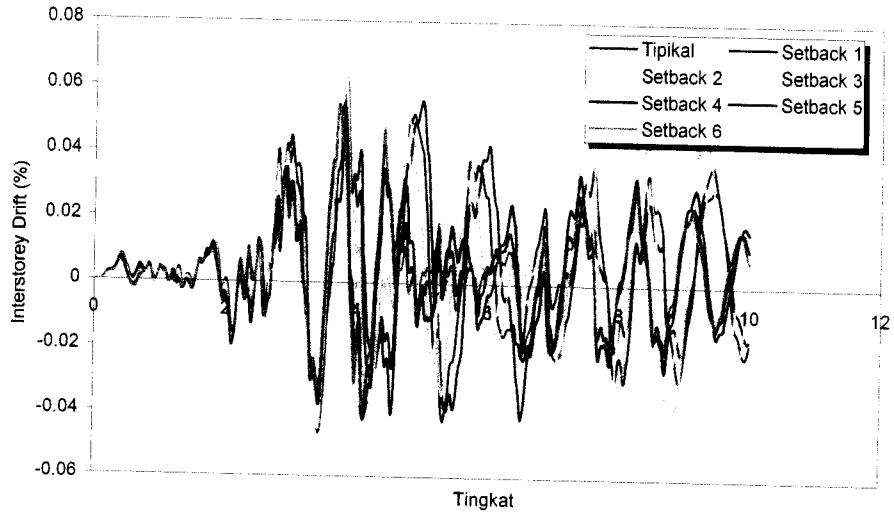


Setback 6

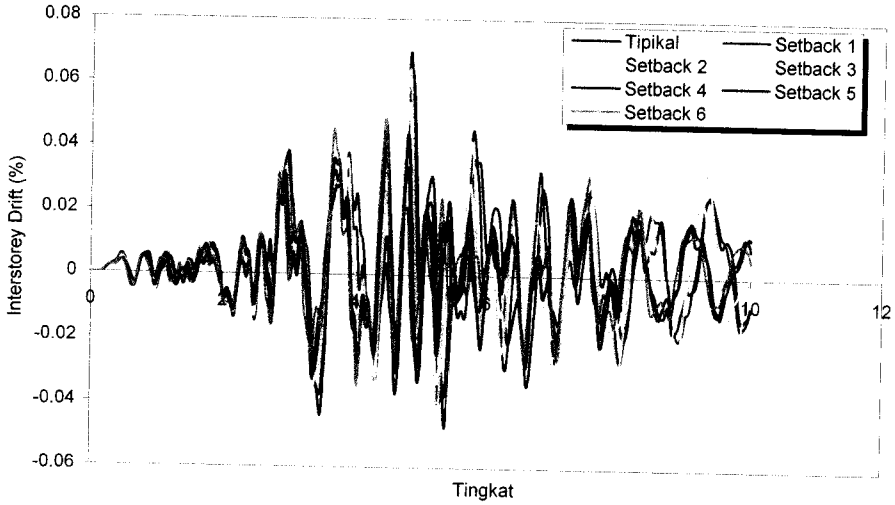
Gambar 5.63 Interstorey Drift Struktur Tingkat 15 Akibat Gempa Koyna



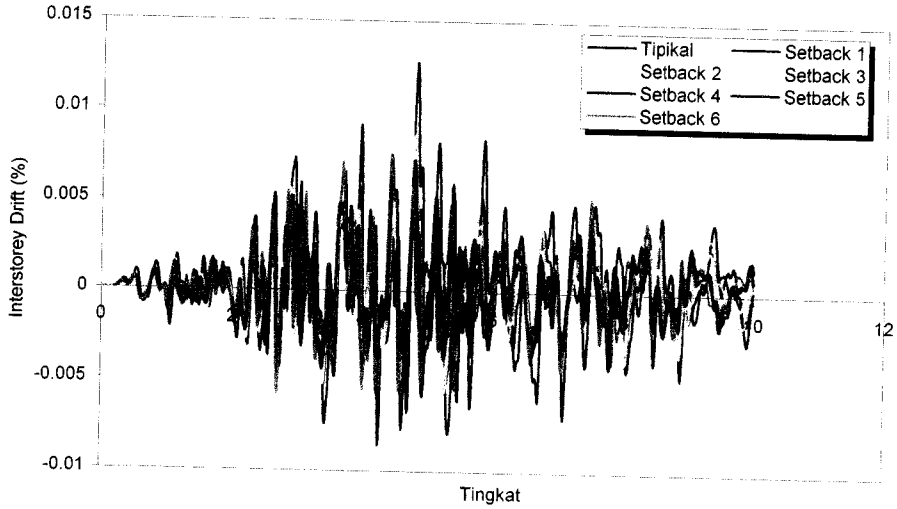
Tingkat 1



Tingkat 5

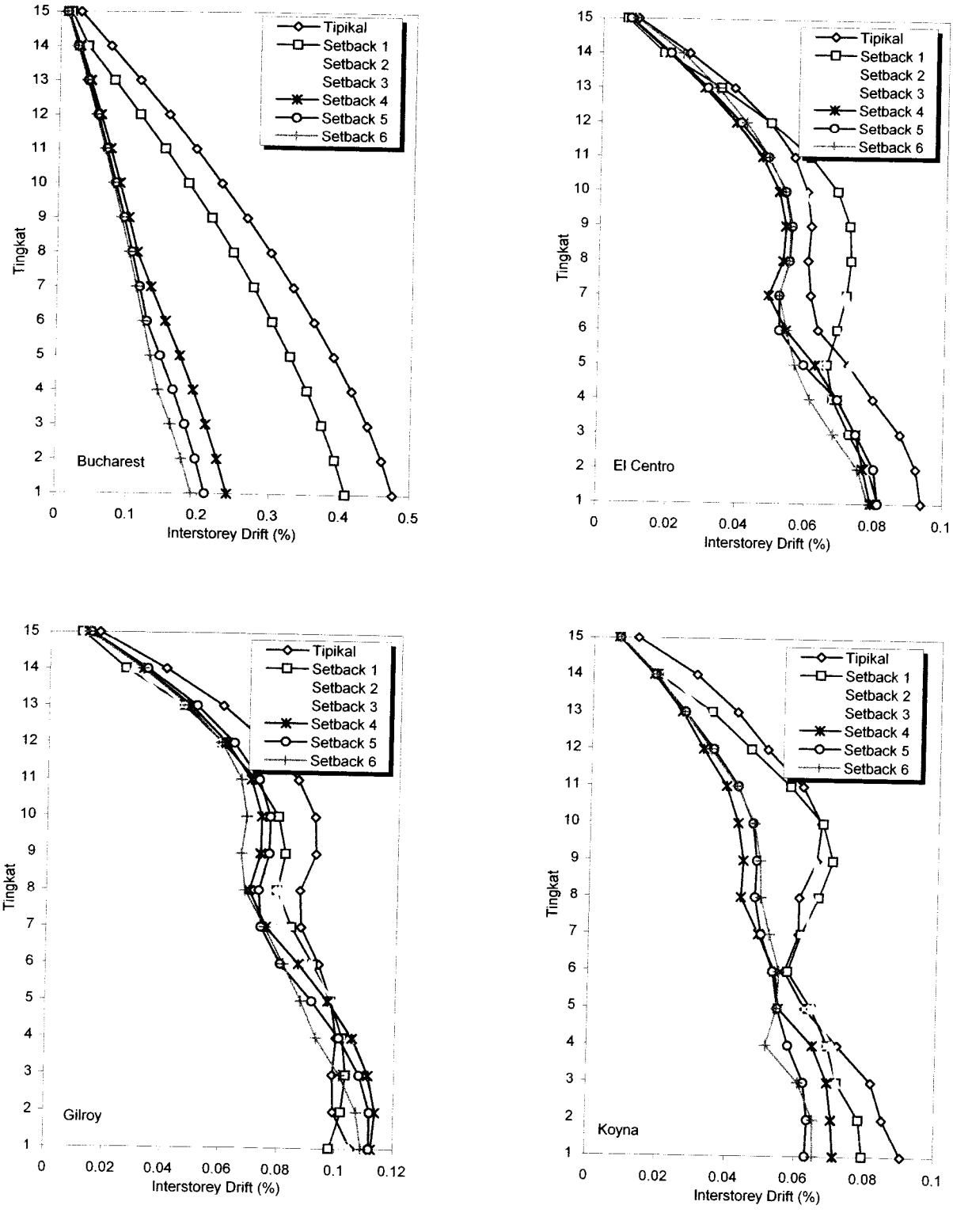


Tingkat 9

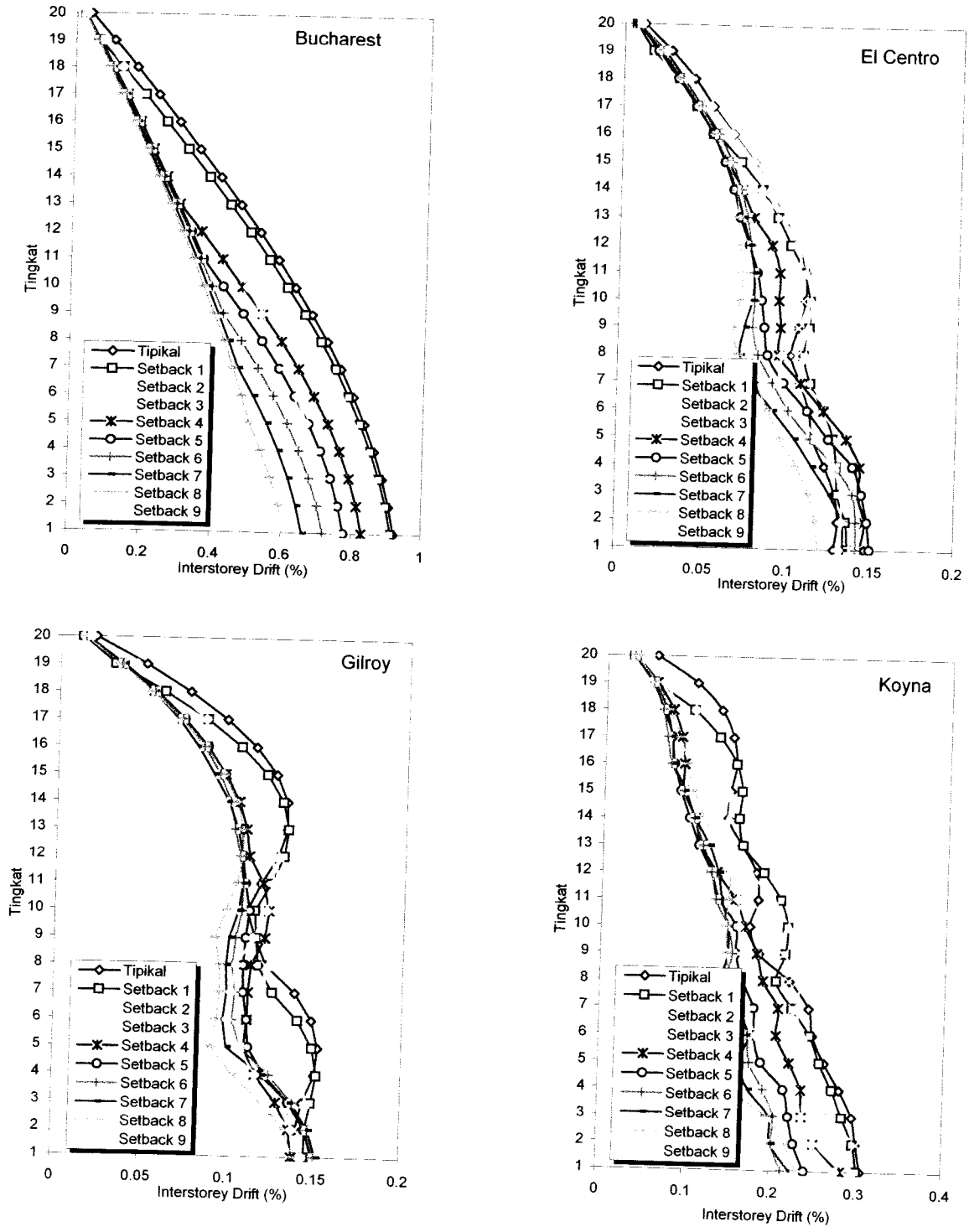


Tingkat 15

Gambar 5.64 Perbandingan Interstorey Drift Struktur Tingkat 15 Akibat Gempa Koyna



Gambar 5.65 Interstorey Drift Maksimum Struktur Tingkat 15 Akibat 4 Gempa



Gambar 5.66 Interstorey Drift Maksimum Struktur Tingkat 20 Akibat 4 Gempa

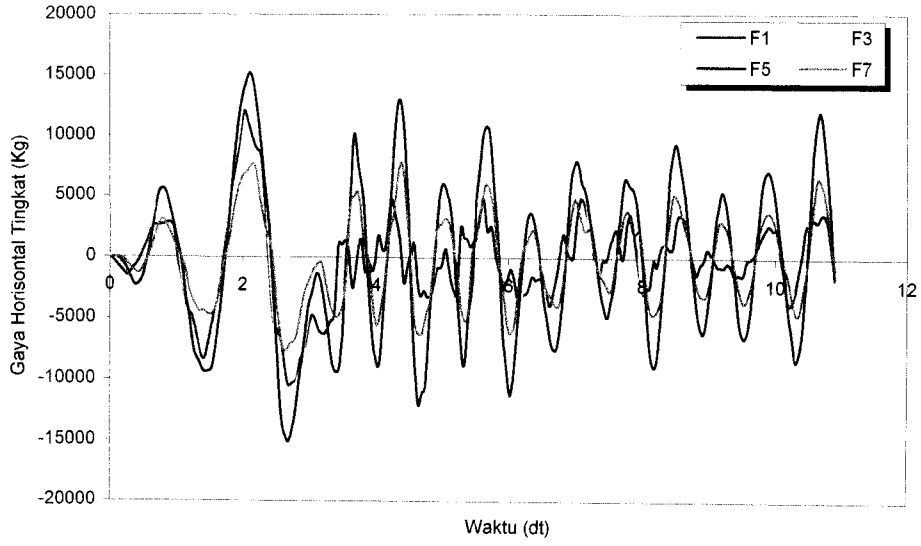
5.4.4 Gaya Horisontal Tingkat

Gaya horisontal tingkat adalah perkalian dari simpangan dengan kekakuan struktur tersebut. Dihitung berdasarkan atas persamaan (3.53).

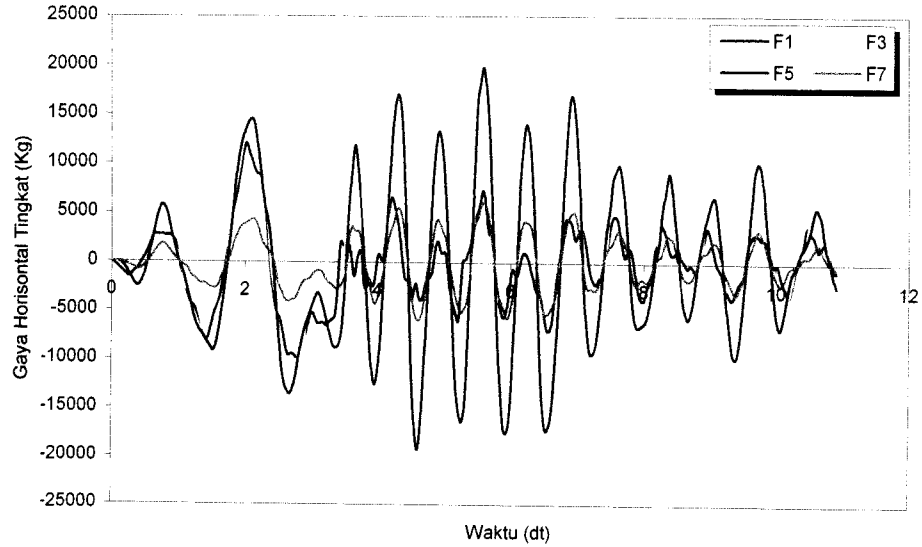
Dari program ini dapat disajikan nilai-nilai *Gaya Horisontal Tingkat* untuk struktur bangunan tingkat 7, 10, 15 dan 20 dengan 4 variasi gempa pada Gambar 5.67 sampai dengan Gambar 5.94. Dengan memperhatikan Gambar 5.67 sampai dengan Gambar 5.94 tersebut, maka dapat dilihat bahwa nilai *Gaya Horisontal Tingkat* terbesar terdapat pada pembebanan gempa Bucharest yang telah dinormalisasi. Ini disebabkan A_{maks} gempa Bucharest mendekati nilai 0,2g sehingga skala gempa mendekati 1.

Titik belok pada grafik nilai *Gaya Horisontal Tingkat* terjadi karena adanya pengurangan nilai *Gaya Horisontal Tingkat*. Hal tersebut disebabkan karena *Gaya Horisontal Tingkat* merupakan fungsi perkalian simpangan dengan kekakuan. Pada struktur tipikal sampai setback vertikal yang paling kritis nilai gaya horisontal tingkat semakin mengecil karena terdapat pengurangan massa dan kekakuan. Titik belok terdapat pada tingkat yang terdapat pengurangan muka lantainya. Dapat dilihat bahwa terdapat peristiwa tertariknya struktur atas oleh Gaya Horisontal yang berada pada struktur yang terletak dibawahnya.

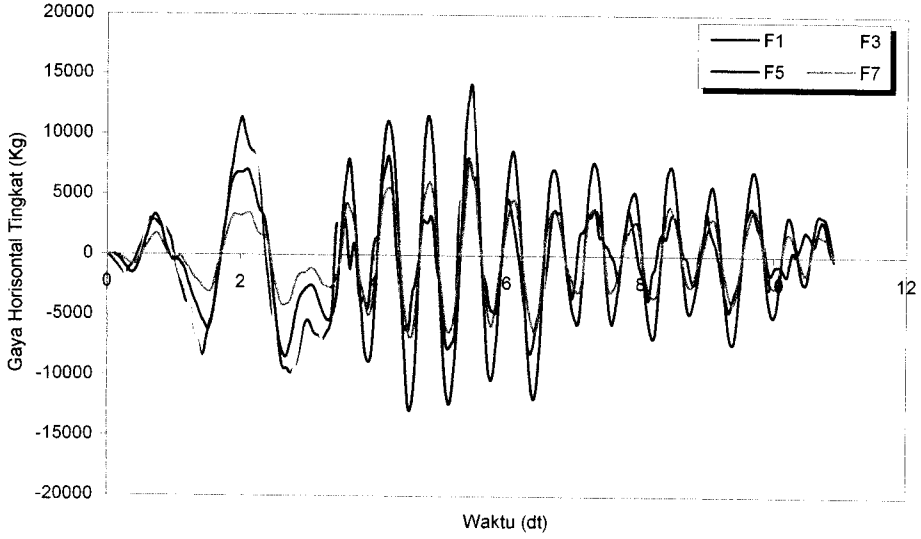
Pada gempa Bucharest selisih *Gaya Horisontal Tingkat* maksimum cukup besar, sedangkan *Gaya Horisontal Tingkat* gempa Elcentro dan Gilroy sangatlah fluktuatif, karena perbedaan periode (T) bangunan. Sedangkan pada Koyna selisih nilai *Gaya Horisontal Tingkat* sangat kecil karena gempanya termasuk gempa berfrekuensi tinggi.



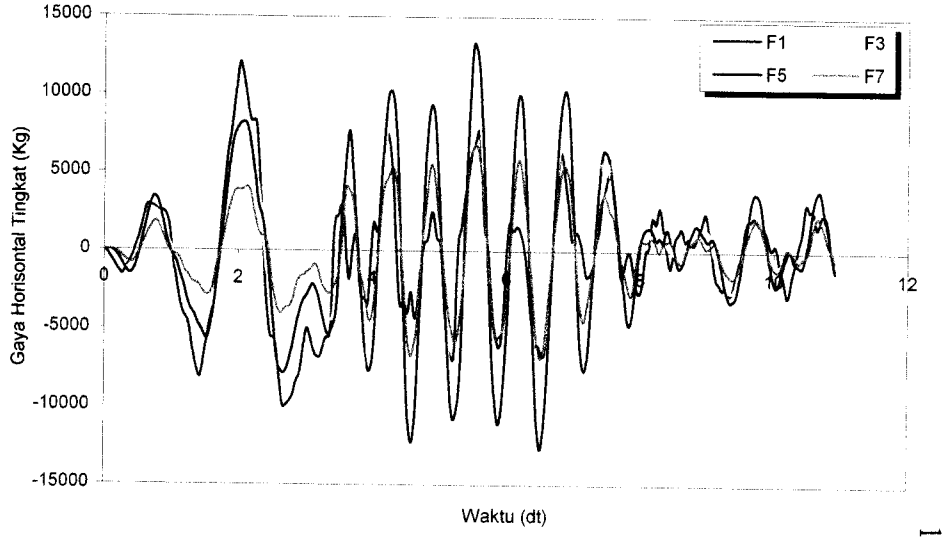
Tipikal



Setback 1

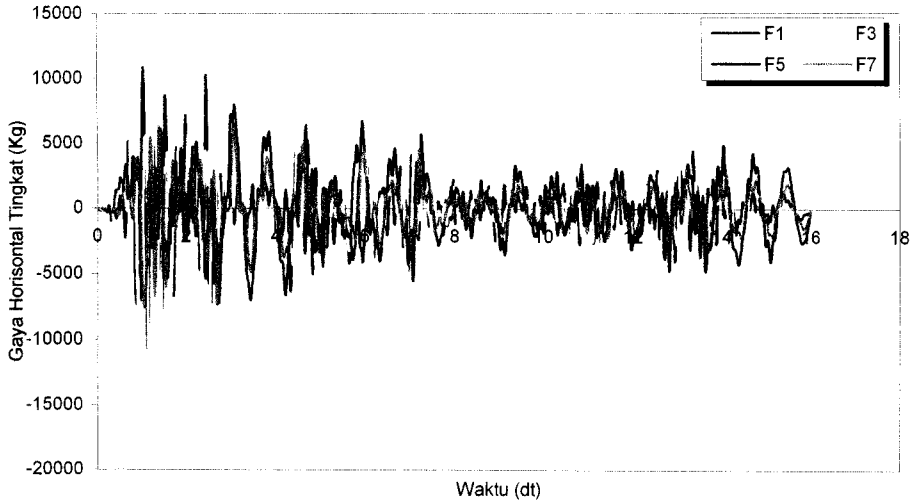


Setback 2

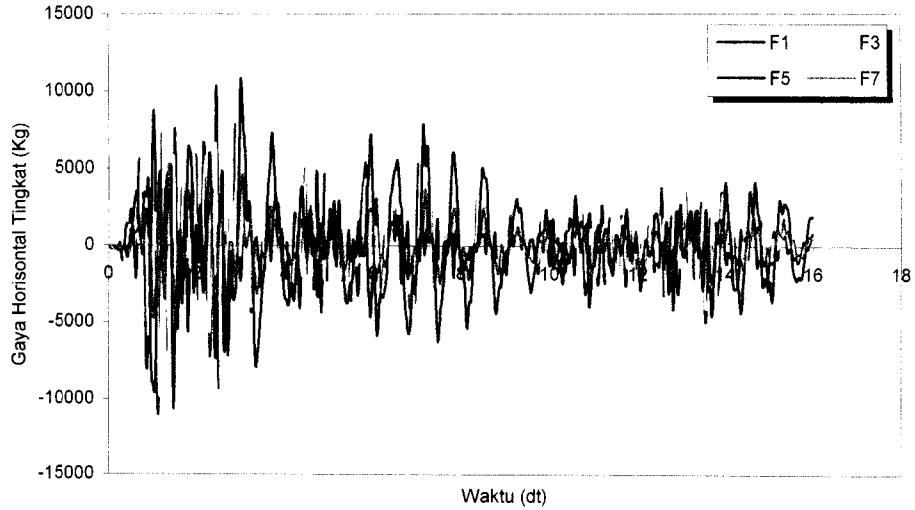


Setback 3

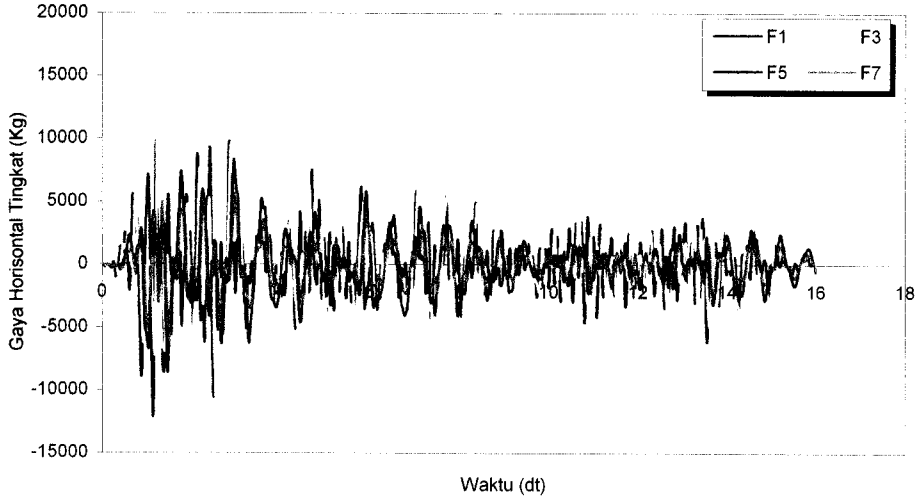
Gambar 5.67 Gaya Horisontal Tingkat Struktur Tingkat 7 Gempa Bucharest



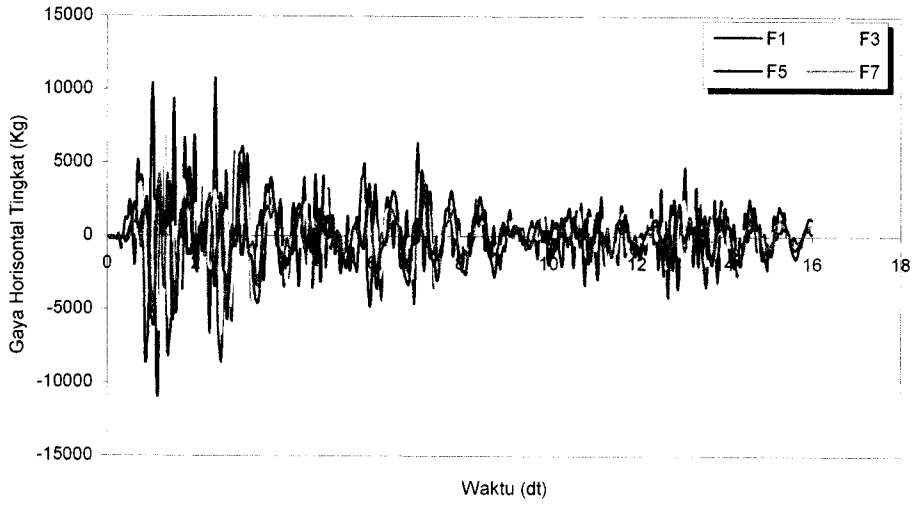
Tipikal



Setback 1

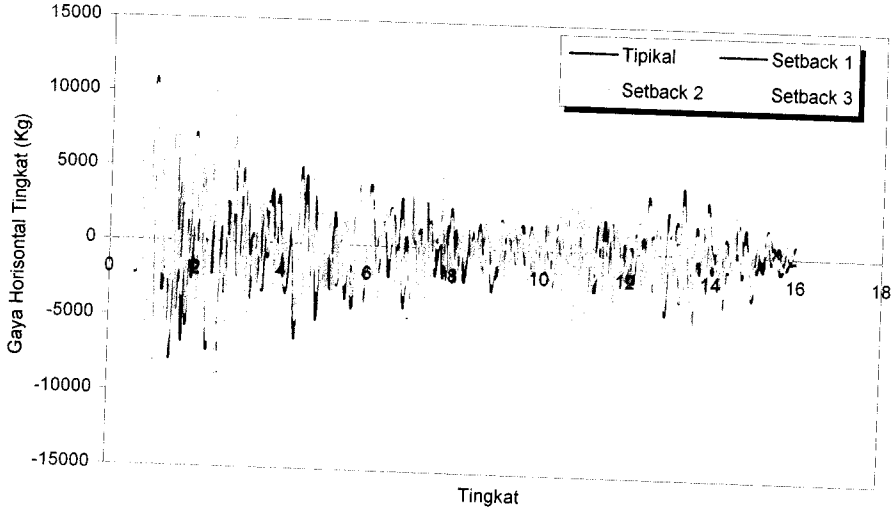


Setback 2

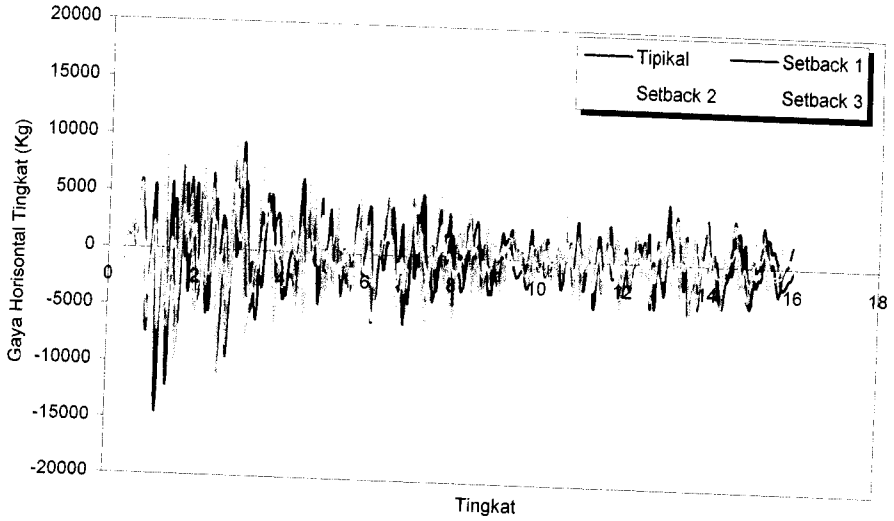


Setback 3

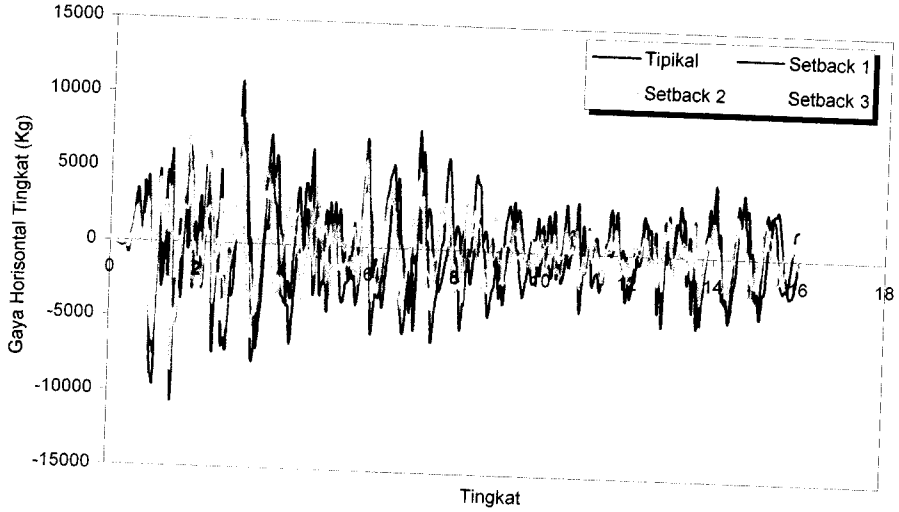
Gambar 5.69 Gaya Horisontal Tingkat Struktur Tingkat 7 Akibat Gempa El Centro



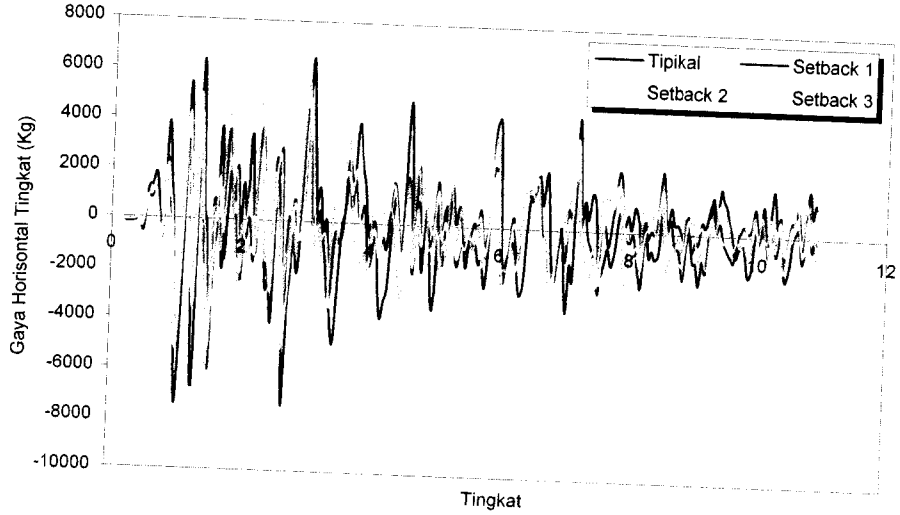
Tingkat 1



Tingkat 3

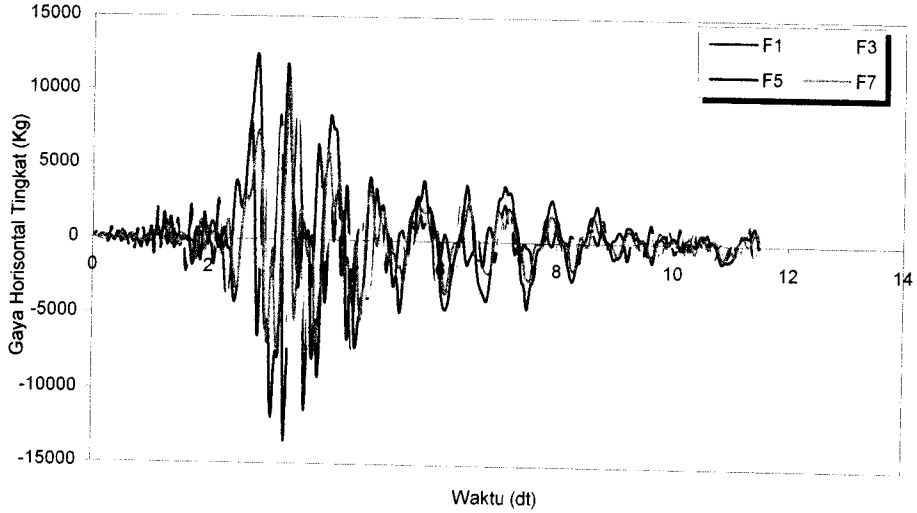


Tingkat 5

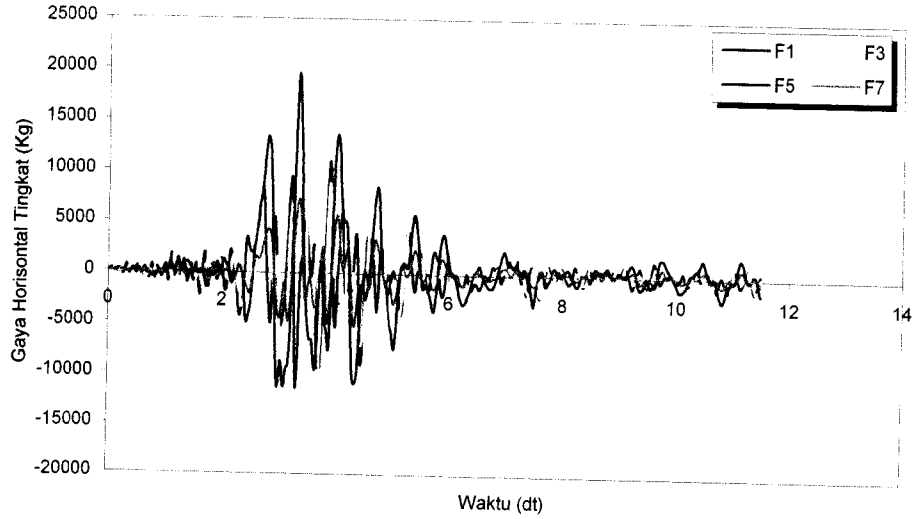


Tingkat 7

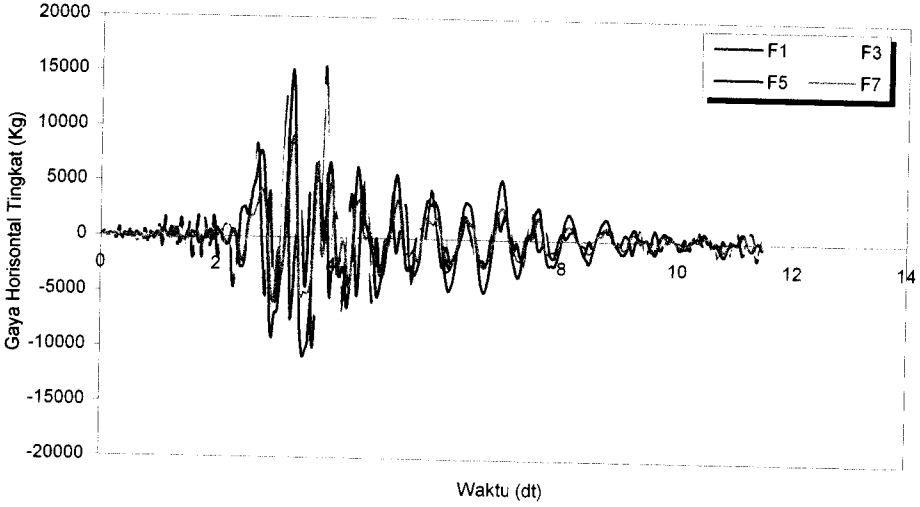
Gambar 5.70 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 7 Akibat Gempa El Centro



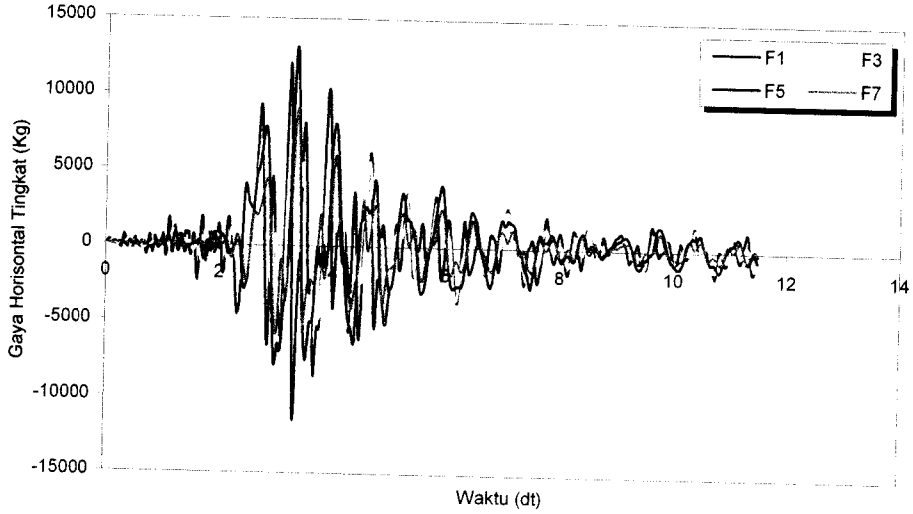
Tipikal



Setback 1

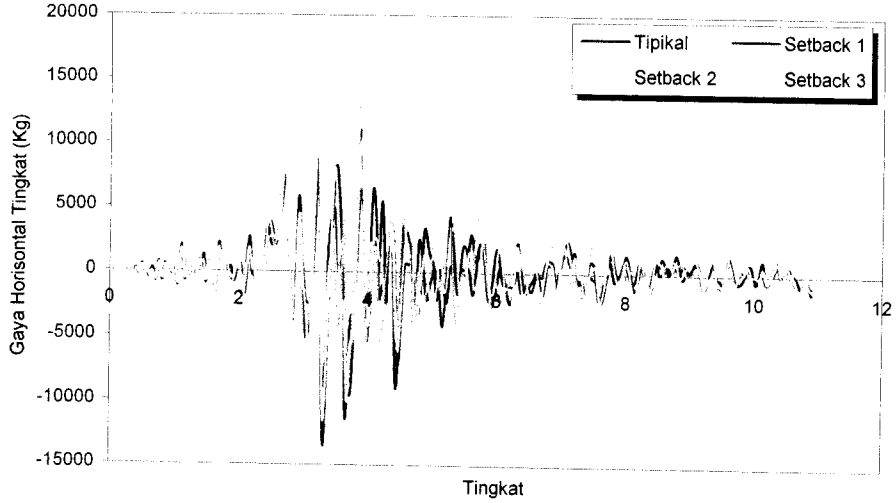


Setback 2

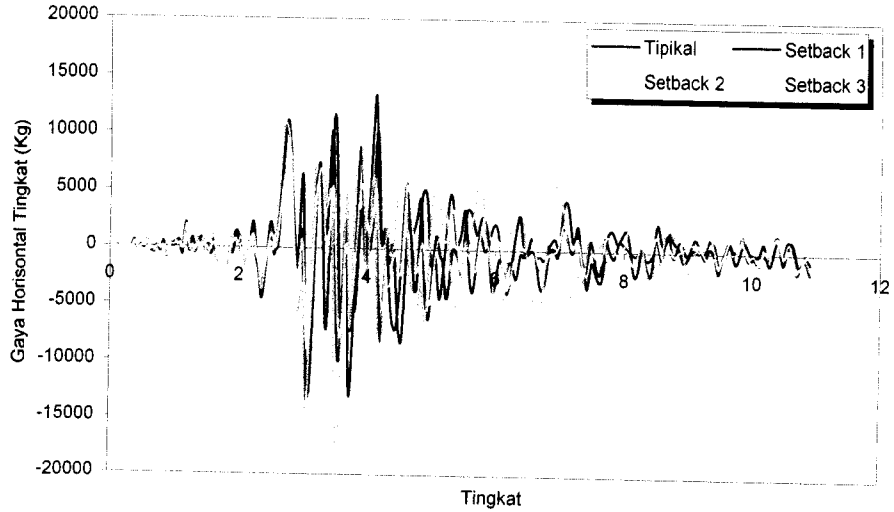


Setback 3

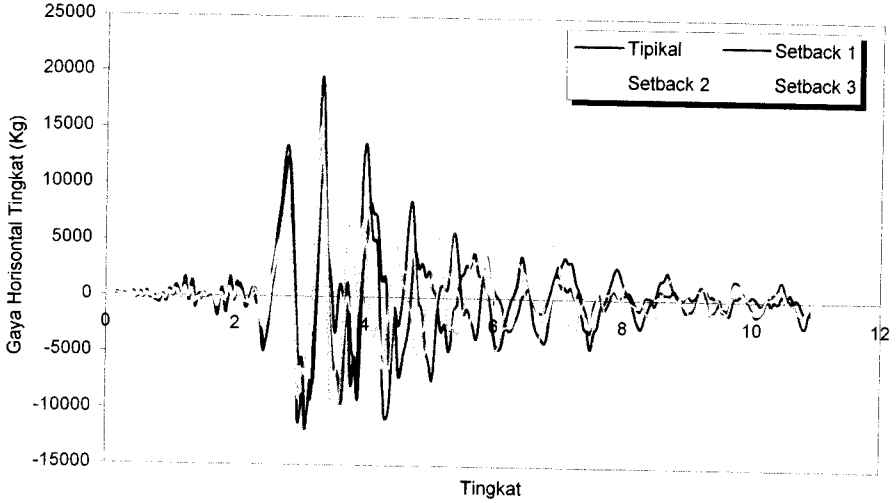
Gambar 5.71 Gaya Horisontal Tingkat Struktur Tingkat 7 Akibat Gempa Gilroy



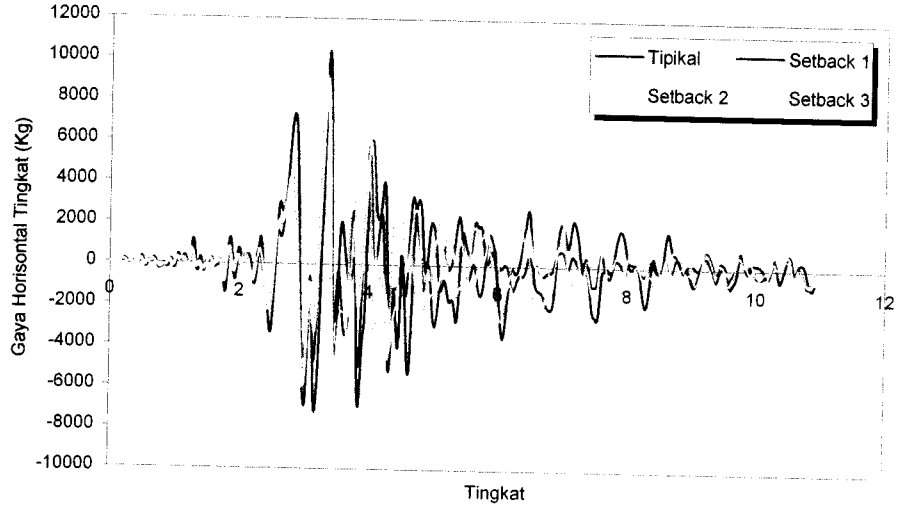
Tingkat 1



Tingkat 3

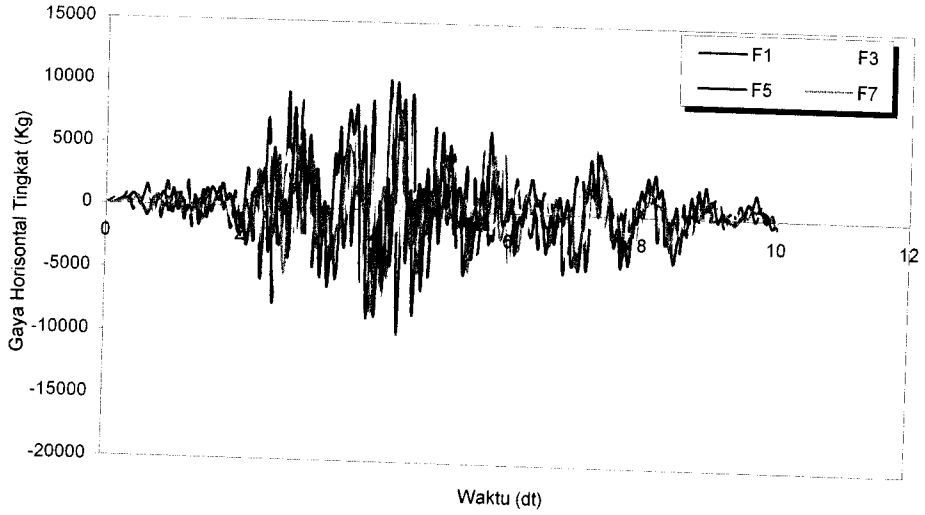


Tingkat 5

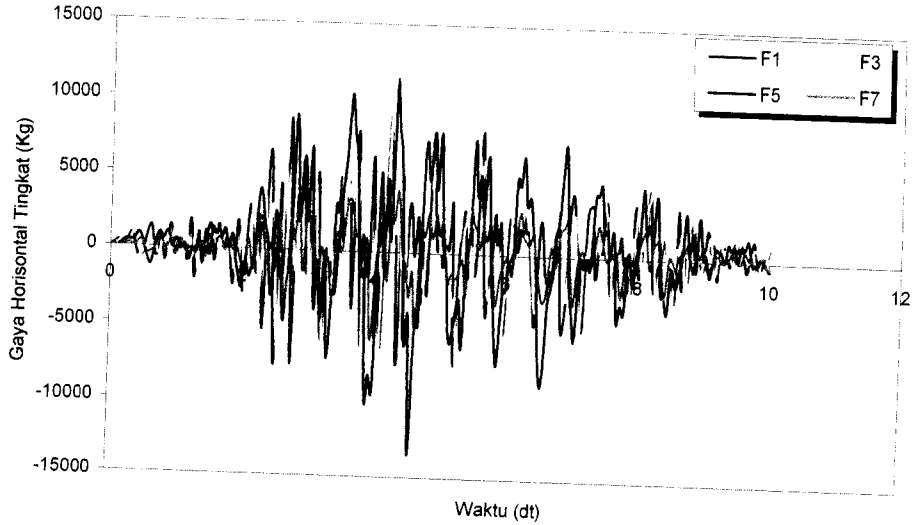


Tingkat 7

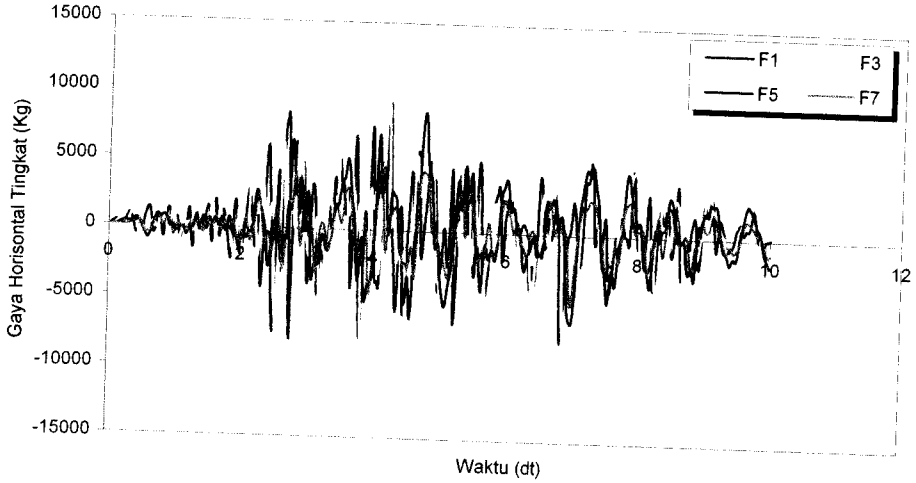
Gambar 5.72 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 7 Akibat Gempa Gilroy



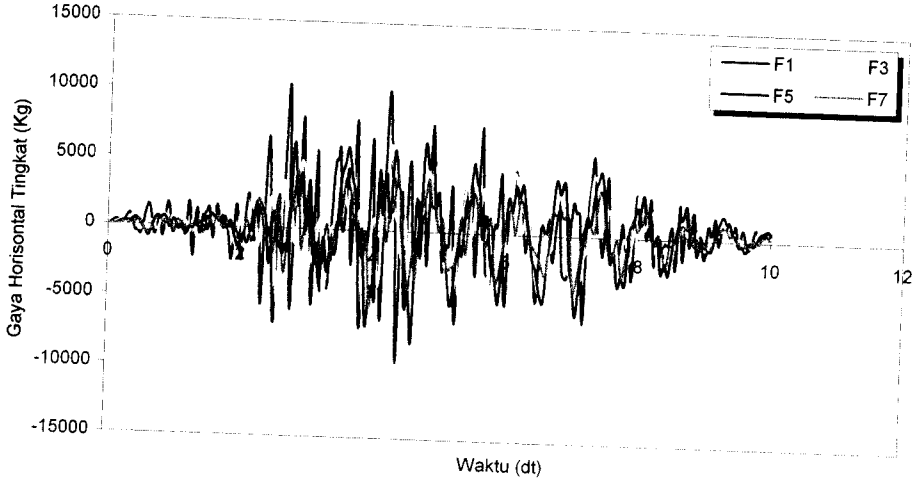
Tipikal



Setback 1

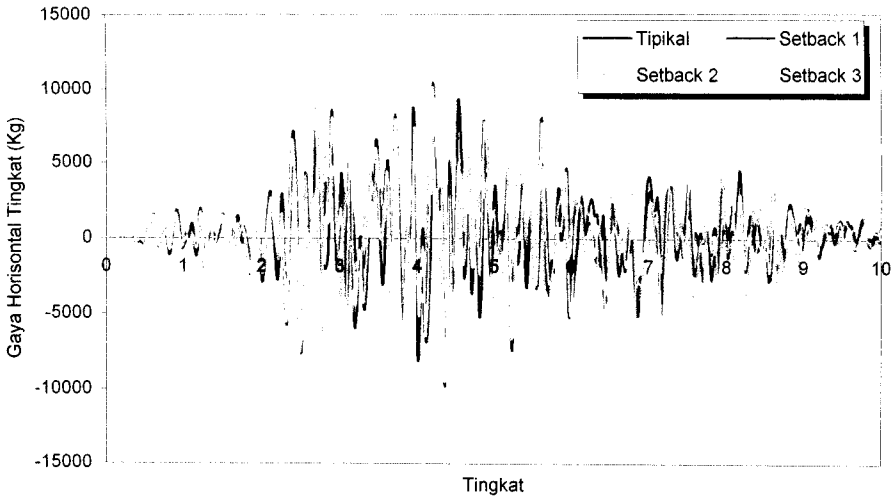


Setback 2

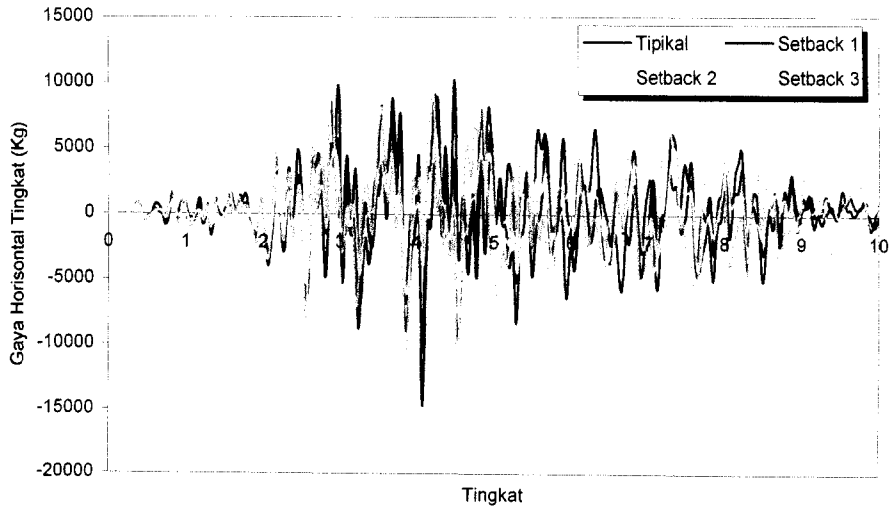


Setback 3

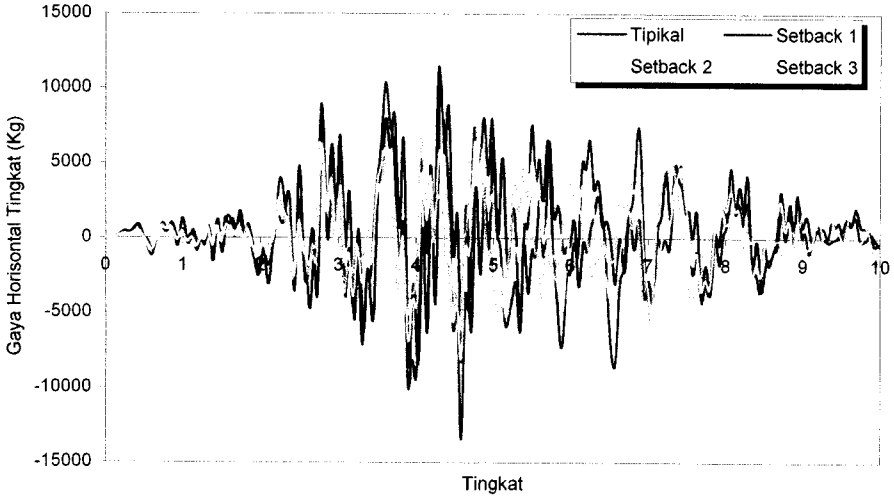
Gambar 5.73 Gaya Horisontal Tingkat Struktur Tingkat 7 Akibat Gempa Koyna



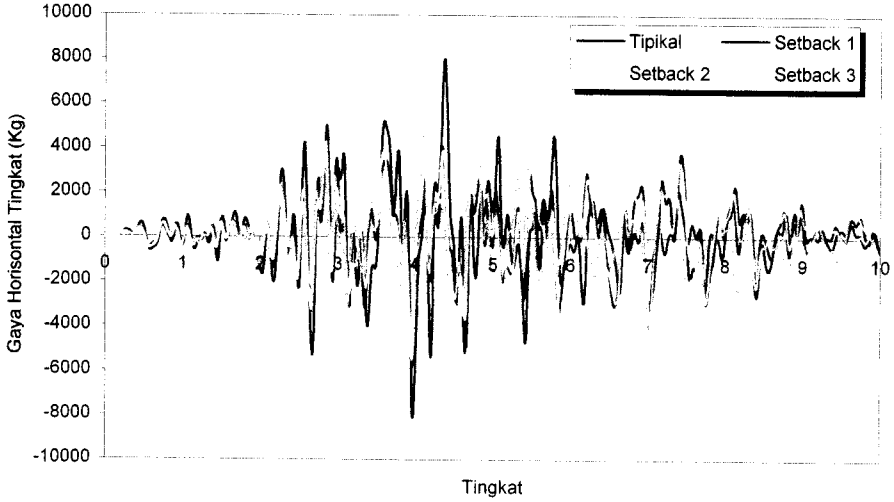
Tingkat 1



Tingkat 3

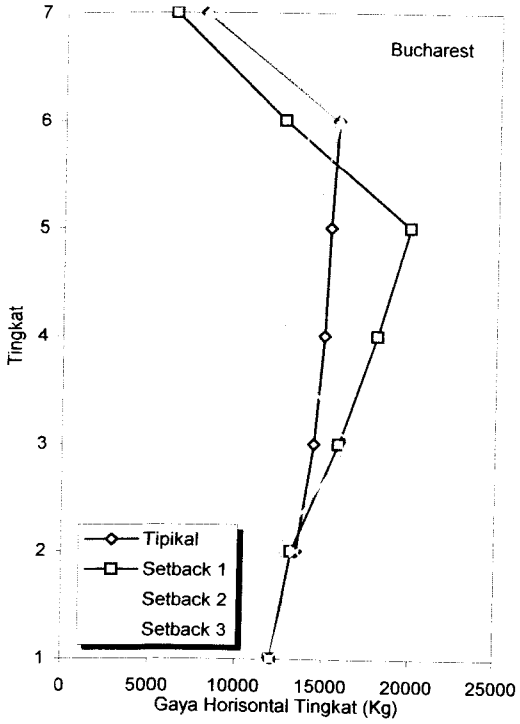


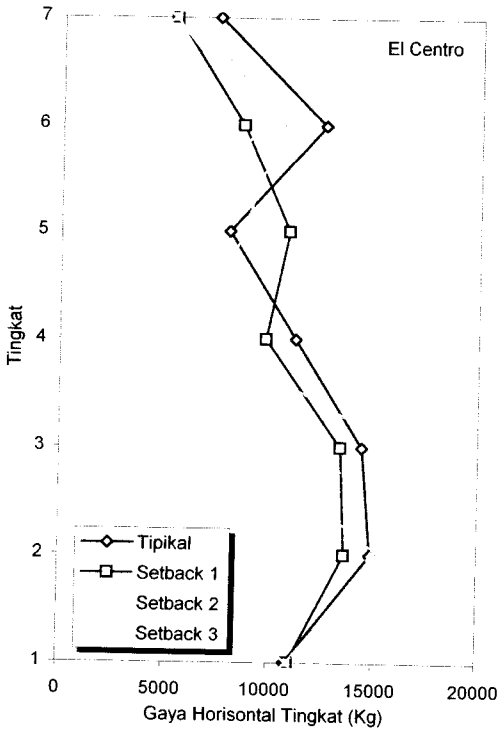
Tingkat 5

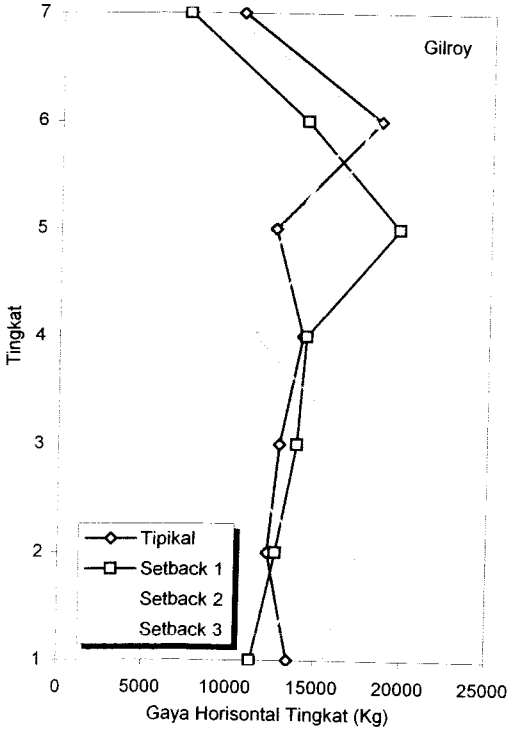


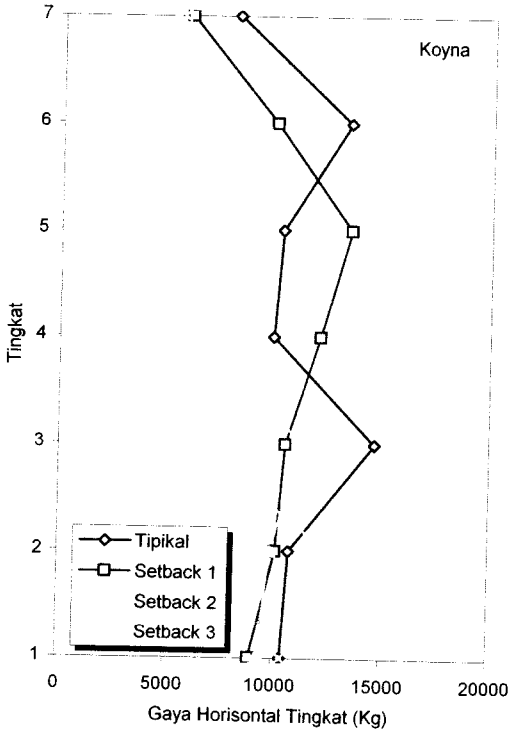
Tingkat 7

Gambar 5.74 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 7 Akibat Gempa Koyna

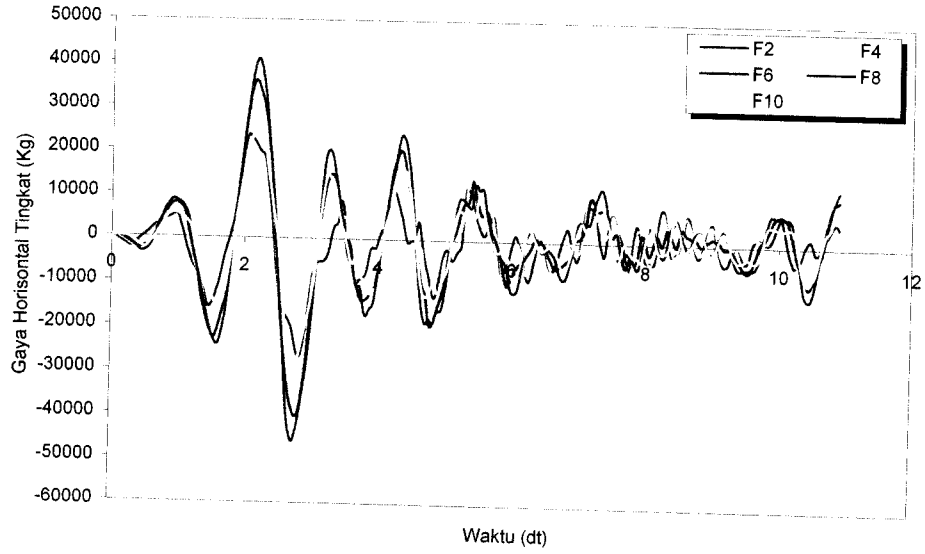




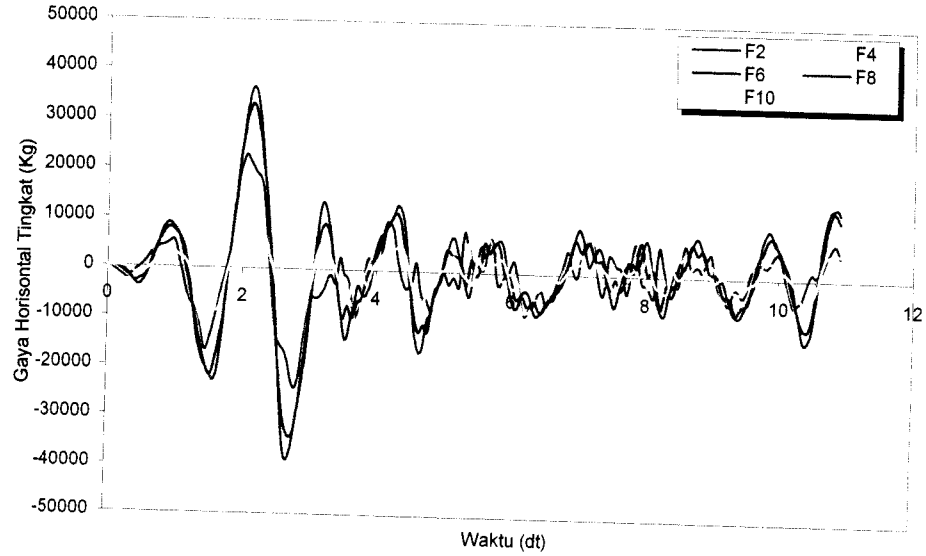




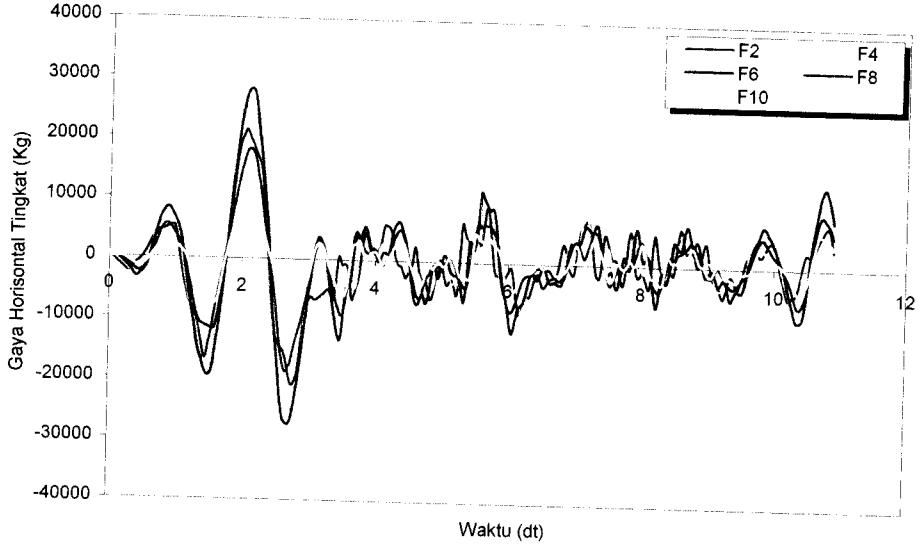
Gambar 5.75 Gaya Horisontal Tingkat Maksimum Struktur Tingkat 7 Akibat 4 Gempa



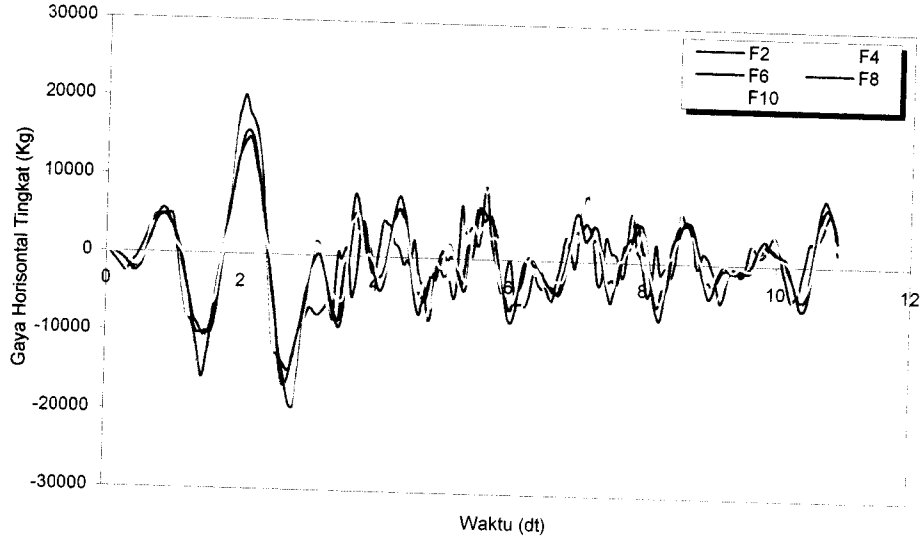
Tipikal



Setback 1

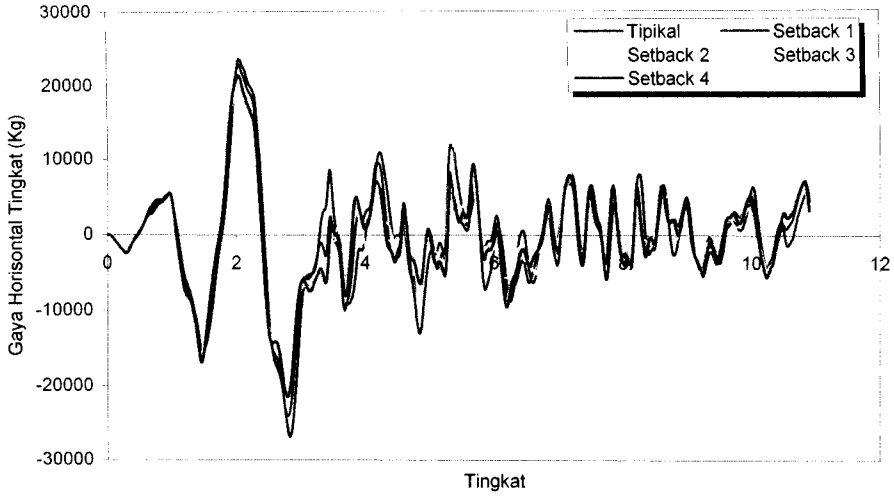


Setback 2

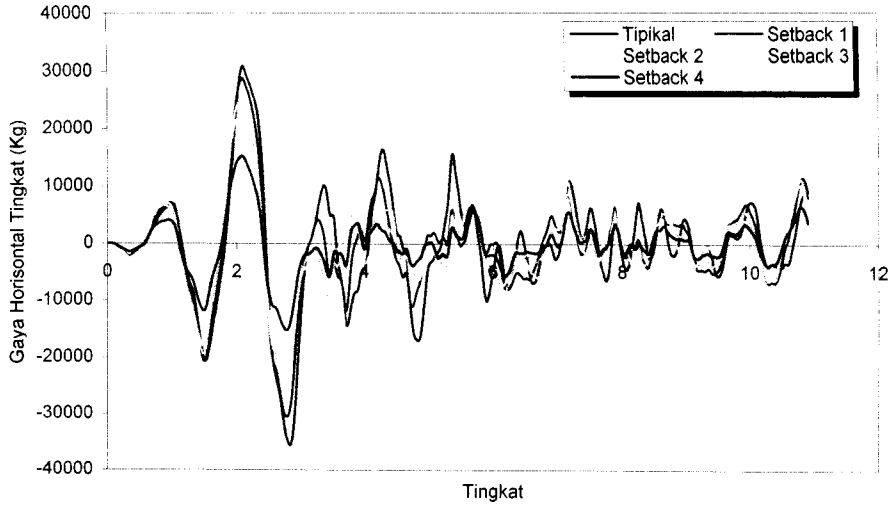


Setback 3

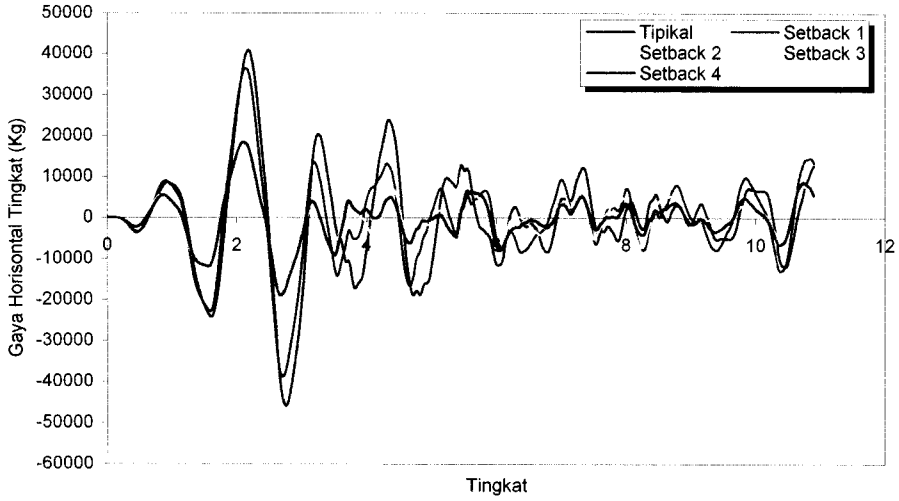
Gambar 5.76 Gaya Horisontal Tingkat Struktur Tingkat 10 Akibat Gempa Bucharest



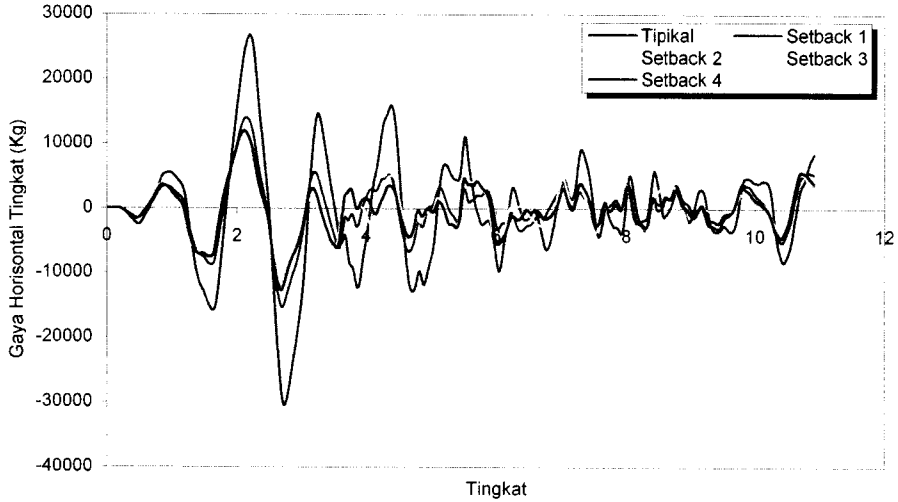
Tingkat 2



Tingkat 4

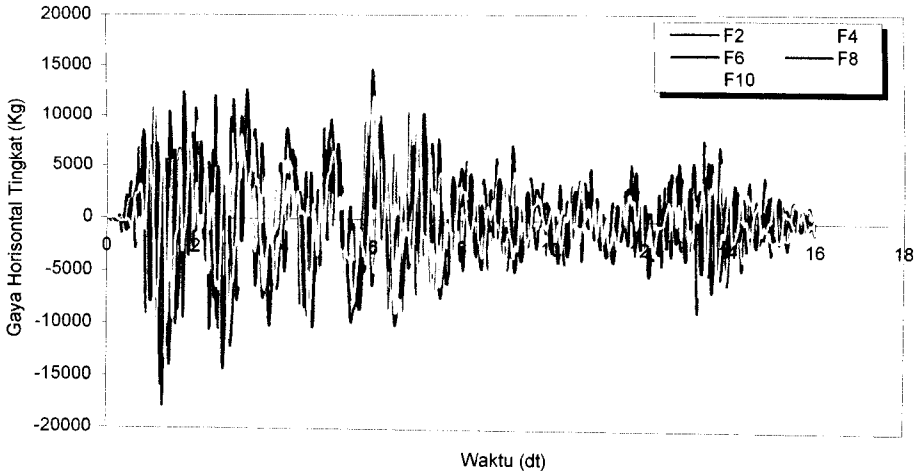


Tingkat 8

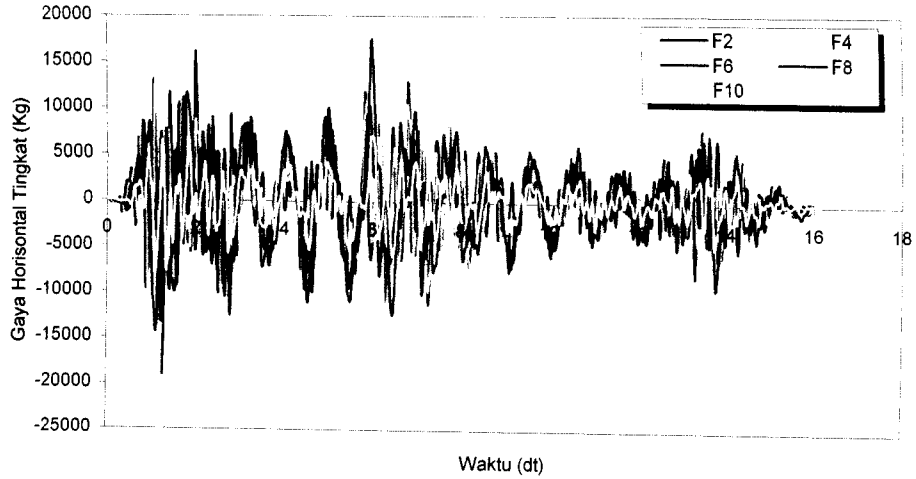


Tingkat 10

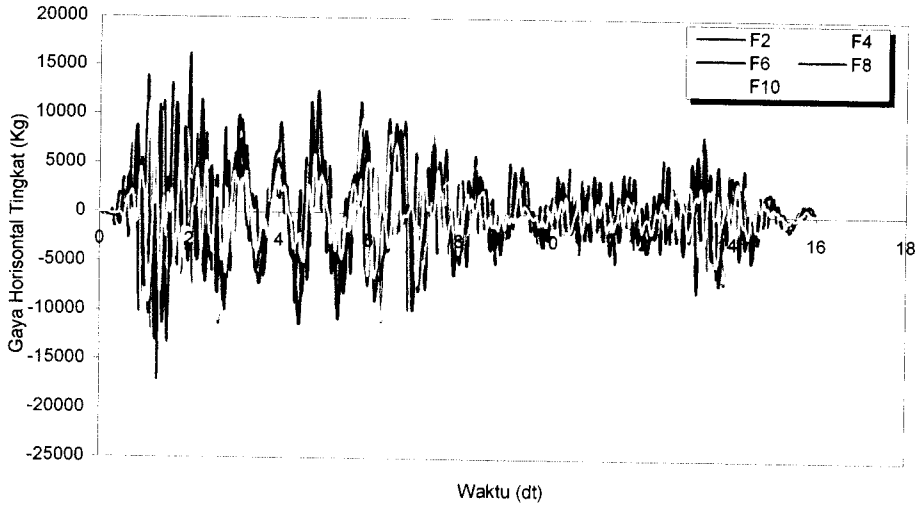
Gambar 5.77 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 10 Akibat Gempa Bucharest



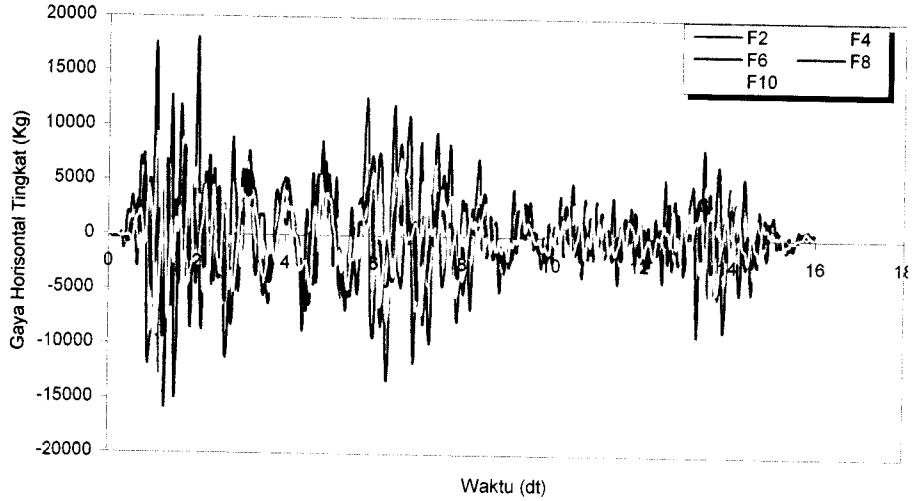
Tipikal



Setback 1

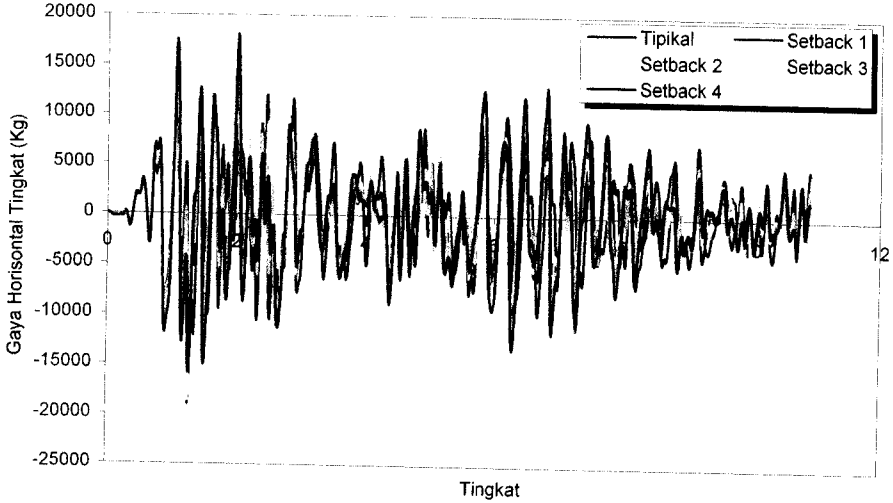


Setback 2

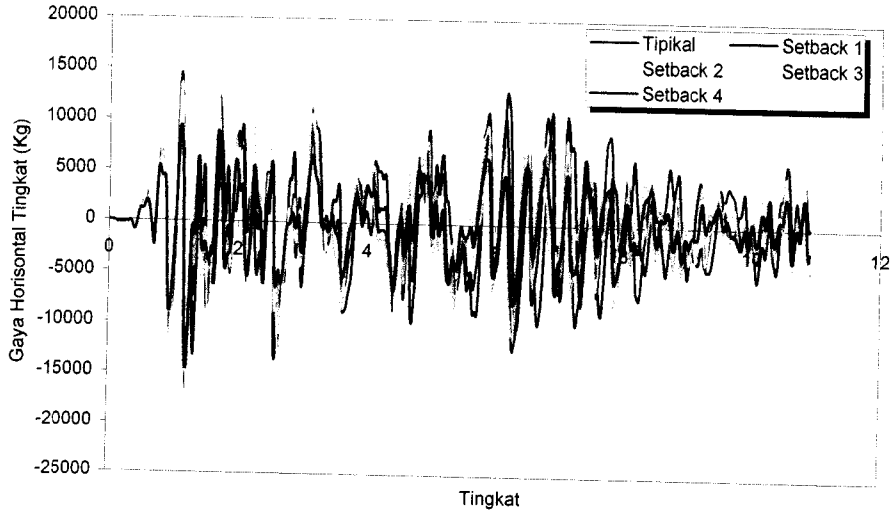


Setback 4

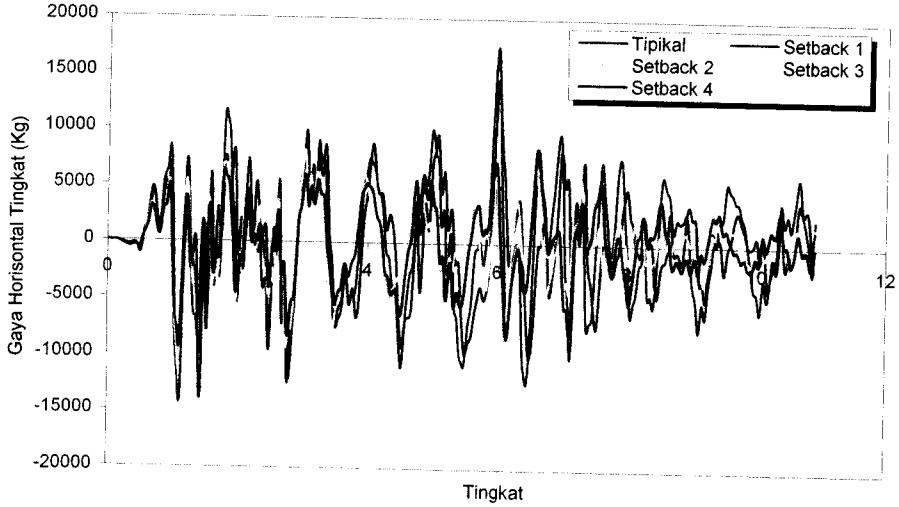
Gambar 5.78 Gaya Horisontal Tingkat Struktur Tingkat 10 Akibat Gempa El Centro



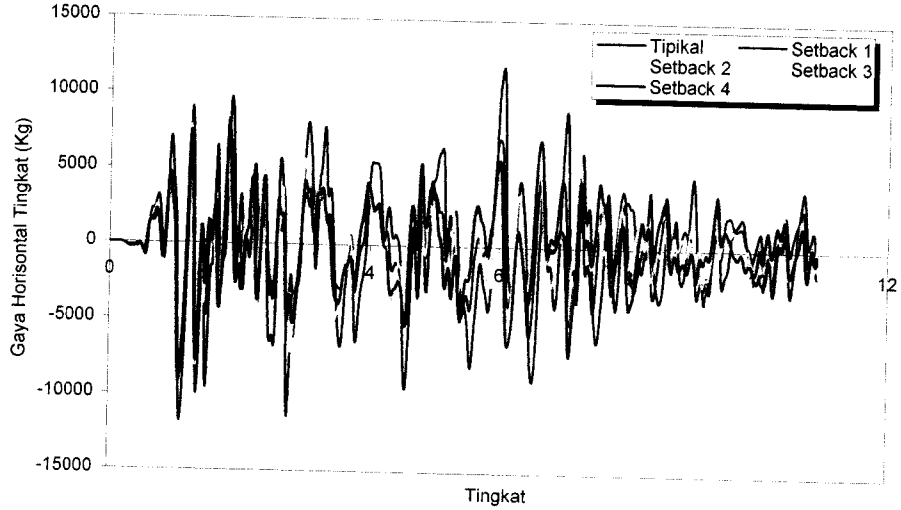
Tingkat 2



Tingkat 4

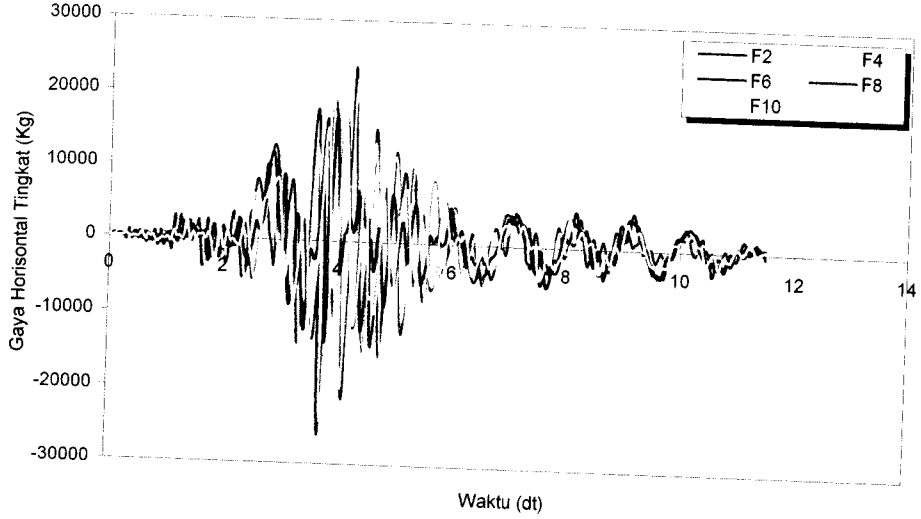


Tingkat 8

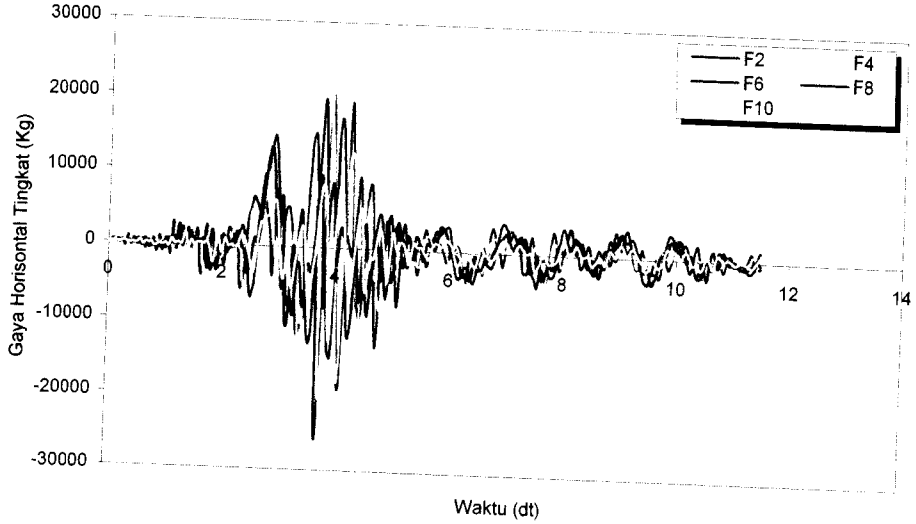


Tingkat 10

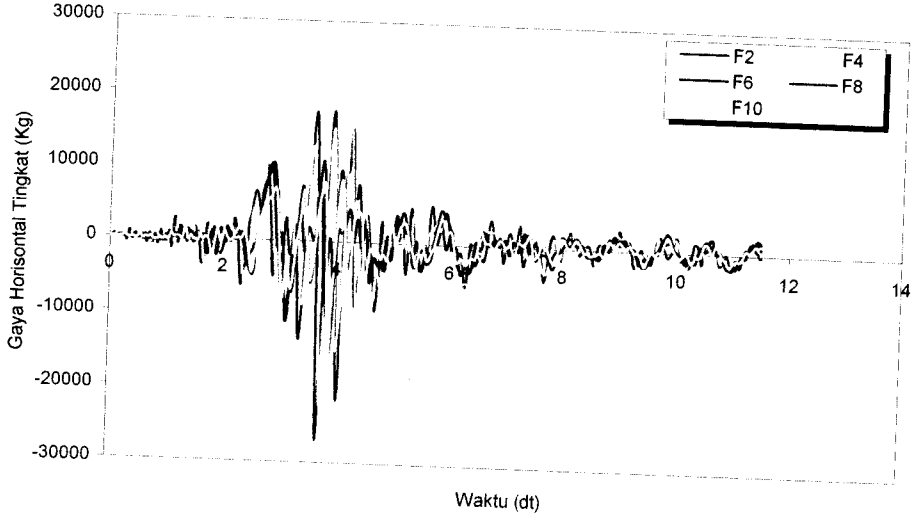
Gambar 5.79 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 10 Akibat Gempa El Centro



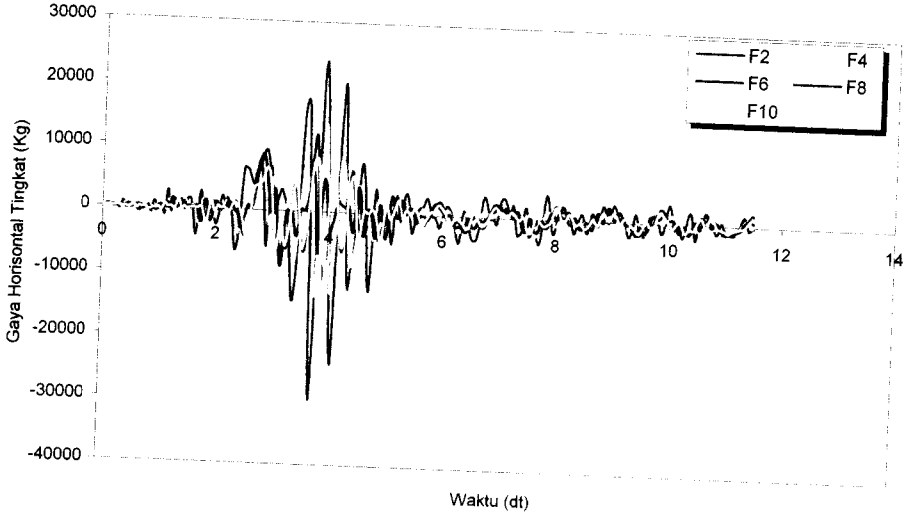
Tipikal



Setback 1

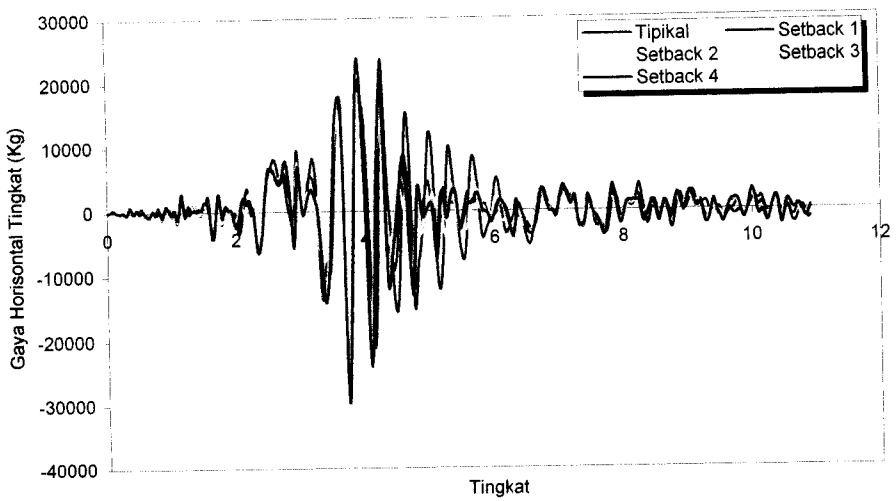


Setback 3

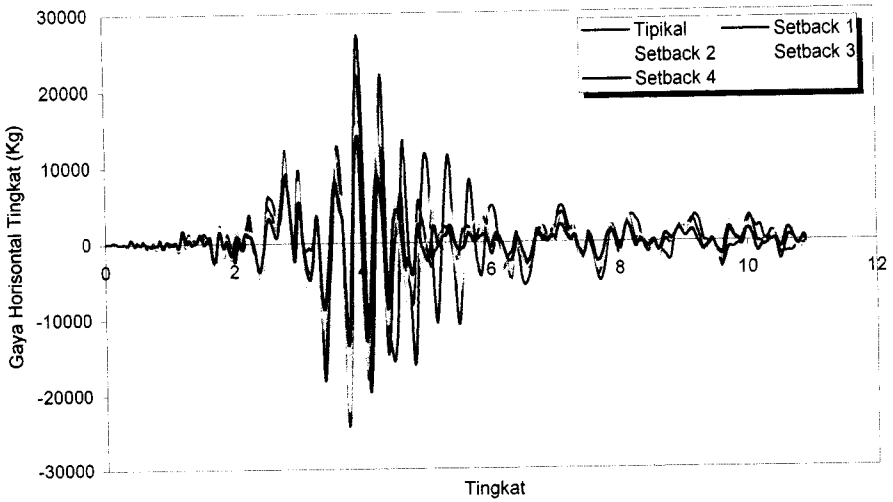


Setback 4

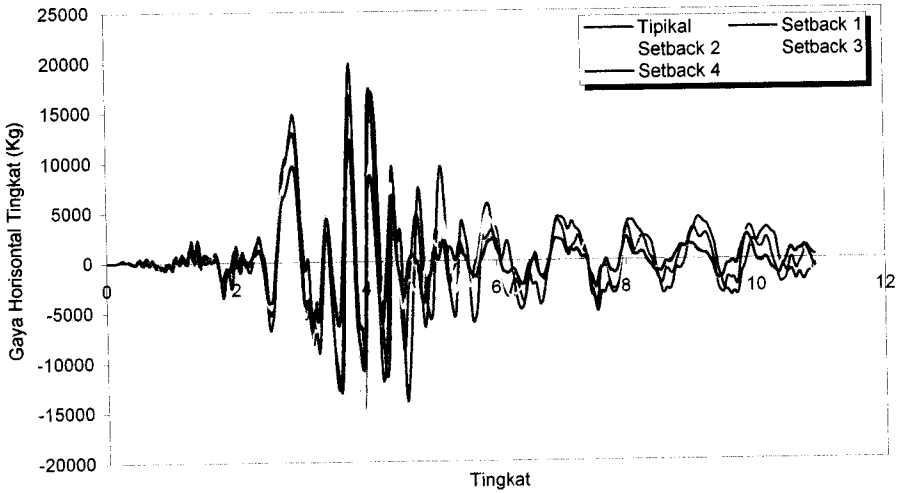
Gambar 5.80 Gaya Horisontal Tingkat Struktur Tingkat 10 Akibat Gempa Gilroy



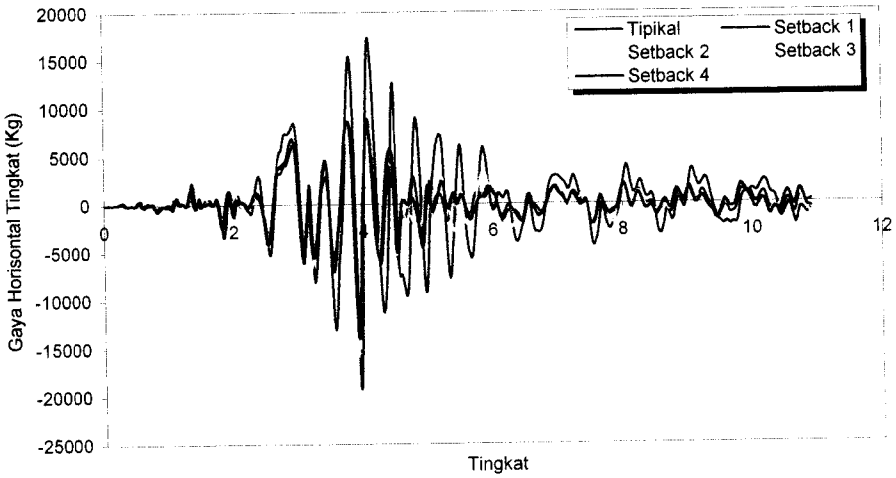
Tingkat 2



Tingkat 4

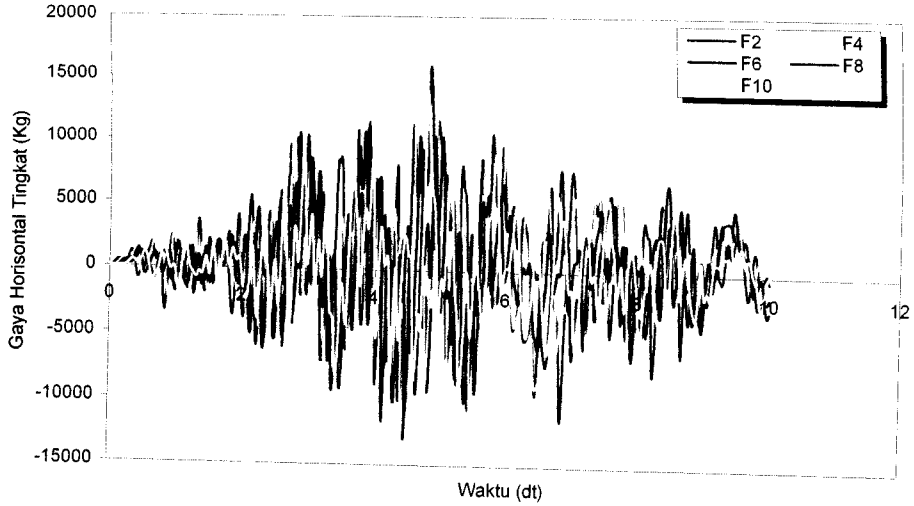


Tingkat 8

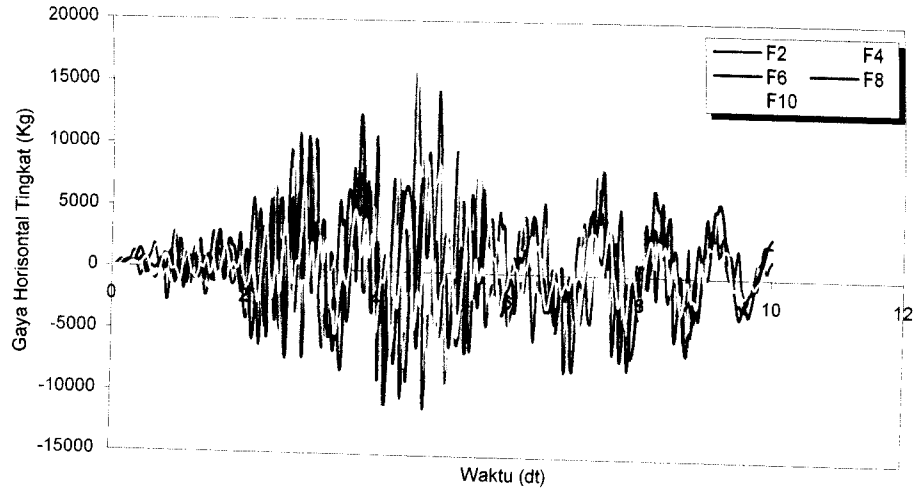


Tingkat 10

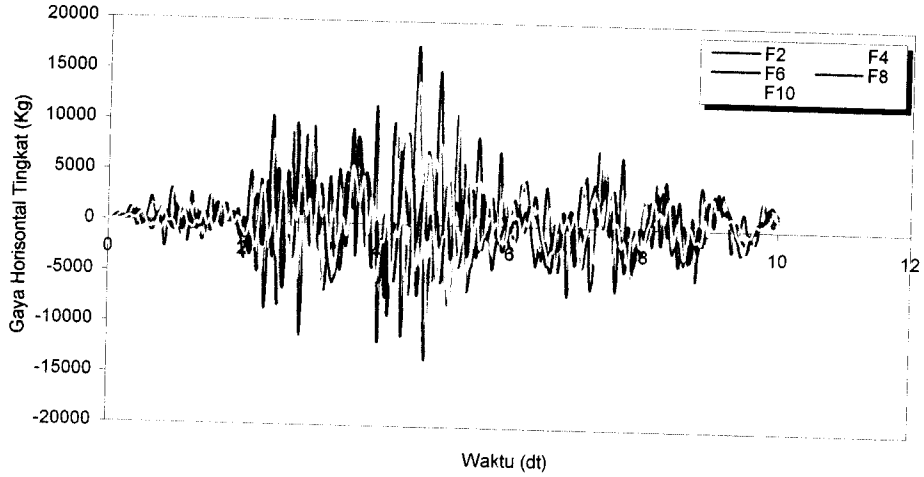
Gambar 5.81 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 10 Akibat Gempa Gilroy



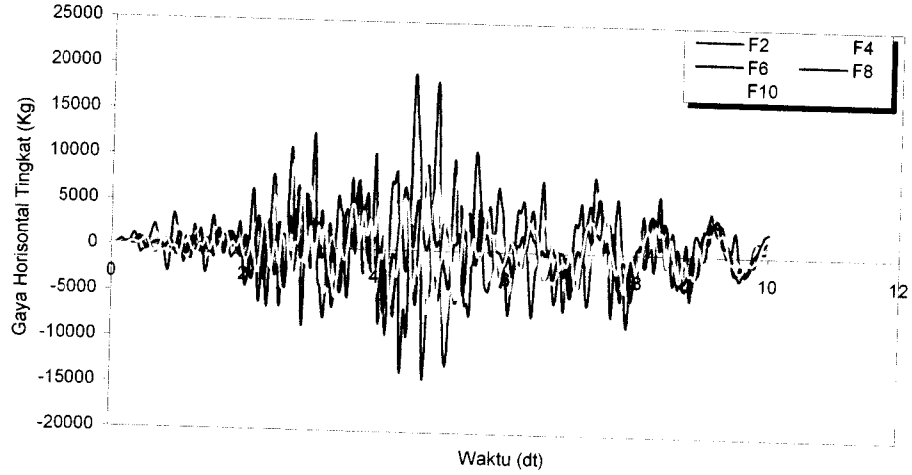
Tipikal



Setback 2

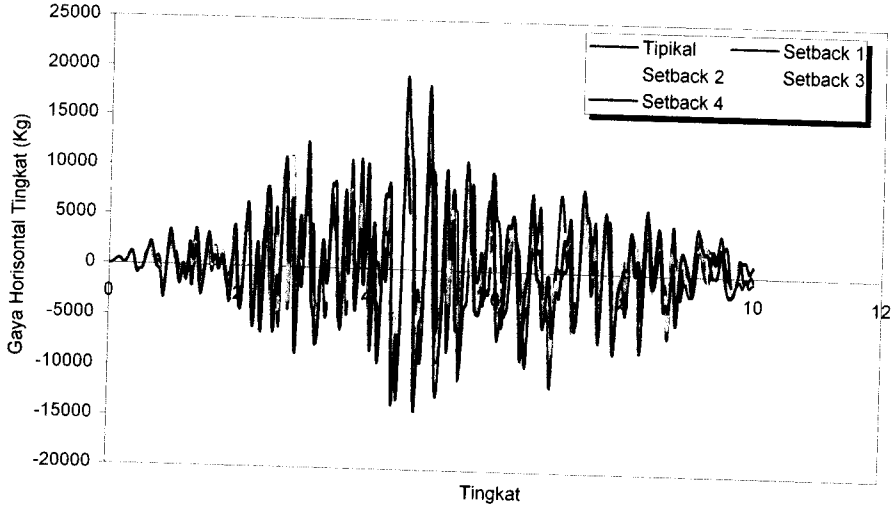


Setback 3

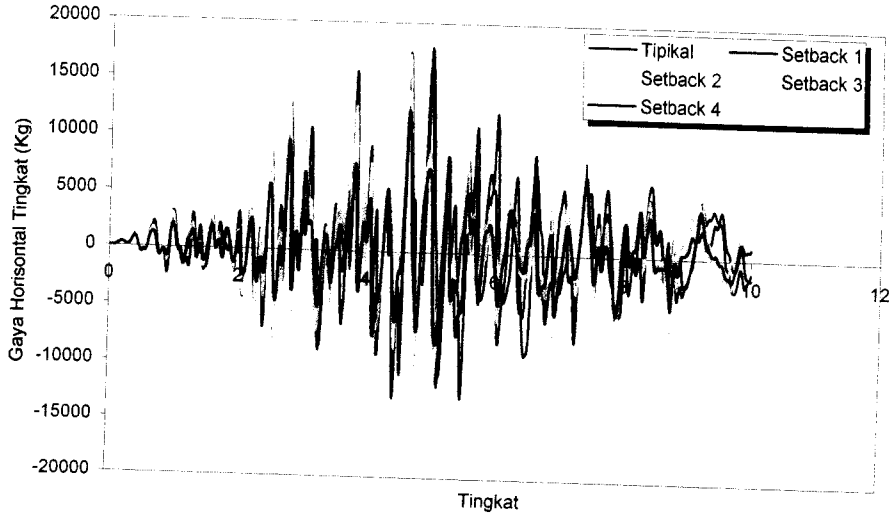


Setback 4

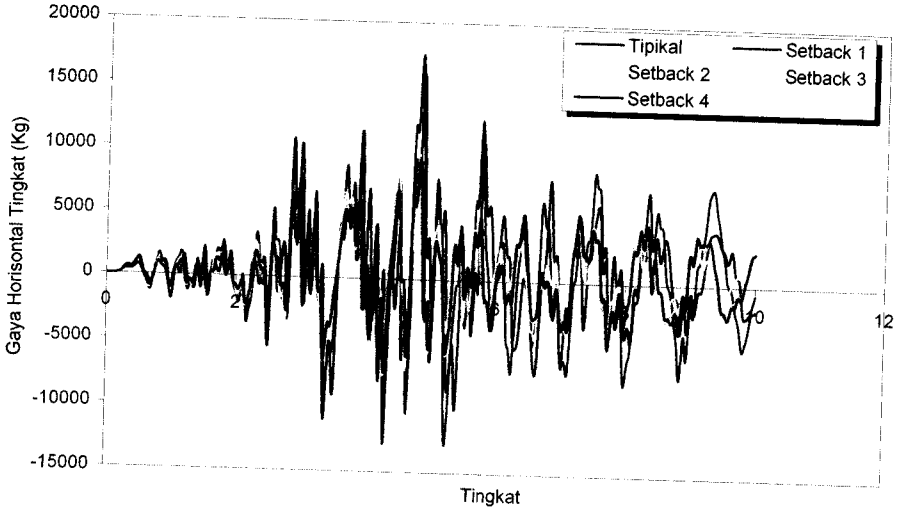
Gambar 5.82 Gaya Horisontal Tingkat Struktur Tingkat 10 Akibat Gempa Koyna



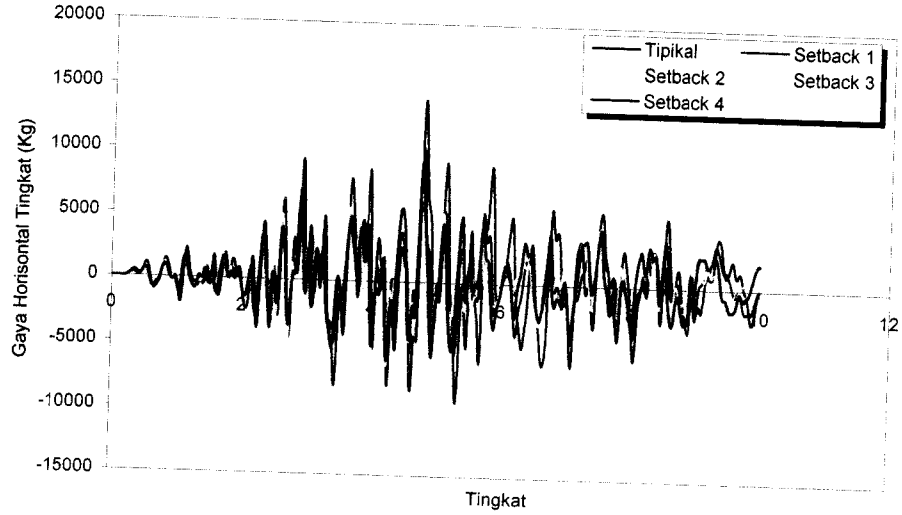
Tingkat 2



Tingkat 4

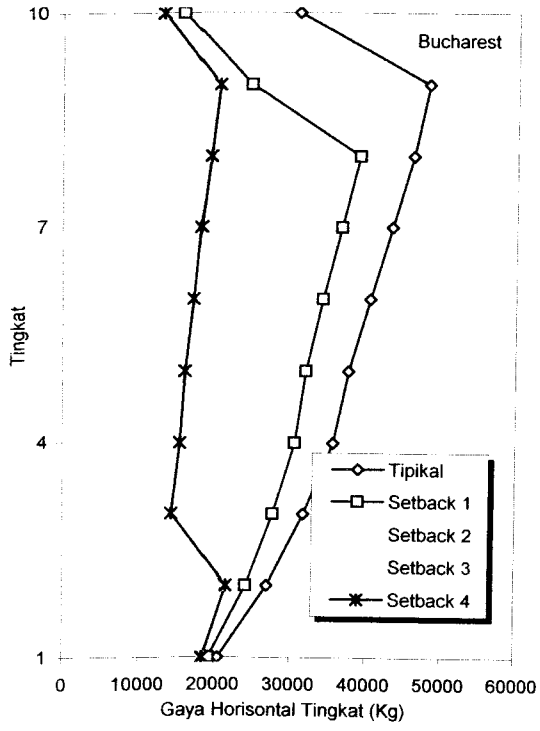


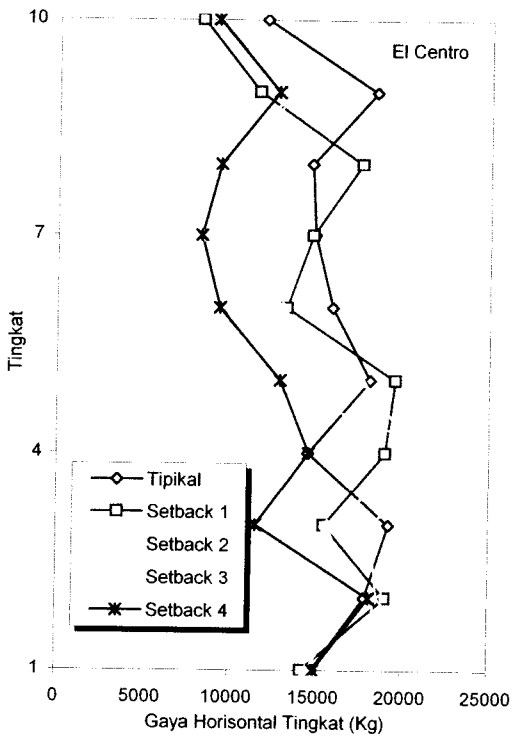
Tingkat 8

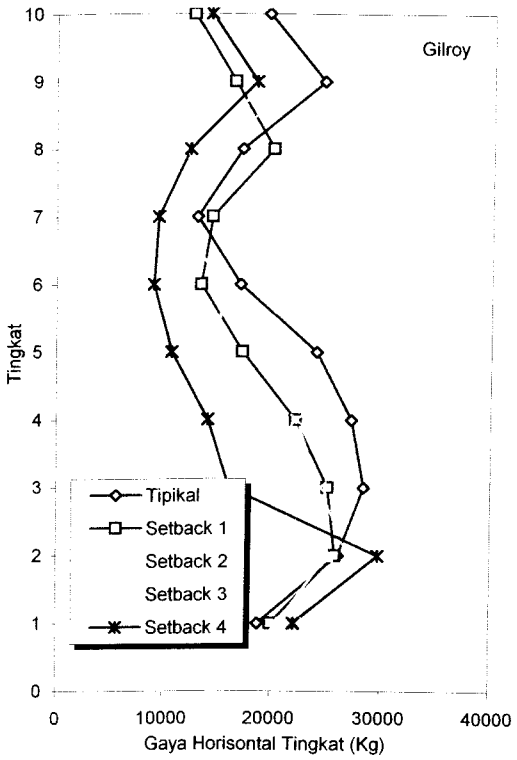


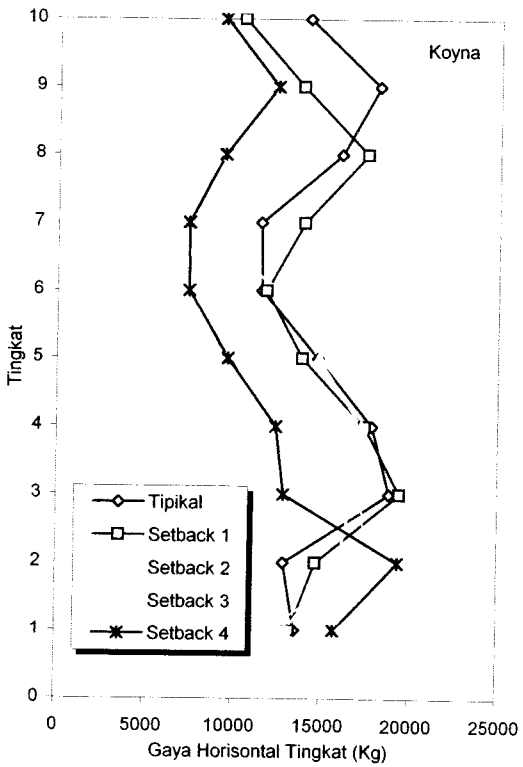
Tingkat 10

Gambar 5.83 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 10 Akibat Gempa Koyna

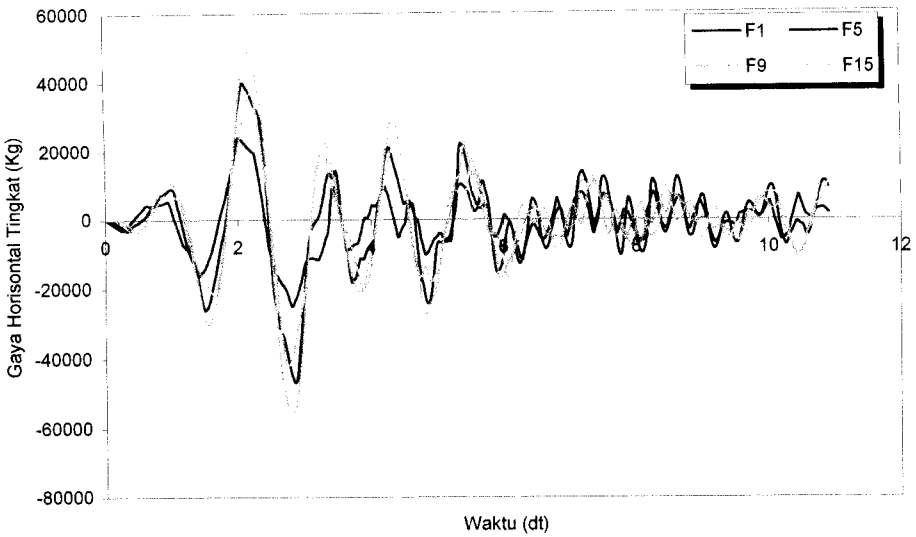




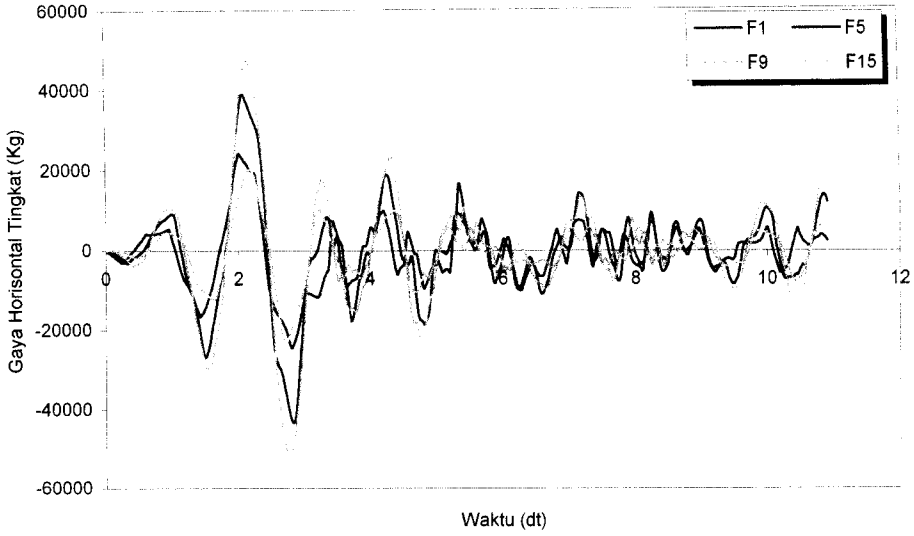




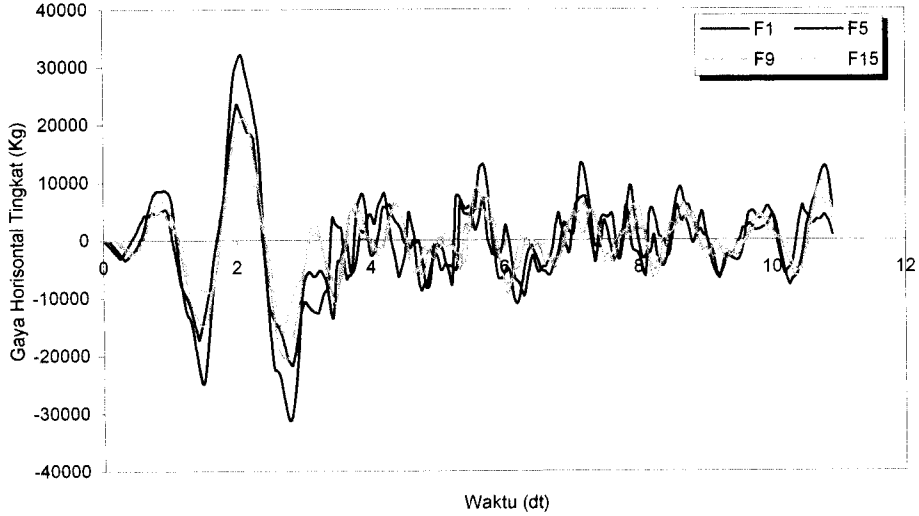
Gambar 5.84 Gaya Horisontal Tingkat Maksimum Struktur Tingkat 10 Akibat 4 Gempa



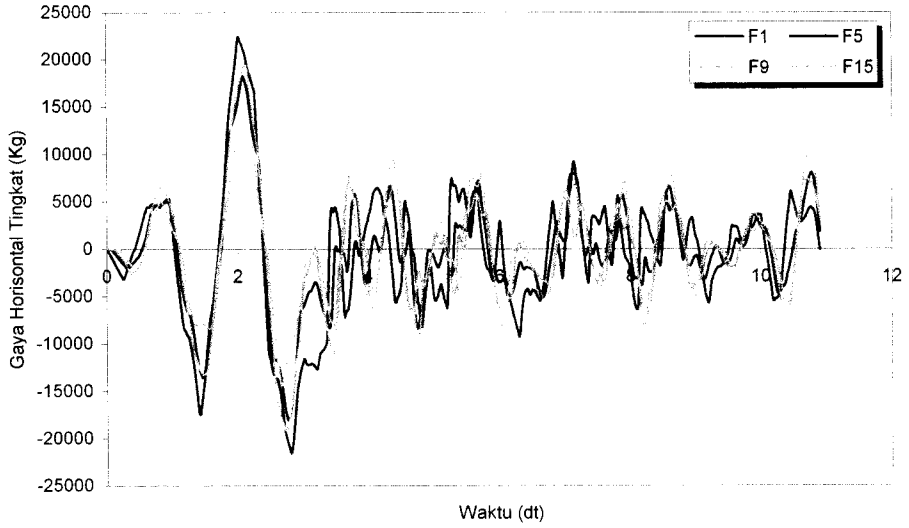
Tipikal



Setback 1

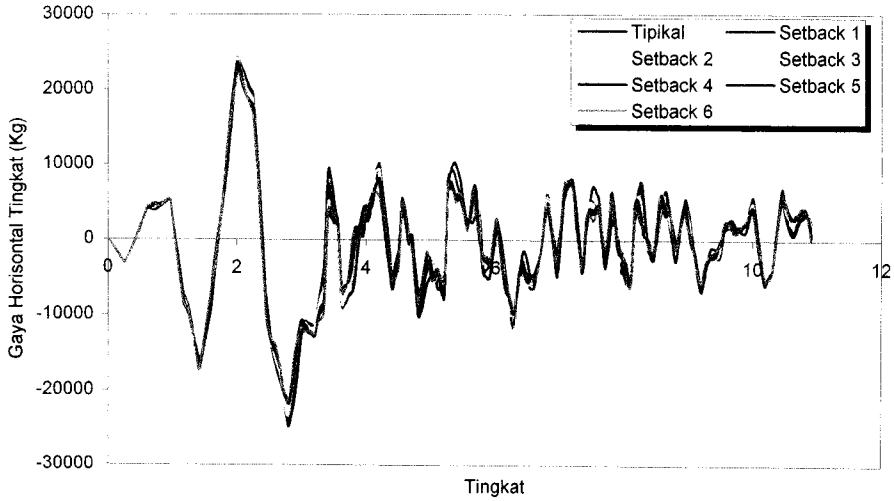


Setback 4

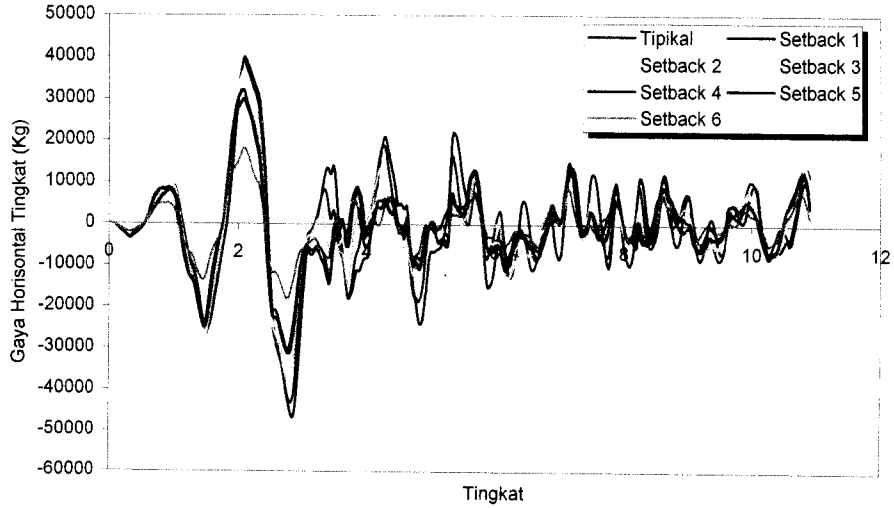


Setback 6

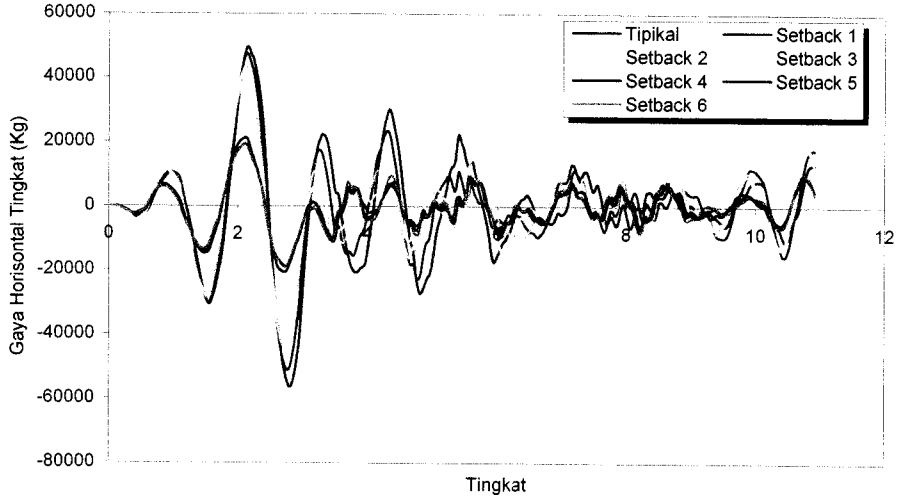
Gambar 5.85 Gaya Horisontal Tingkat Struktur Tingkat 15 Akibat Gempa Bucharest



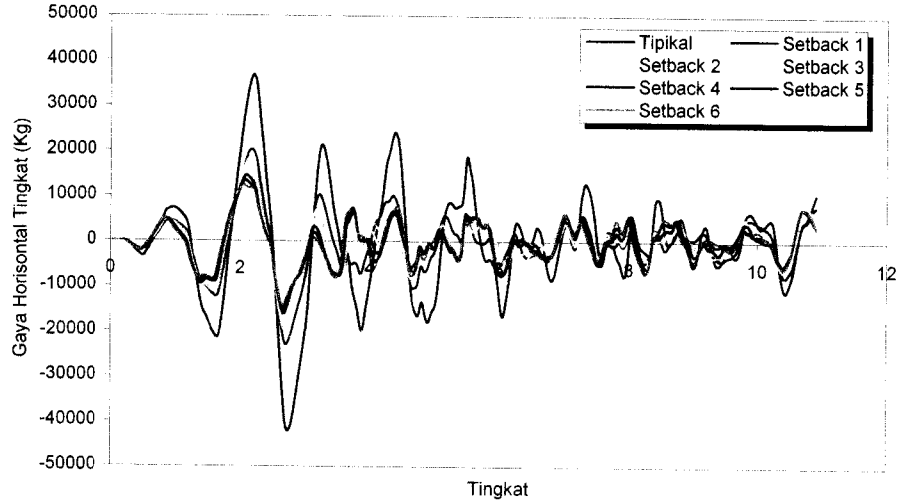
Tingkat 1



Tingkat 5

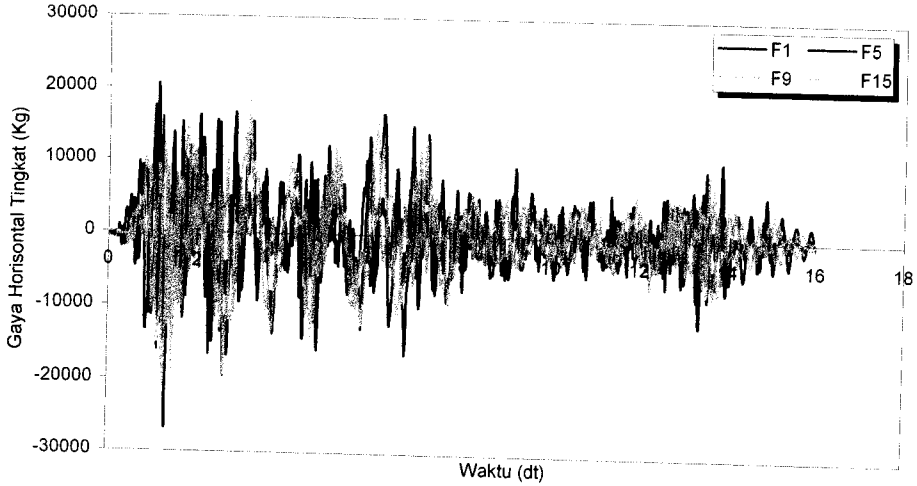


Tingkat 9

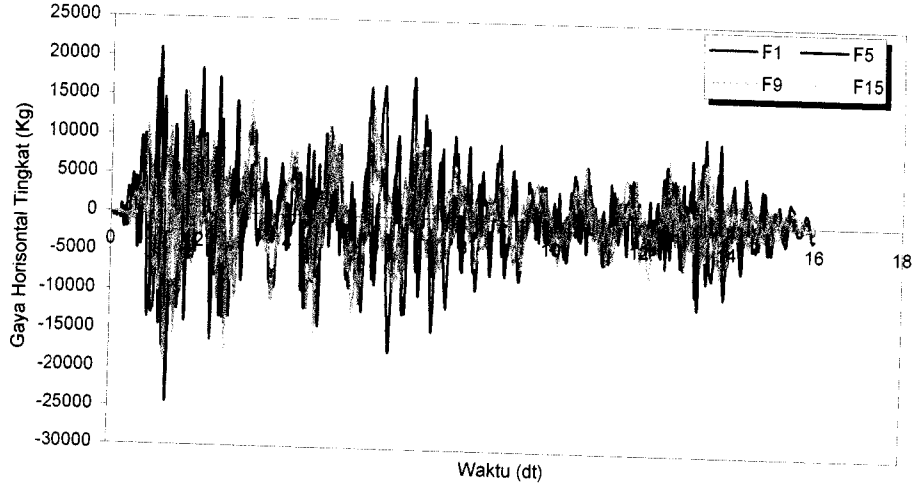


Tingkat 15

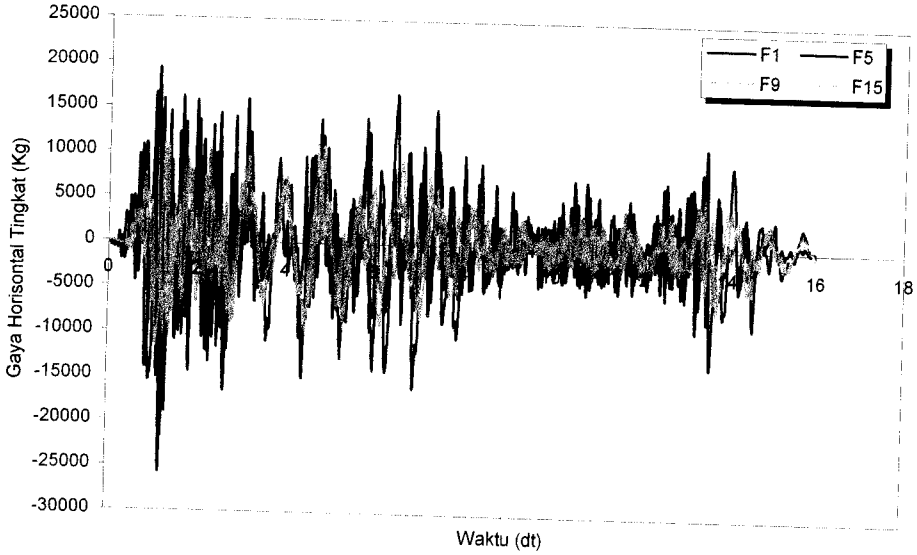
Gambar 5.86 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 15 Akibat Gempa Bucharest



Tipikal



Setback 1



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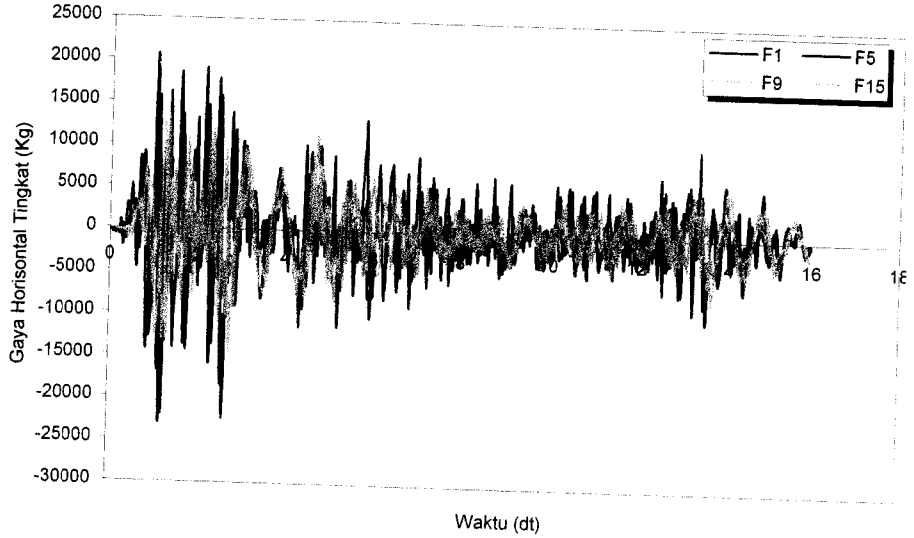
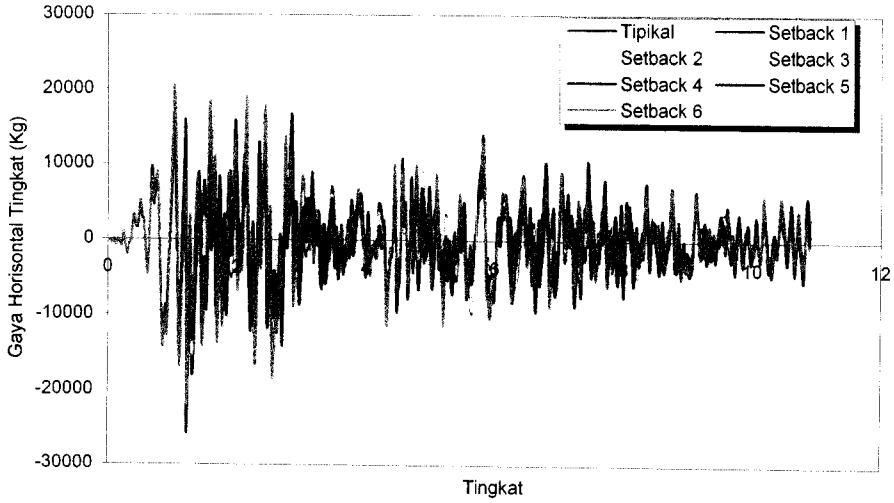
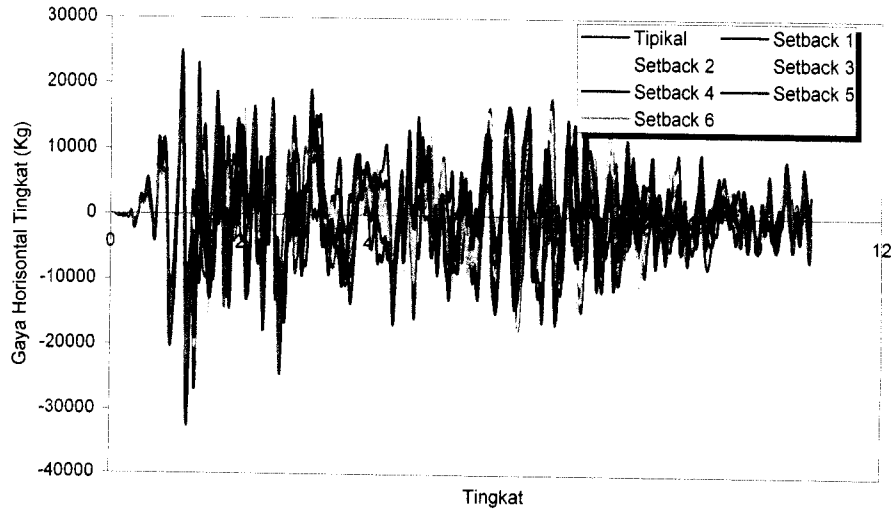


Setback 6

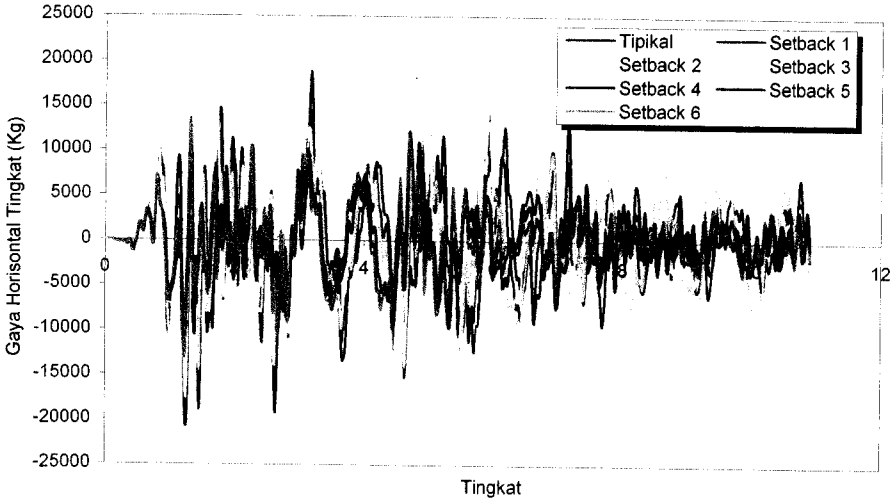
Gambar 5.87 Gaya Horisontal Tingkat Struktur Tingkat 15 Akibat Gempa El Centro



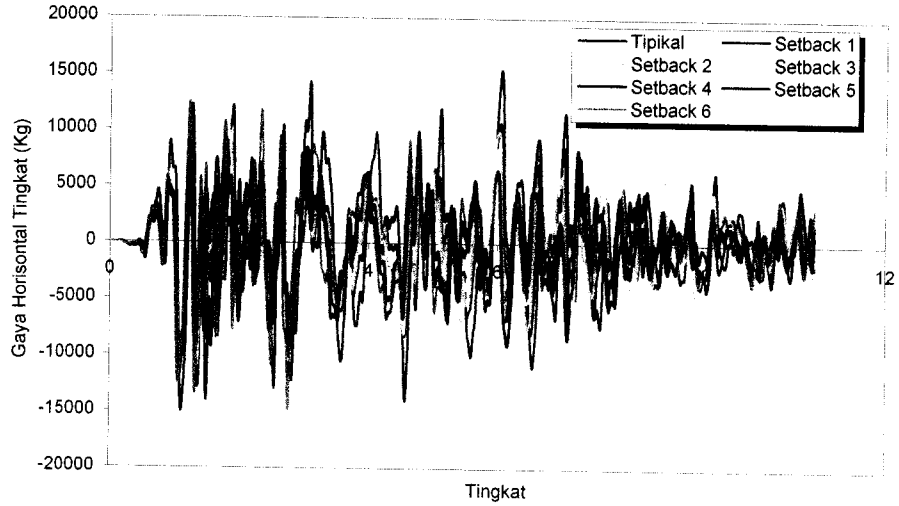
Tingkat 1



Tingkat 5

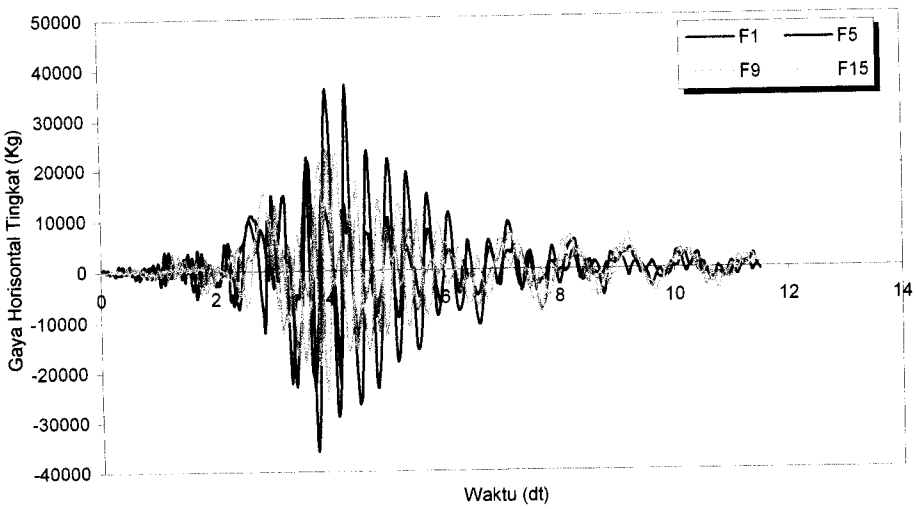


Tingkat 9

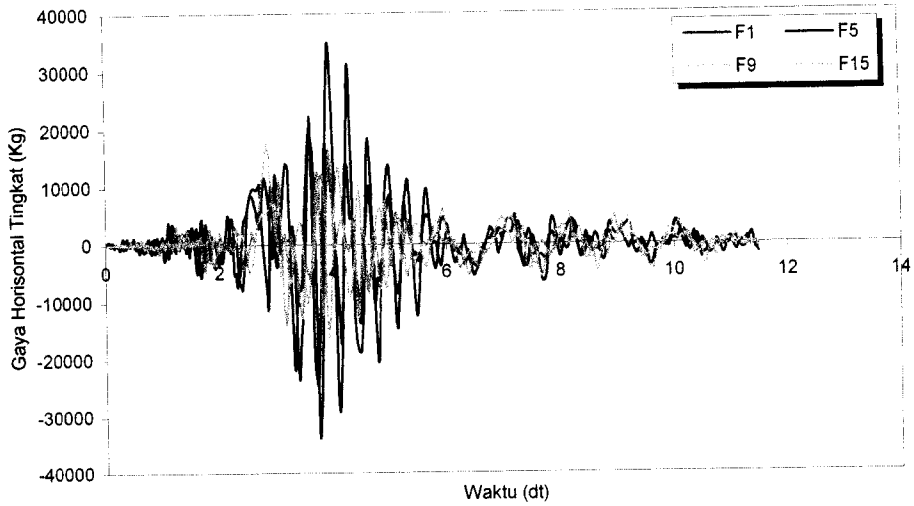


Tingkat 15

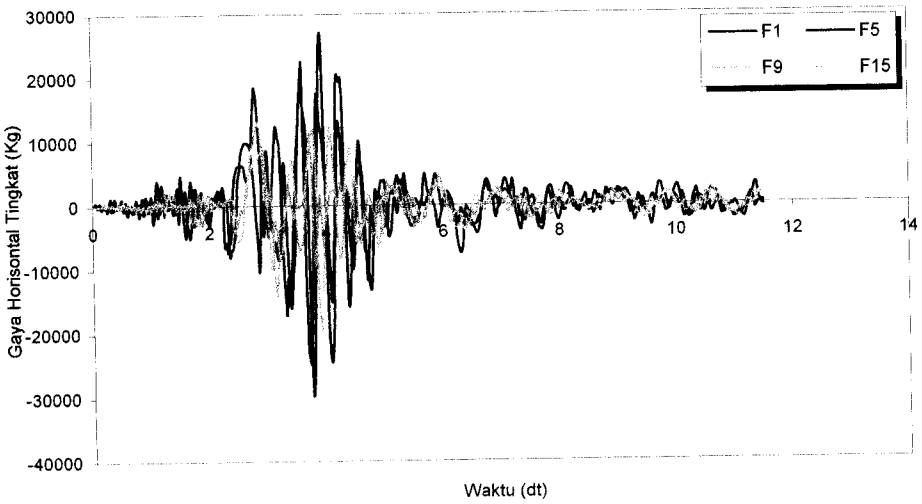
Gambar 5.88 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 15 Akibat Gempa El Centro



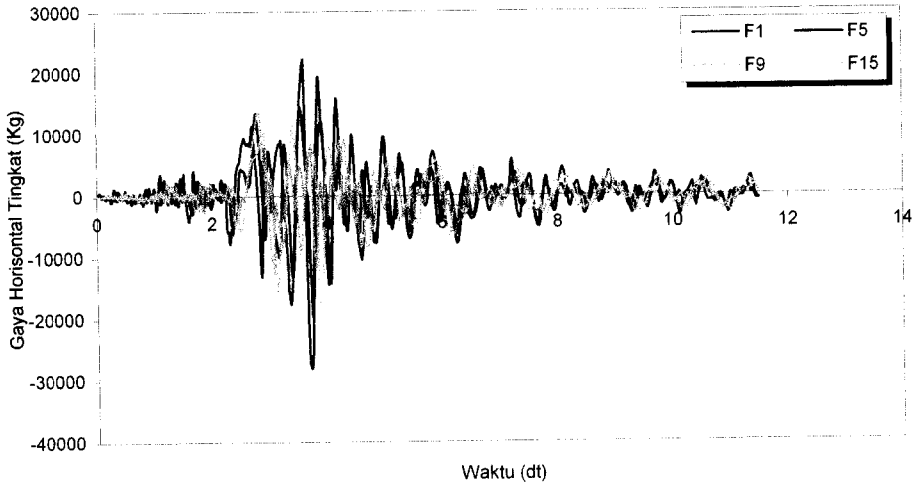
Tipikal



Setback 1

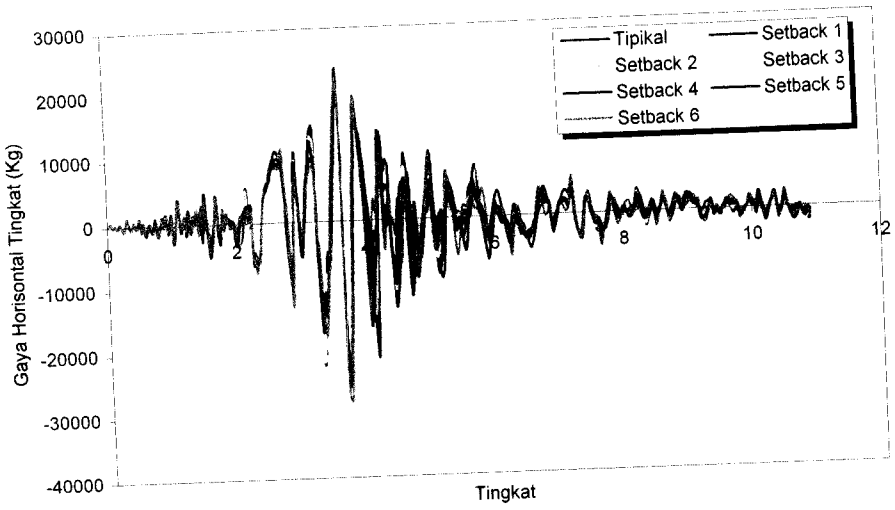


Setback 4

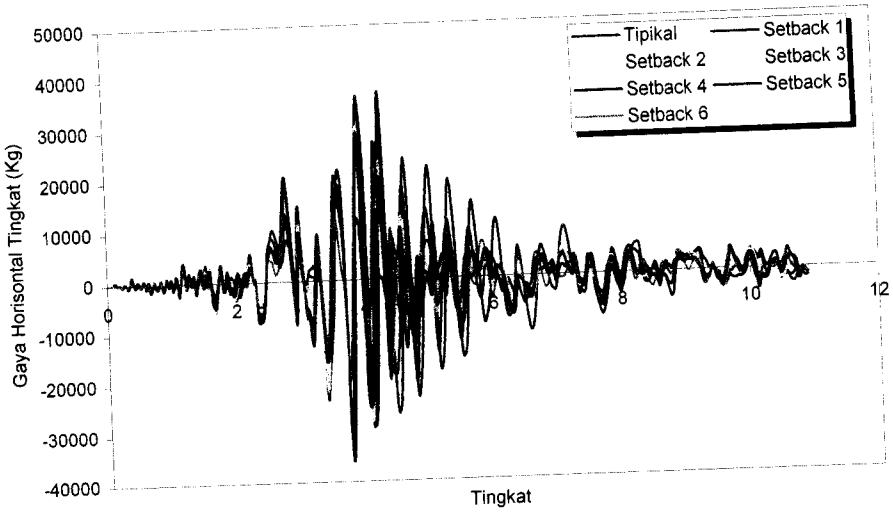


Setback 6

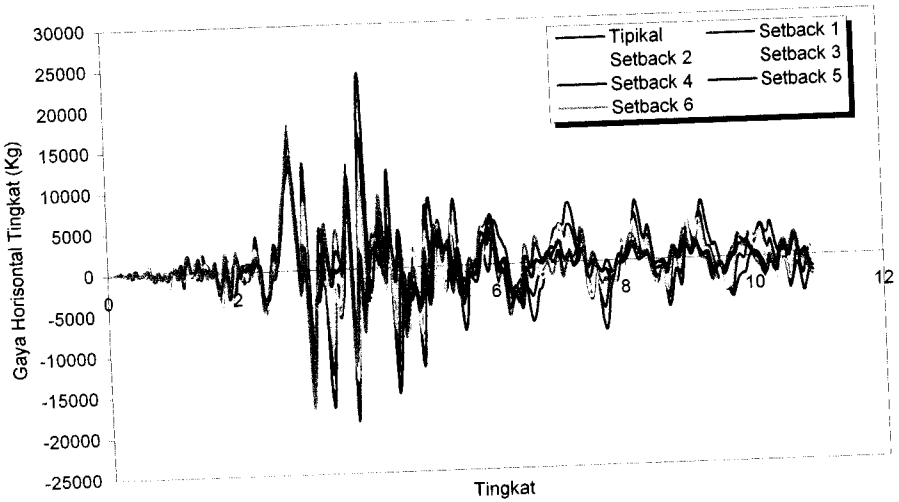
Gambar 5.89 Gaya Horisontal Tingkat Struktur Tingkat 15 Akibat Gempa Gilroy



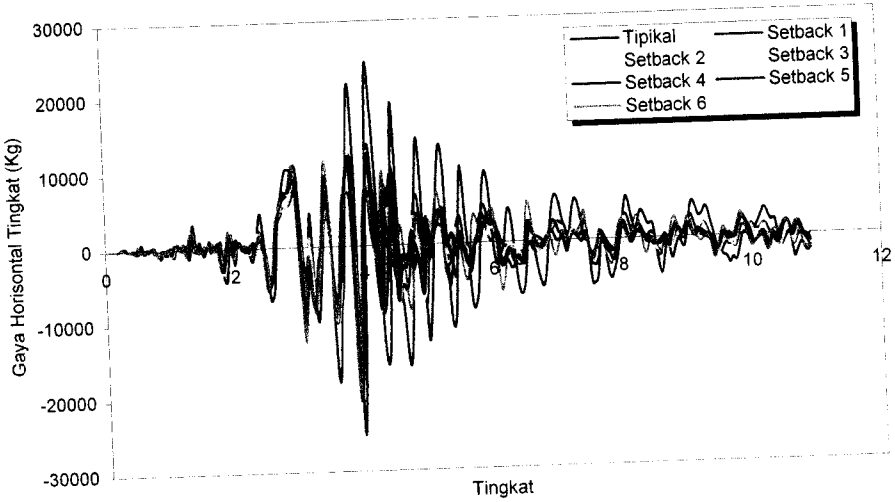
Tingkat 1



Tingkat 5

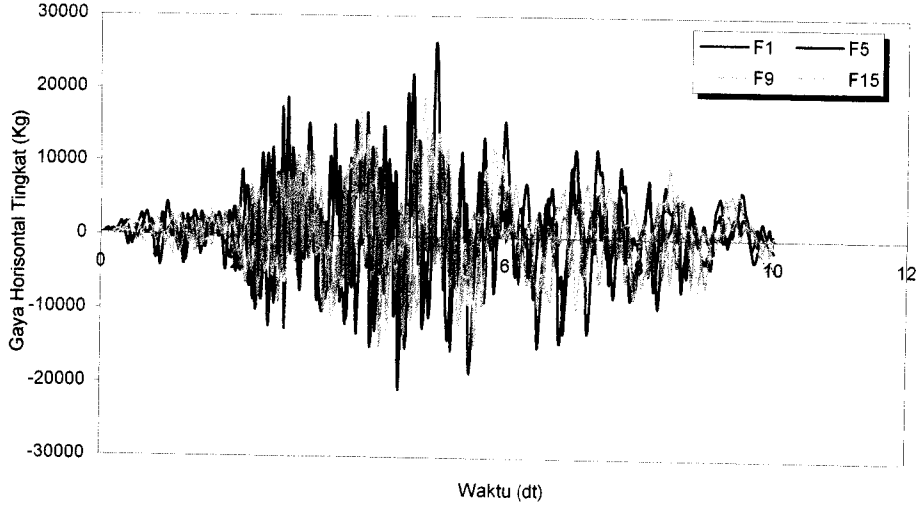


Tingkat 9

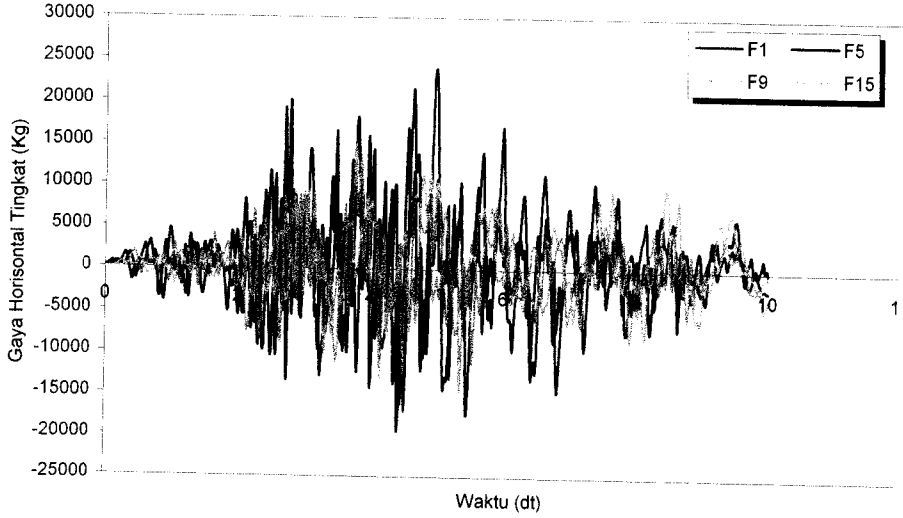


Tingkat 15

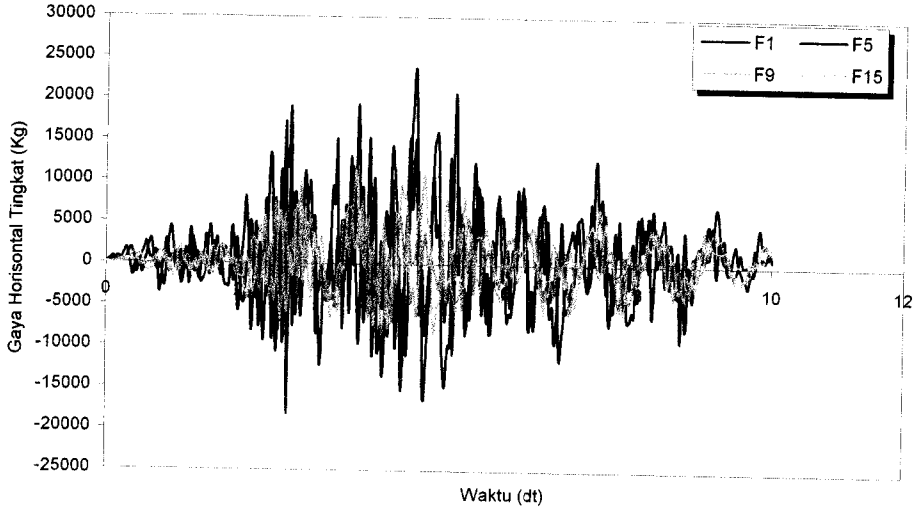
Gambar 5.90 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 15 Akibat Gempa Gilroy



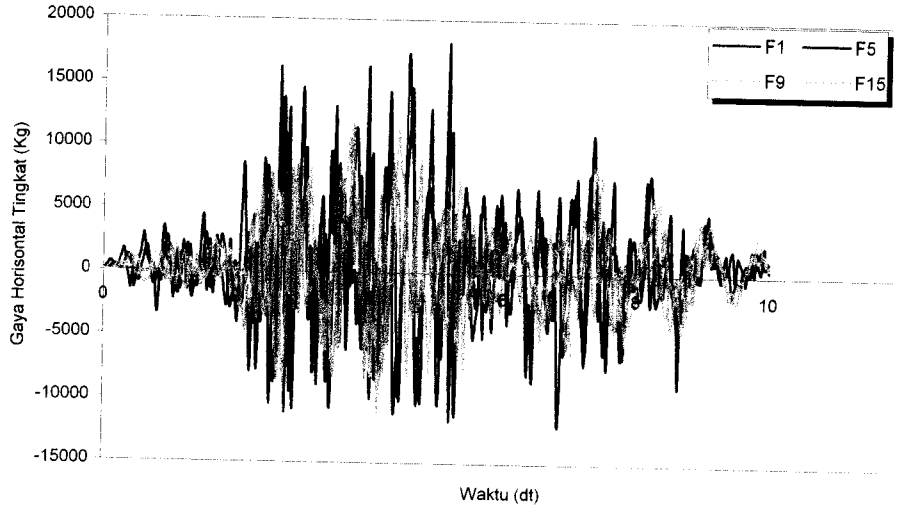
Tipikal



Setback 1

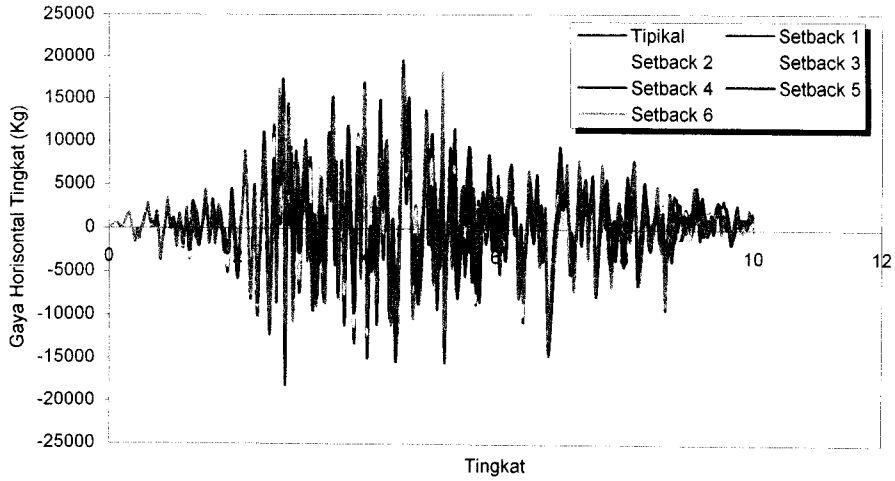


Setback 4

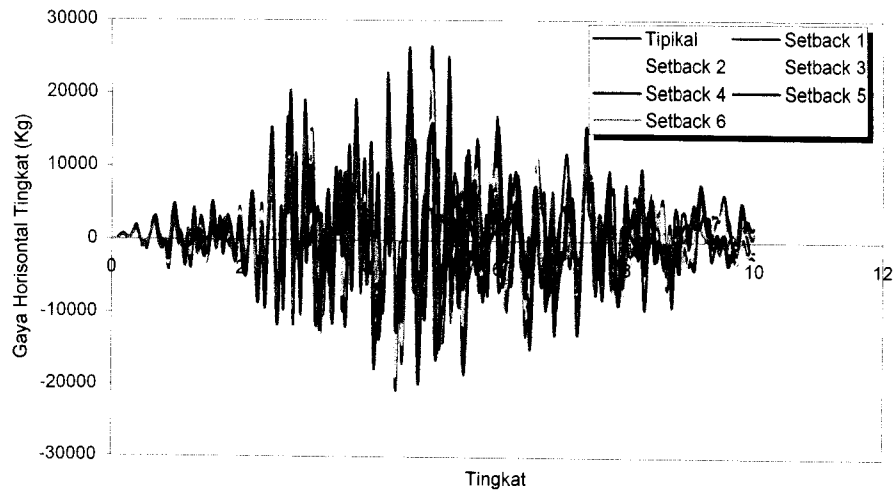


Setback 6

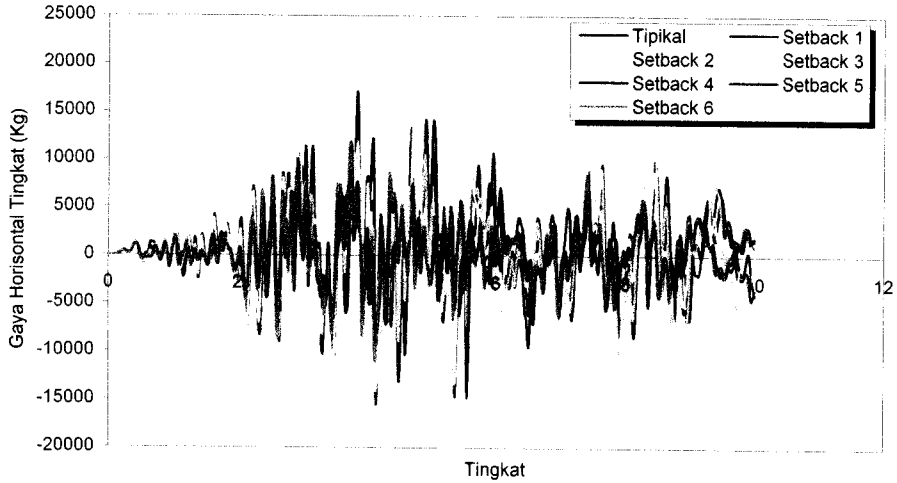
Gambar 5.91 Gaya Horisontal Tingkat Struktur Tingkat 15 Akibat Gempa Koyna



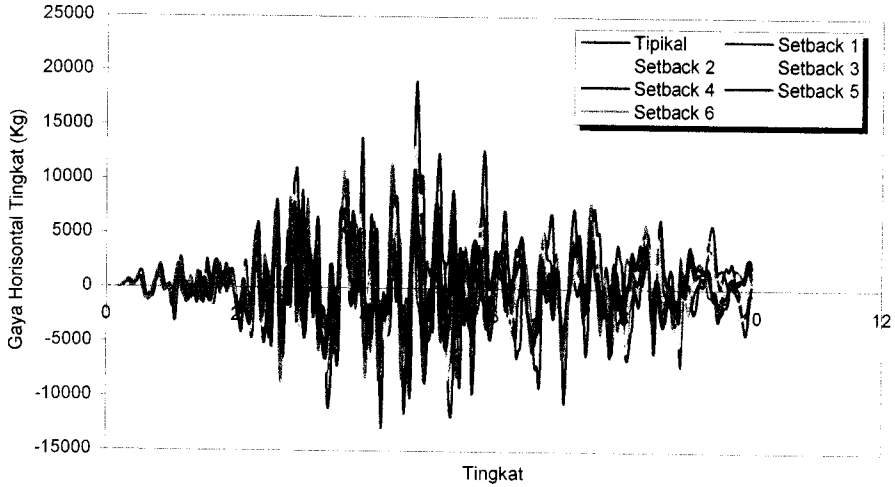
Tingkat 1



Tingkat 5

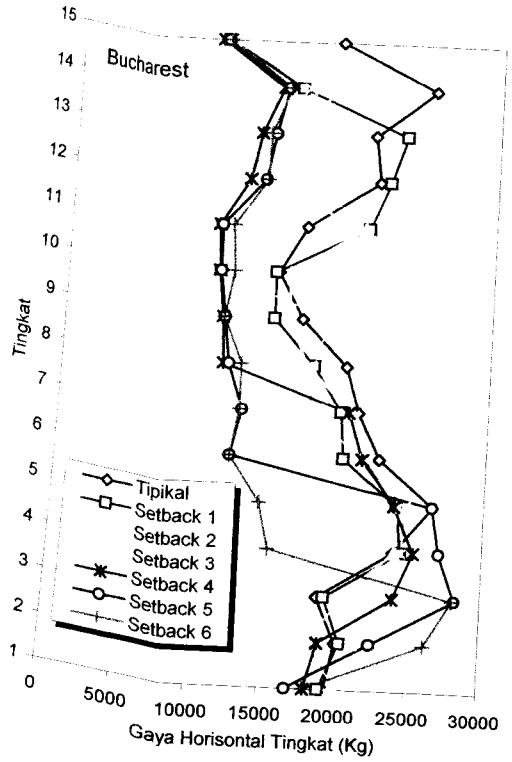


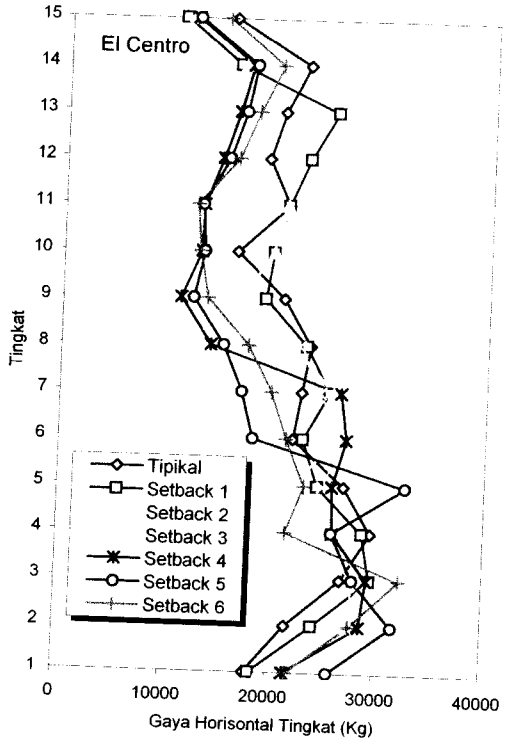
Tingkat 9

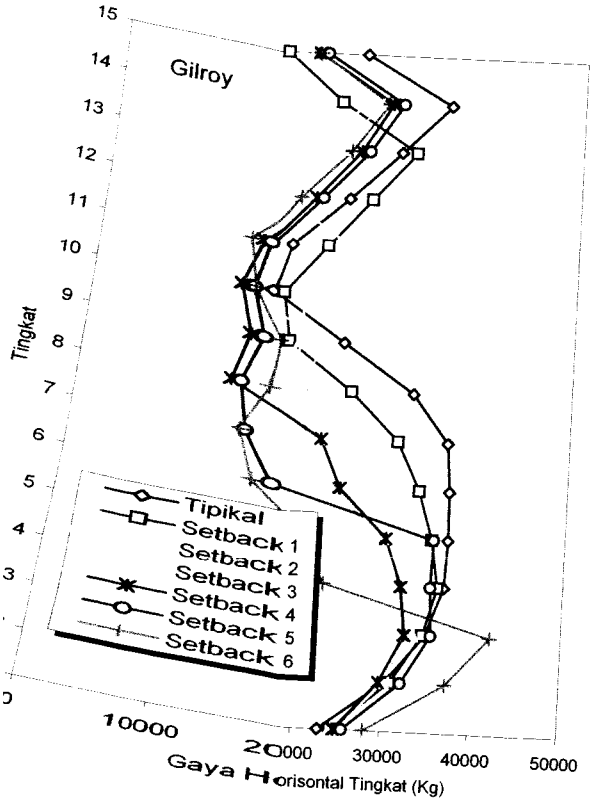


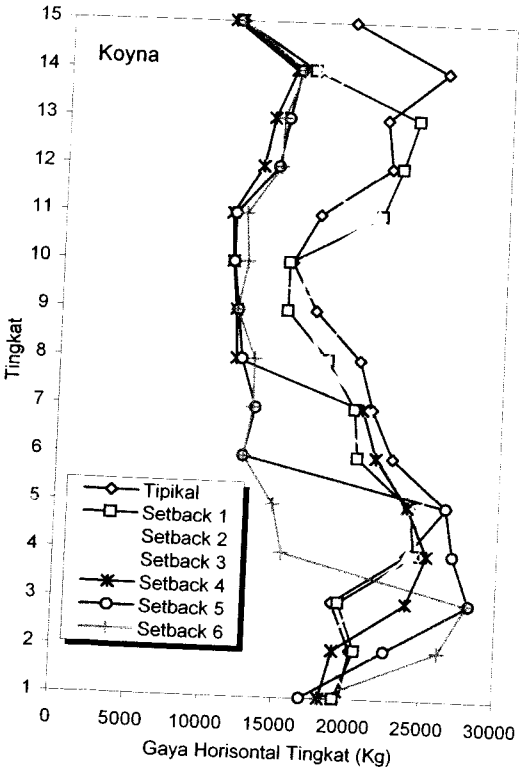
Tingkat 15

Gambar 5.92 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 15 Akibat Gempa Koyna

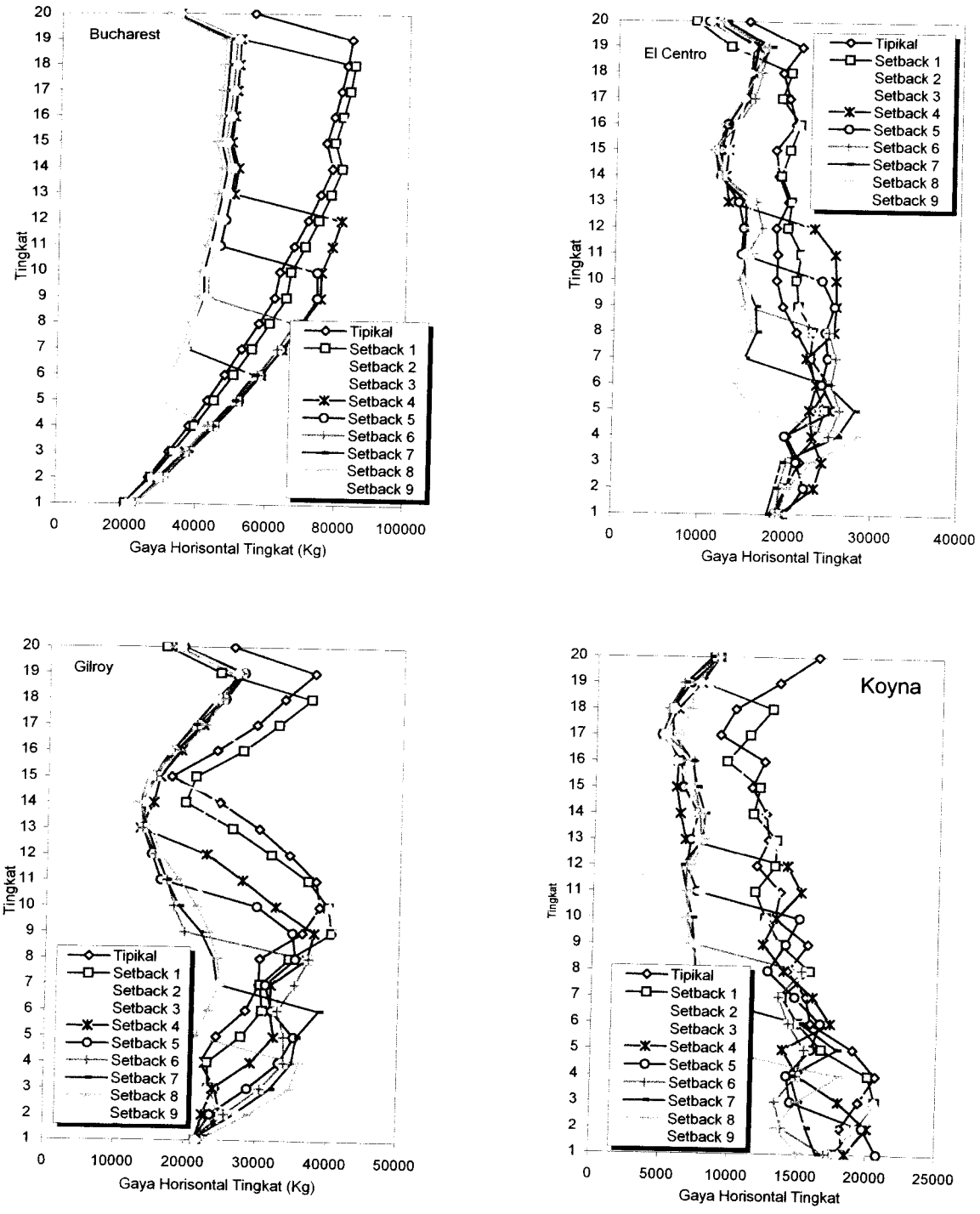








Gambar 5.93 Gaya Horisontal Tingkat Maksimum Struktur Tingkat 15 Akibat 4 Gempa



Gambar 5.94 Gaya Horisontal Tingkat Maksimum Struktur Tingkat 20 Akibat 4 Gempa

5.4.5 Gaya Horisontal Tingkat Kumulatif / Gaya Geser

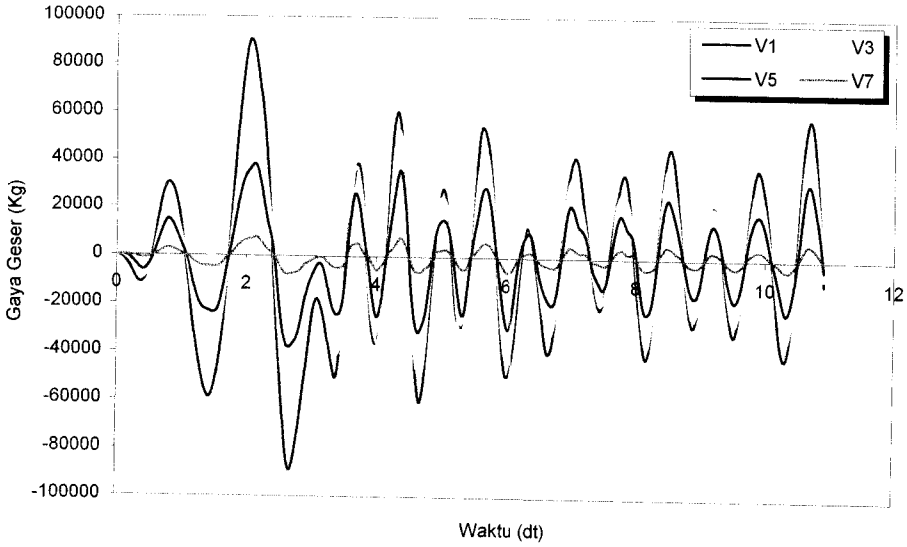
Gaya Horisontal tingkat kumulatif (Gaya Geser) merupakan penjumlah dari gaya horisantal tiap tingkat. Dihitung berdasarkan atas persamaan (3.54).

Dari program ini dapat disajikan nilai-nilai *Gaya Geser* untuk struktur bangunan tingkat 7, 10, 15 dan 20 dengan 4 variasi gempa pada Gambar 5.95 sampai dengan Gambar 5.122. Dengan memperhatikan Gambar 5.95 sampai dengan Gambar 5.122 tersebut, dapat kita lihat bahwa nilai *Gaya Geser* terbesar terdapat pada pembebanan gempa Bucharest yang telah dinormalisasi. Hal ini disebabkan karena percepatan maksimum (Am_{aks}) gempa Bucharest mendekati nilai 0,2g sehingga skala gempa mendekati 1.

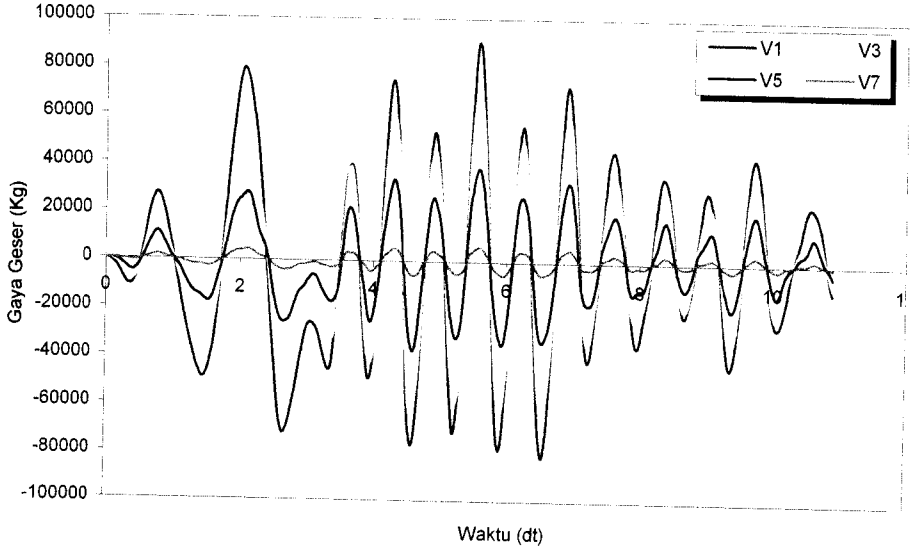
Nilai *Gaya Geser* dari struktur tipikal sampai setback vertikal yang paling kritis semakin ke atas akan semakin mengecil. Ini disebabkan karena semakin ke atas (pada tingkat yang lebih tinggi) terdapat pengurangan massa dan kekakuan secara vertikal (setback vertikal). Ini sama halnya dengan gaya horisontal tingkat karena memang *Gaya Geser* merupakan penjumlahan dari gaya horizontal tingkat.

Pada struktur setback vertikal terdapat titik belok dimana nilai dari *Gaya Geser* maksimum menjadi lebih kecil karena massa dan kekakuan berkurang. Pengurangan nilai gaya geser yang paling besar terdapat pada struktur bangunan setback vertikal yang paling kritis.

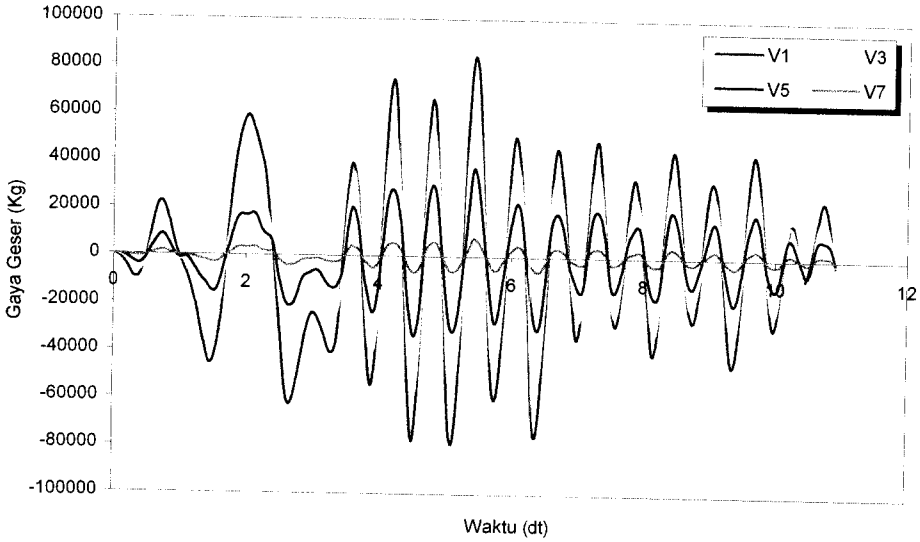
Nilai *Gaya Geser* pada pembebanan gempa Elcentro dan Gilroy nilai *Gaya Geser*nya sangat fluktuatif itu karena perbedaan periode (T). Nilai *Gaya Geser* akibat gempa Koyna nilainya semakin rapat ini dikarenakan gempa koyna merupakan gempa dengan frekuensi tinggi.



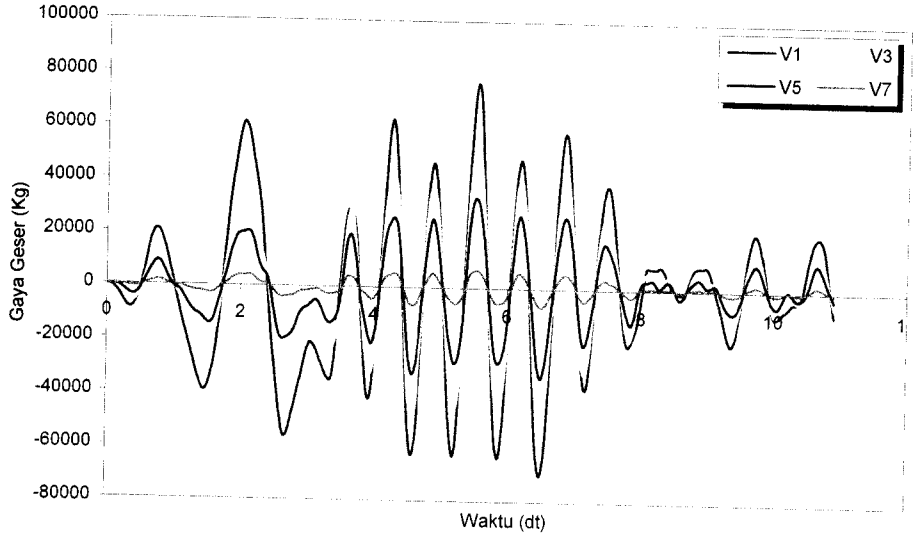
Tipikal



Setback 1

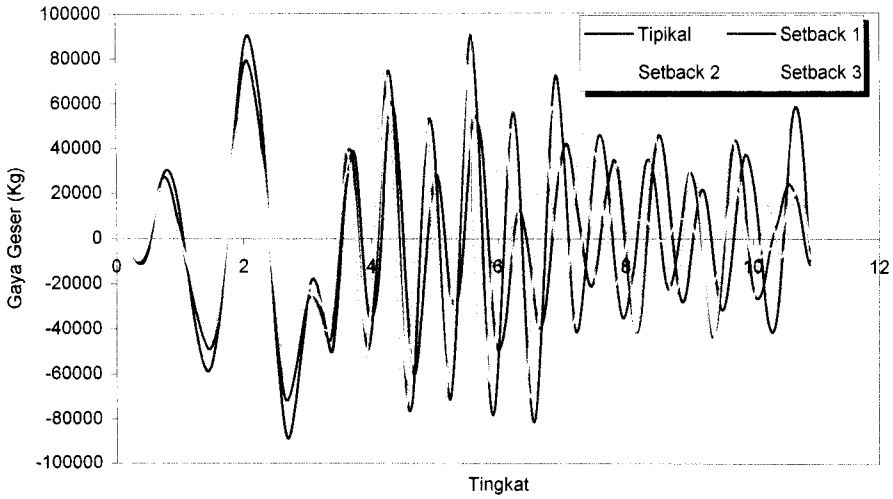


Setback 2

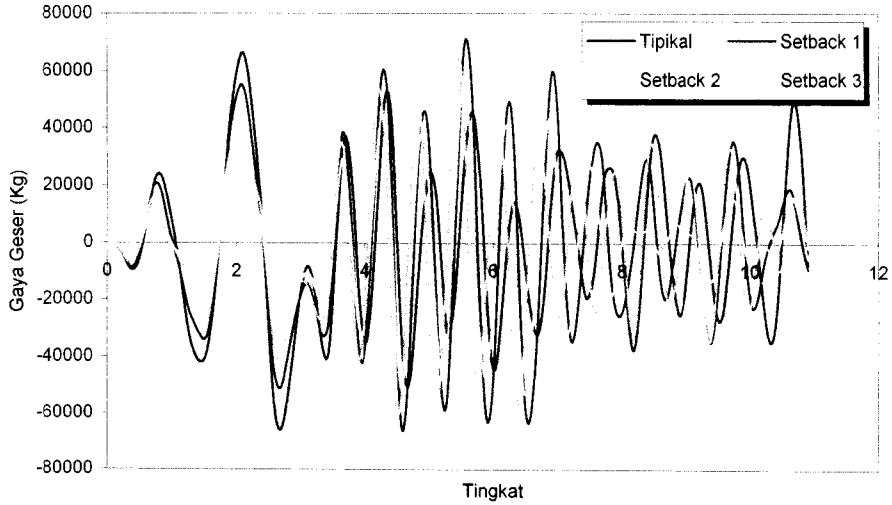


Setback 3

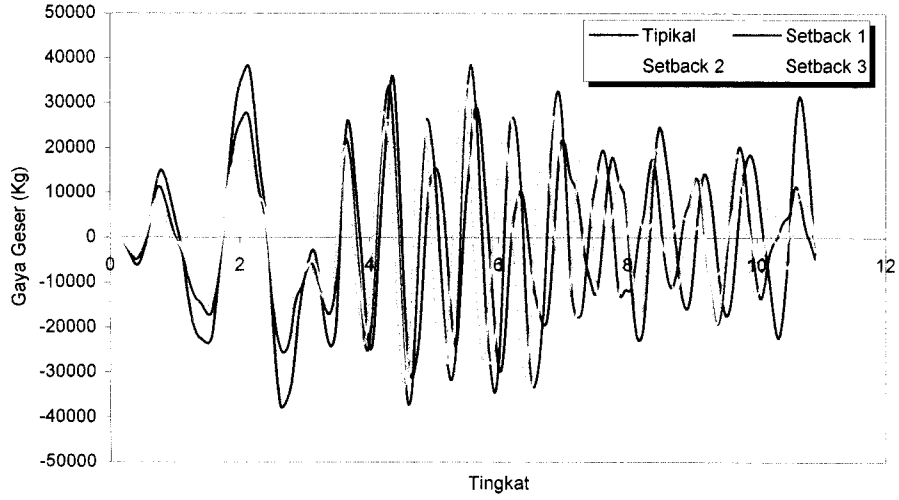
Gambar 5.95 Gaya Geser Struktur Tingkat 7 Gempa Bucharest



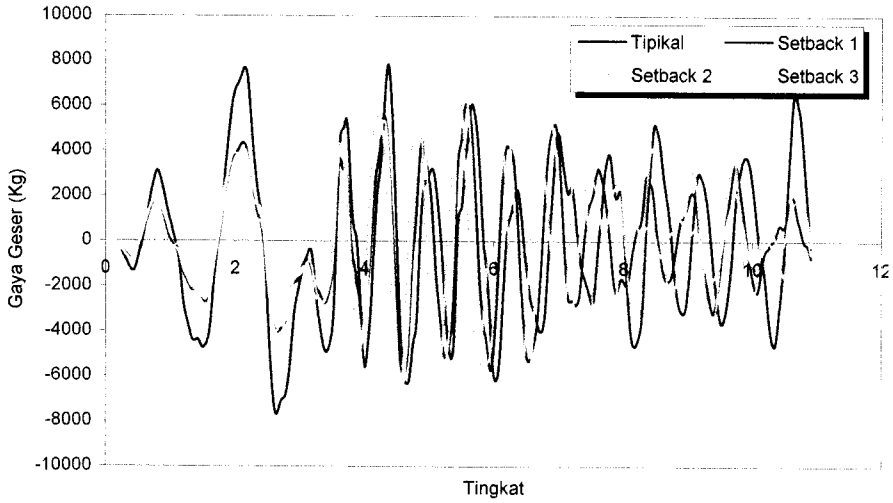
Tingkat 1



Tingkat 3

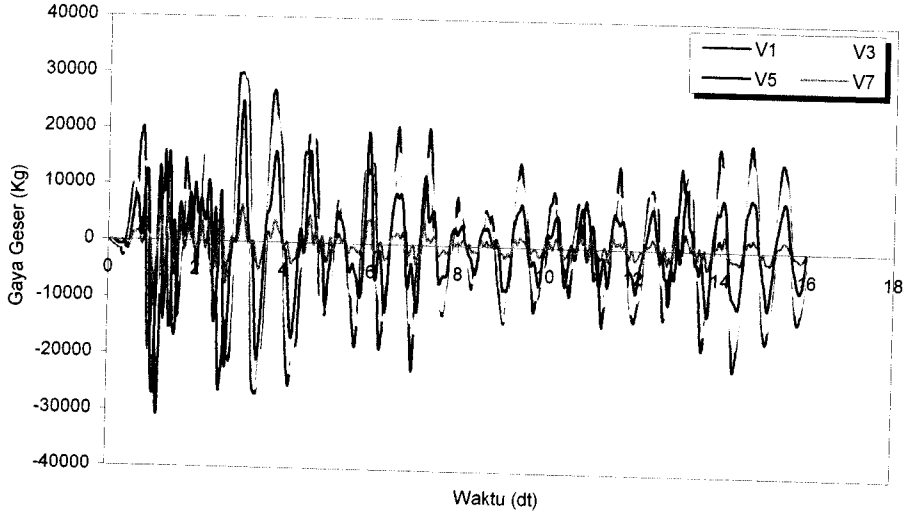


Tingkat 5

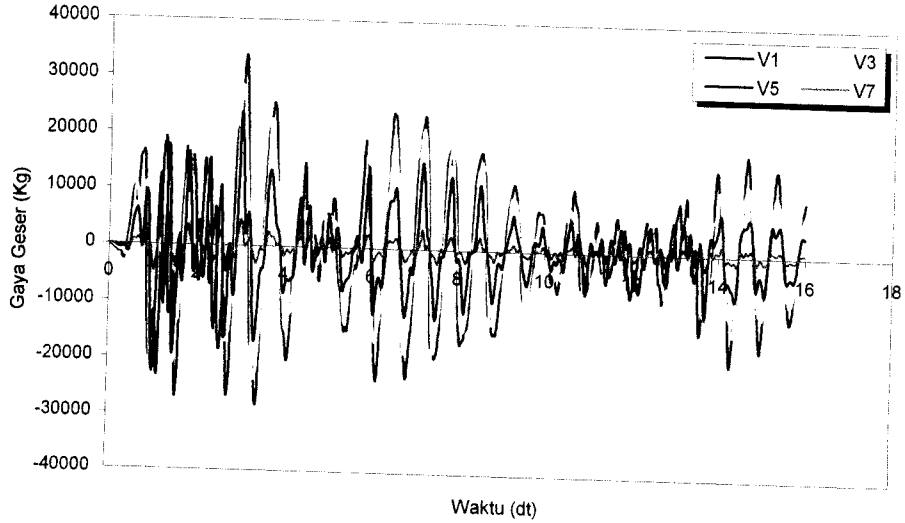


Tingkat 7

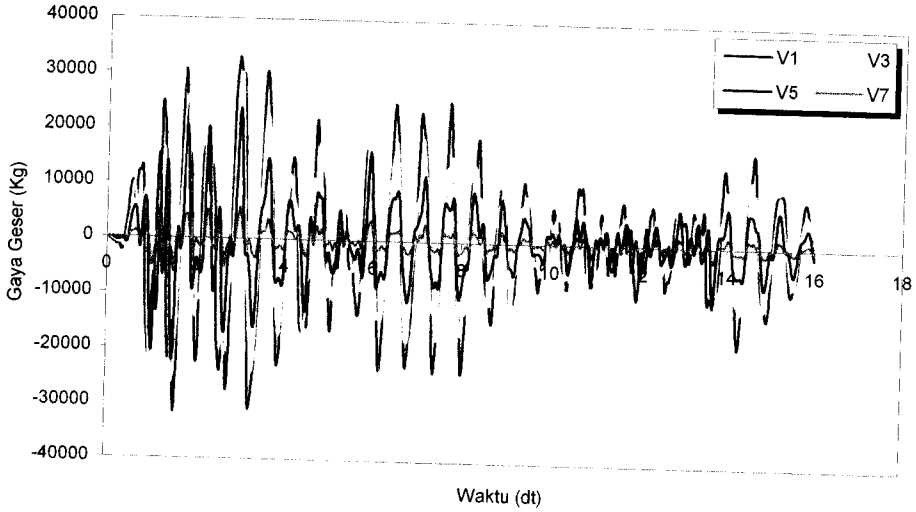
Gambar 5.96 Perbandingan Gaya Geser Struktur Tingkat 7 Akibat Gempa Bucharest



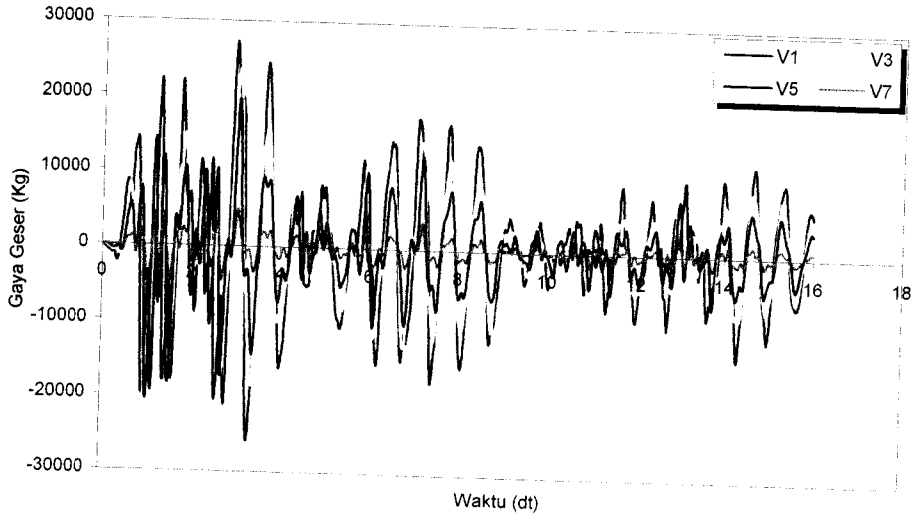
Tipikal



Setback 1

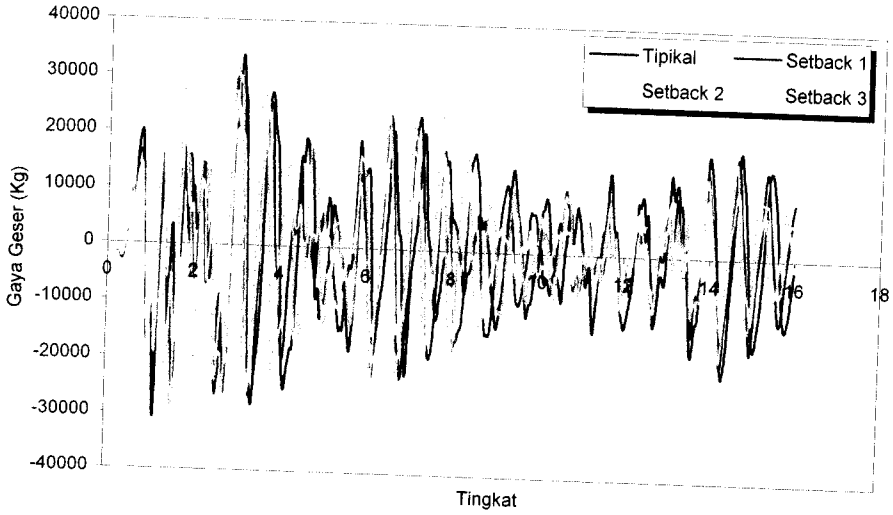


Setback 2

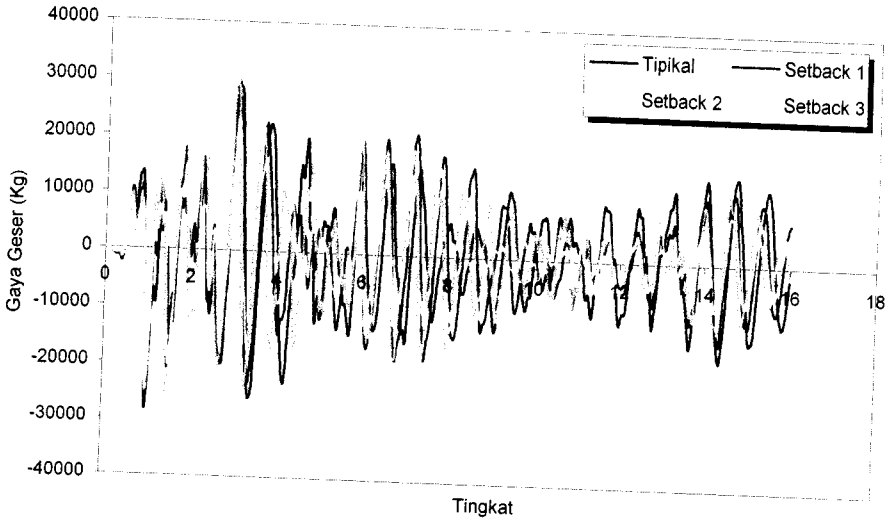


Setback 3

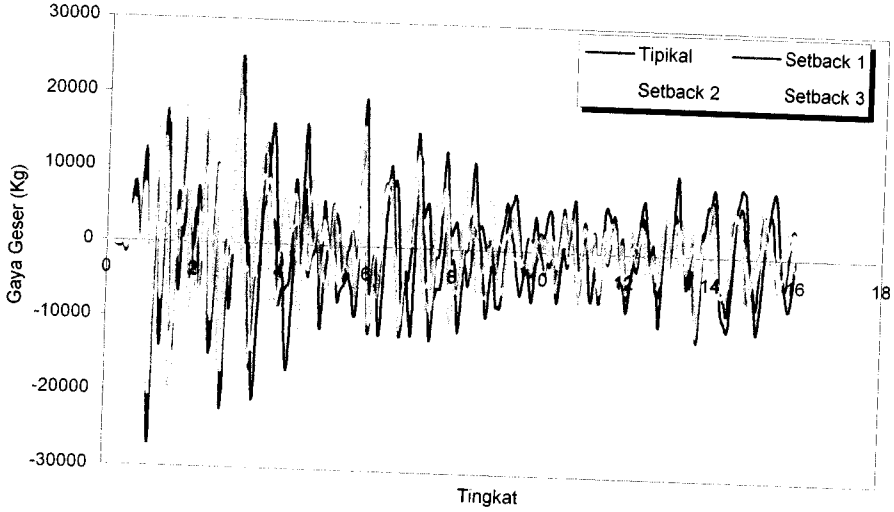
Gambar 5.97 Gaya Geser Struktur Tingkat 7 Gempa El Centro



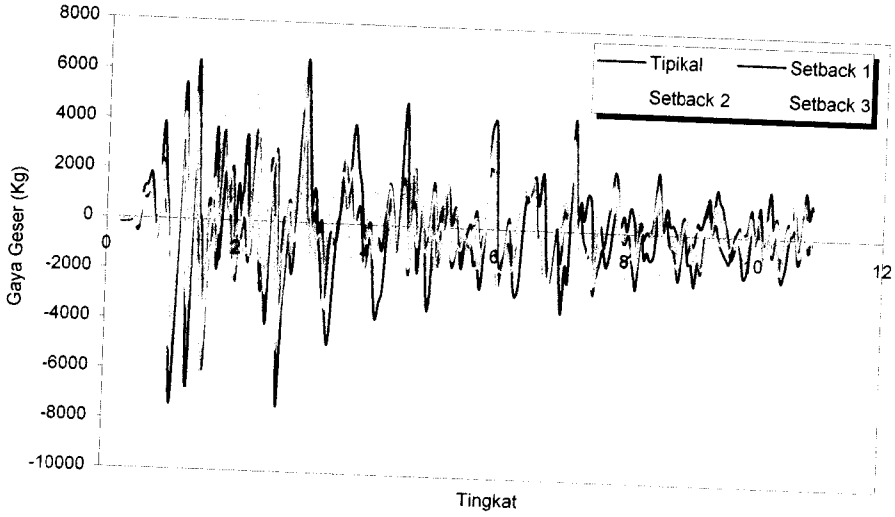
Tingkat 1



Tingkat 3

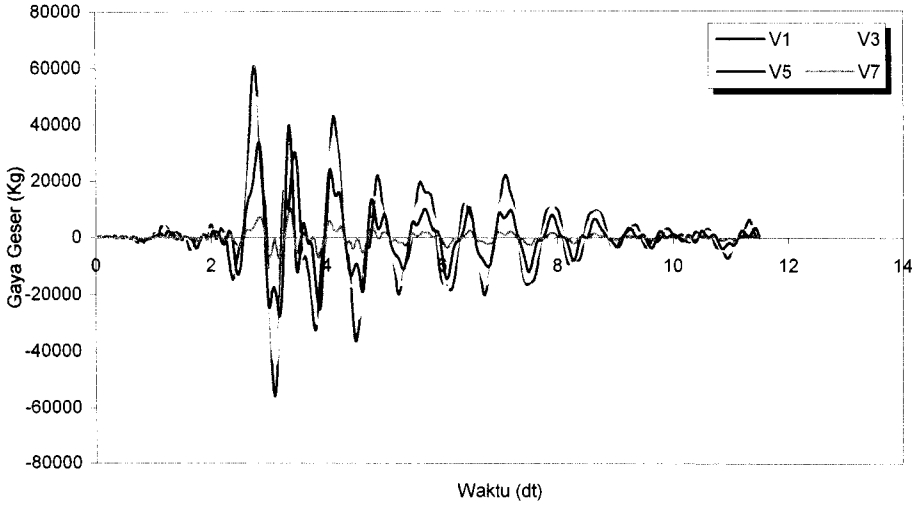


Tingkat 5

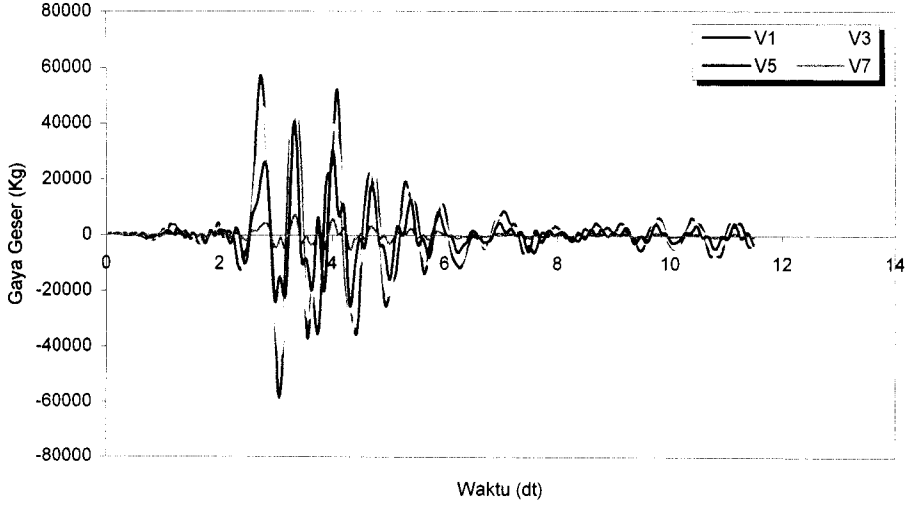


Tingkat 7

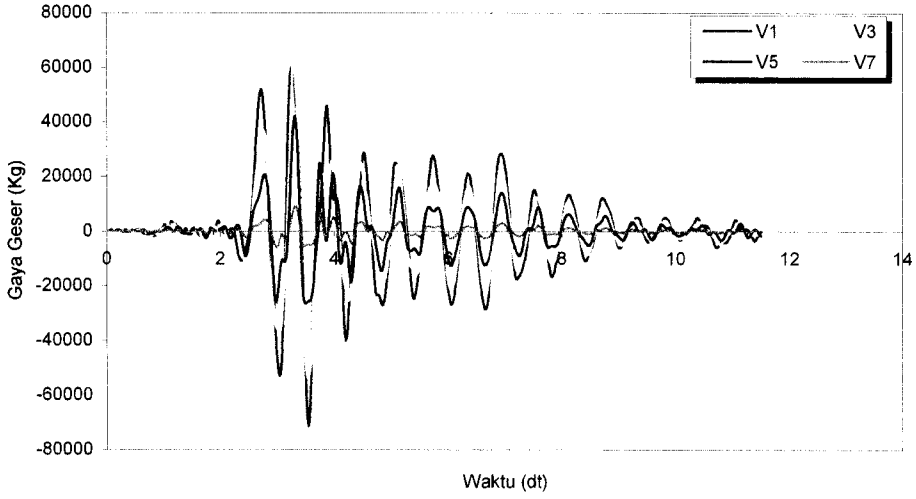
Gambar 5.98 Perbandingan Gaya Geser Struktur Tingkat 7 Akibat Gempa El Centro



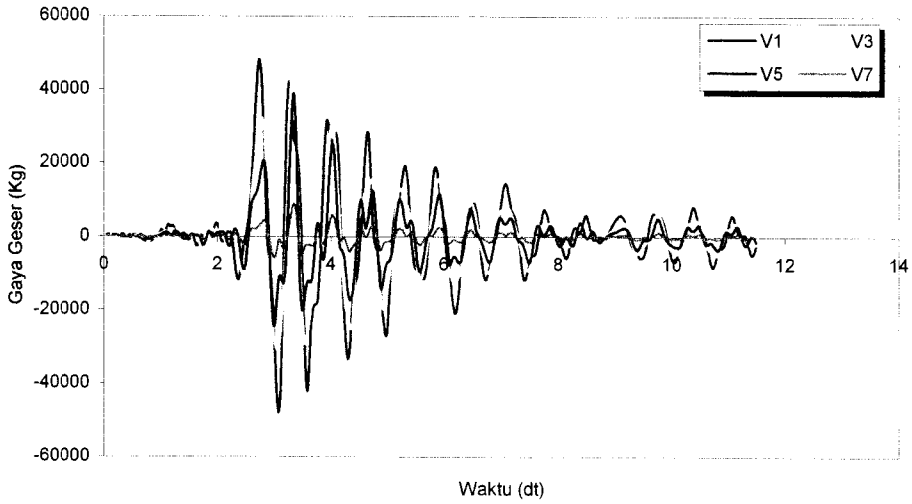
Tipikal



Setback 1

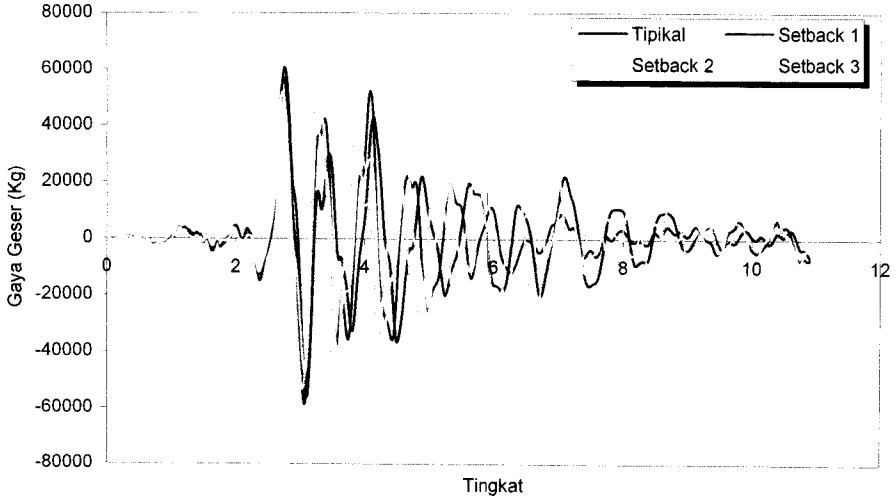


Setback 2

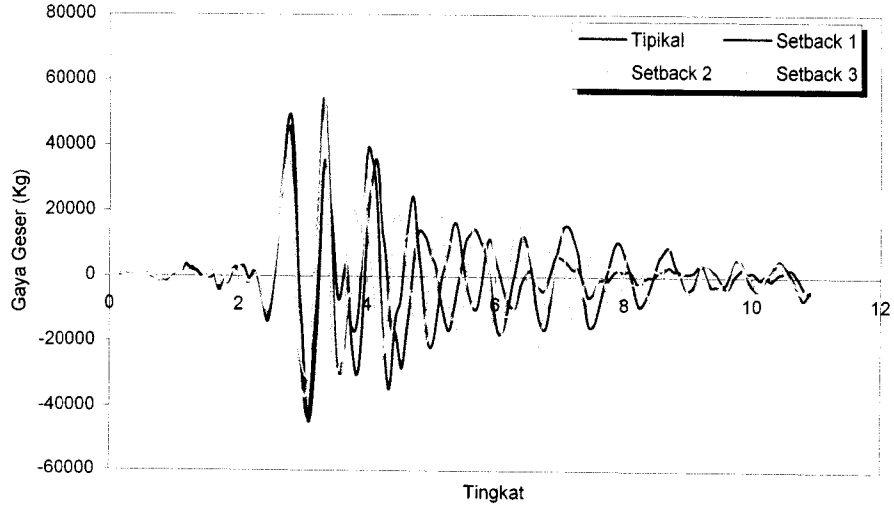


Setback 3

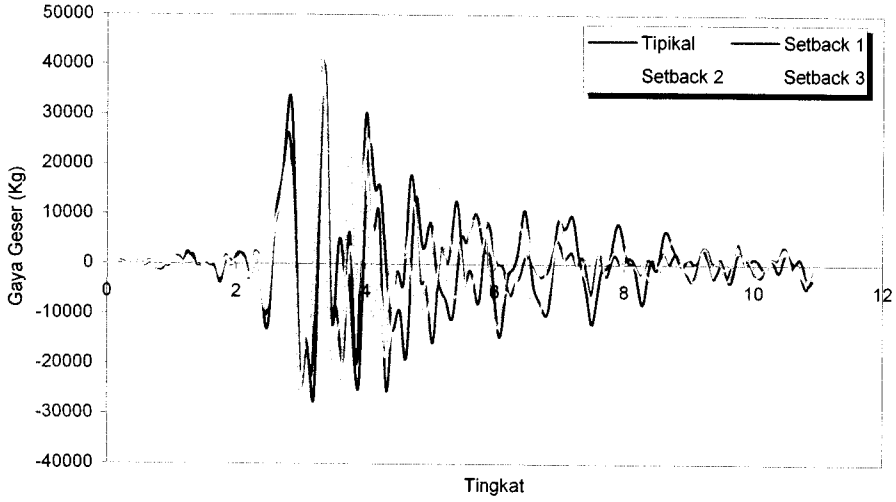
Gambar 5.99 Gaya Geser Struktur Tingkat 7 Akibat Gempa Gilroy



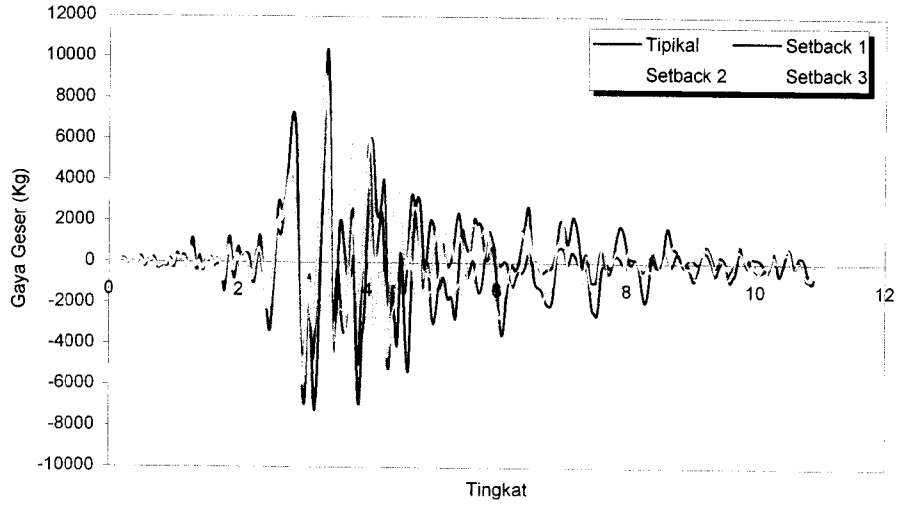
Tingkat 1



Tingkat 3

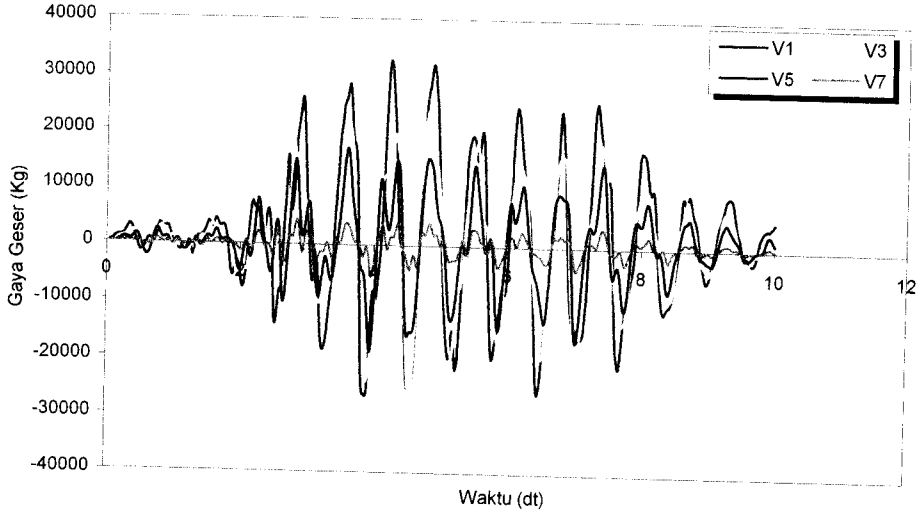


Tingkat 5

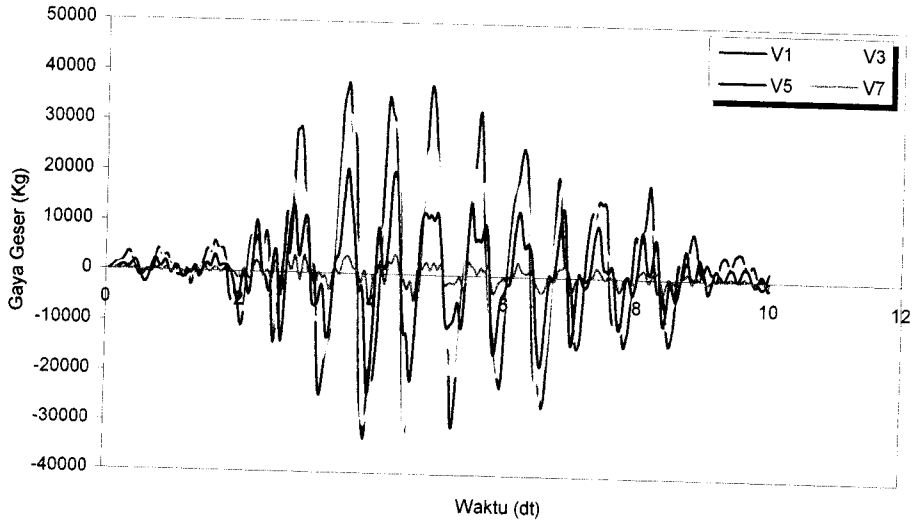


Tingkat 7

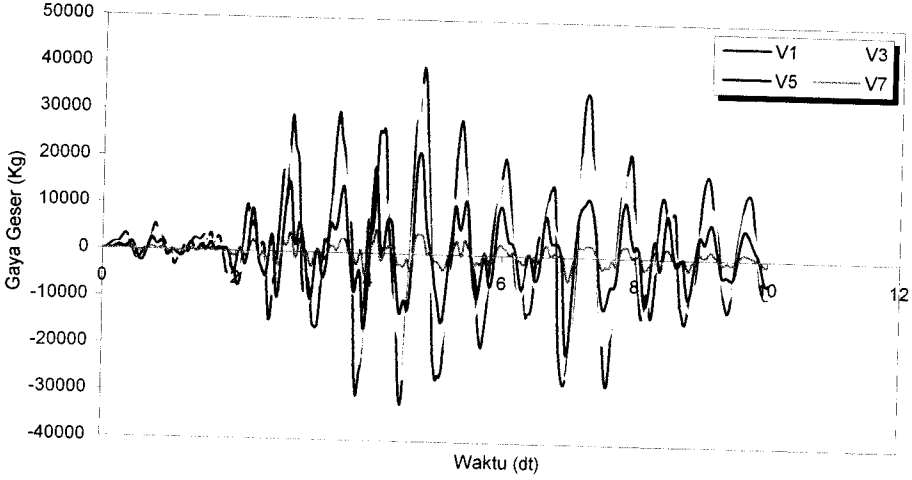
Gambar 5.100 Perbandingan Gaya Geser Struktur Tingkat 7 Akibat Gempa Gilroy



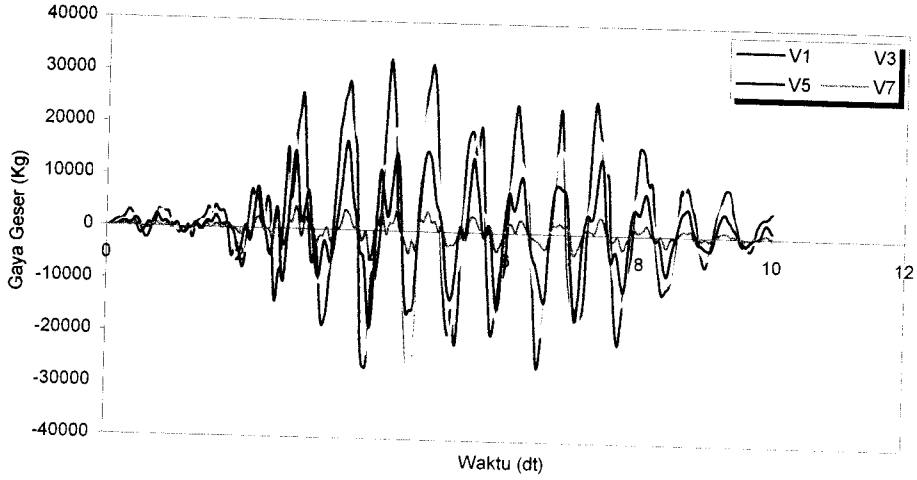
Tipikal



Setback 1

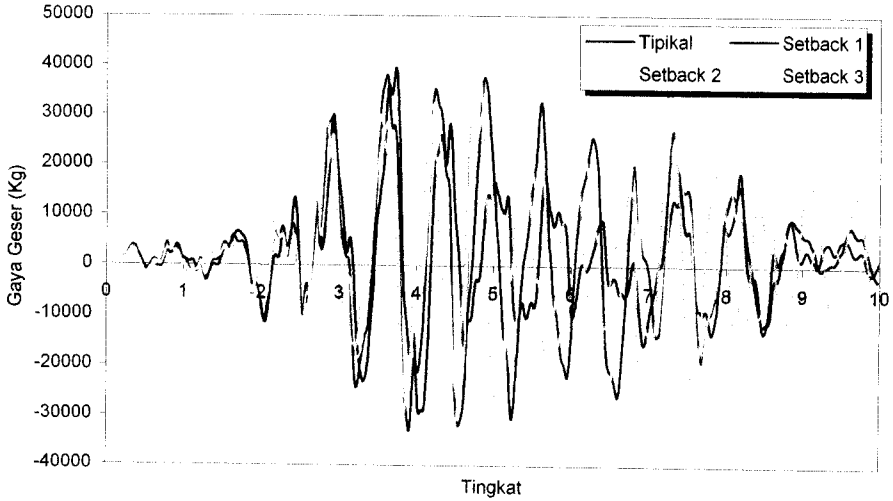


Setback 2

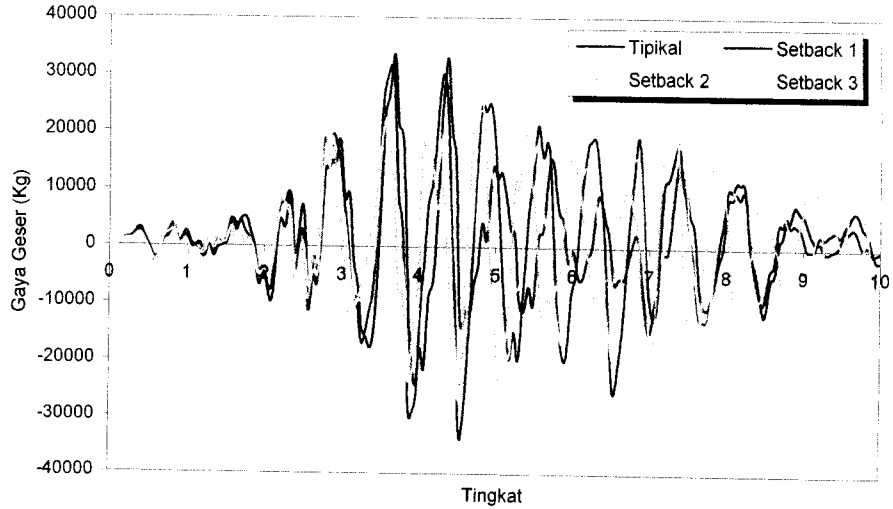


Setback 3

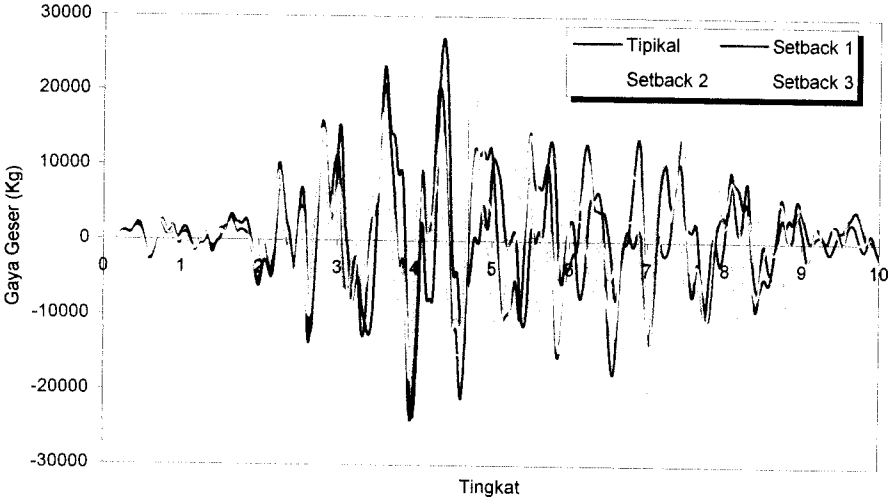
Gambar 5.101 Gaya Geser Struktur Tingkat 7 Akibat Gempa Koyna



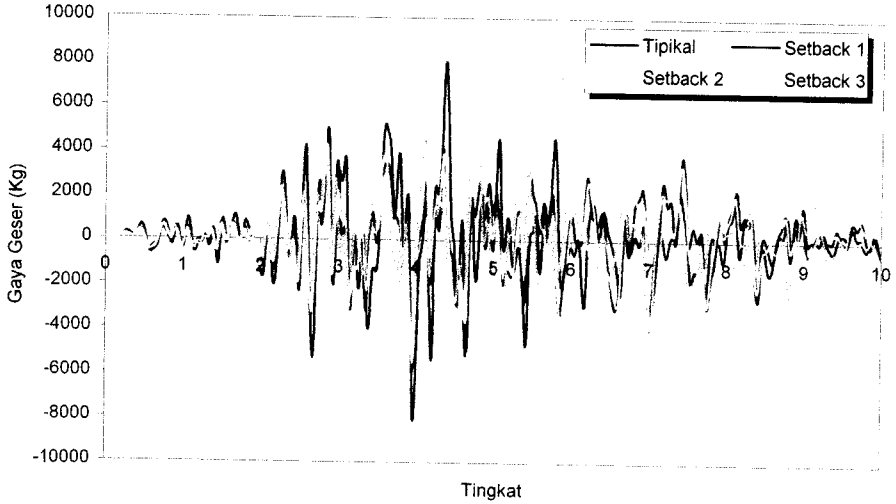
Tingkat 1



Tingkat 3

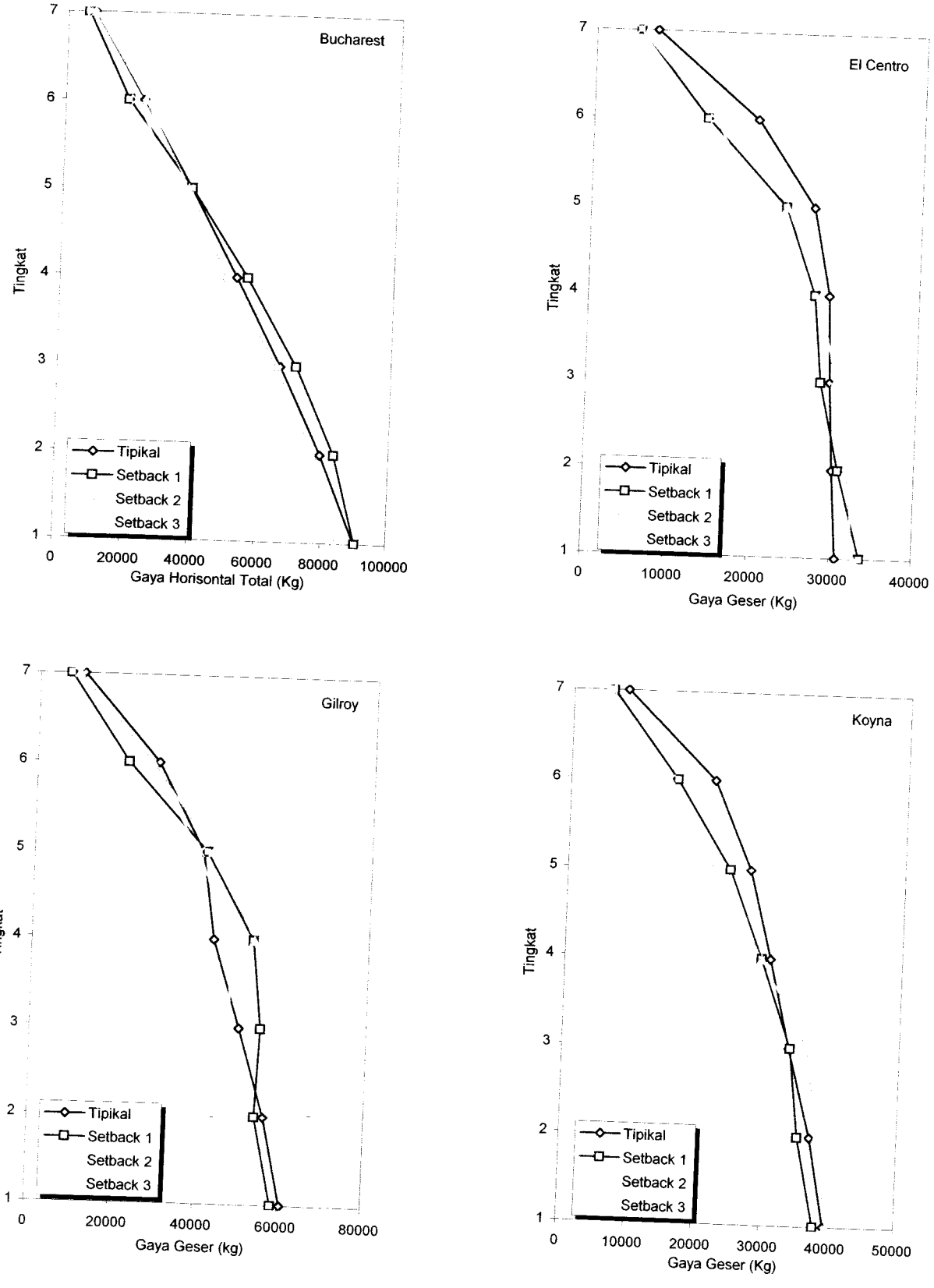


Tingkat 5

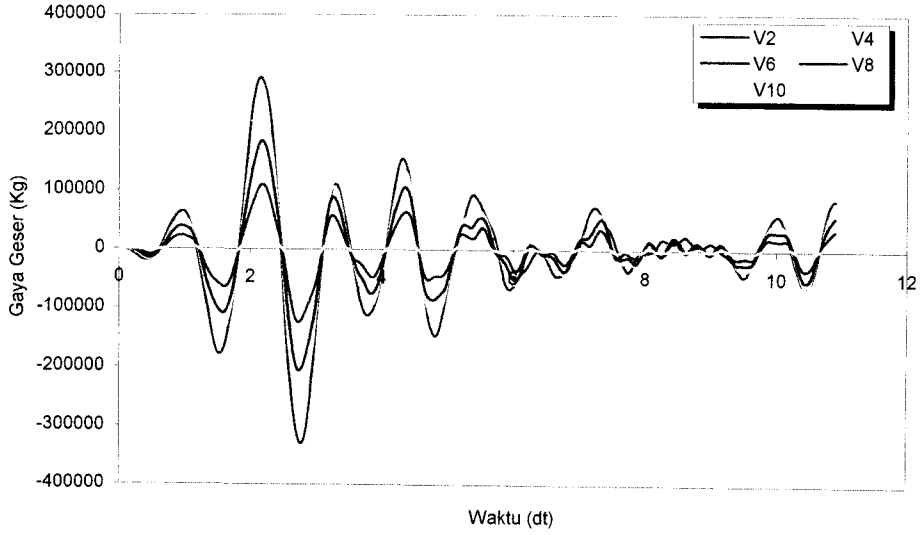


Tingkat 7

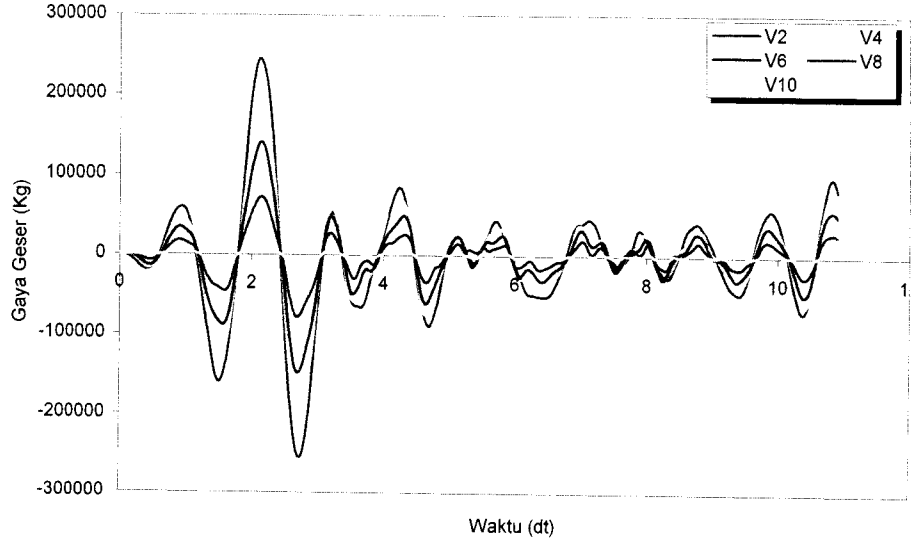
Gambar 5.102 Perbandingan Gaya Geser Struktur Tingkat 7 Akibat Gempa Koyna



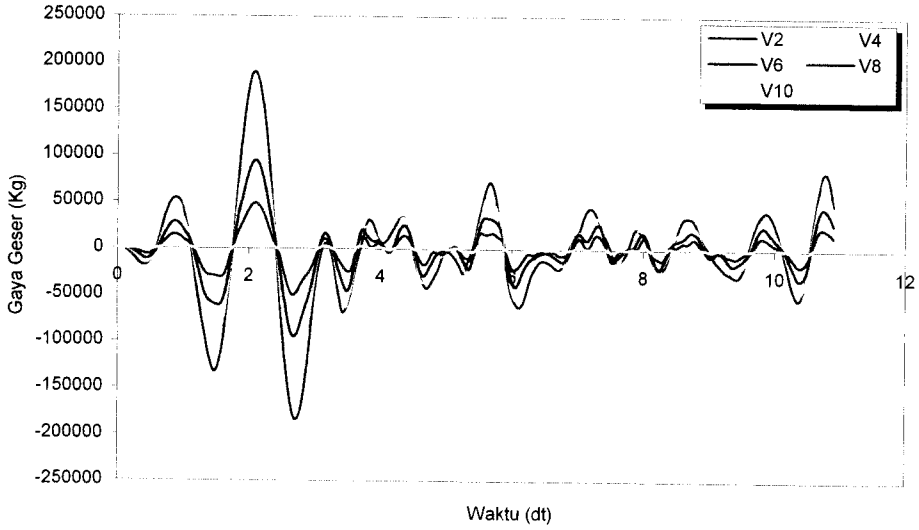
Gambar 5.103 Gaya Geser Maksimum Struktur Tingkat 7 Akibat 4 Gempa



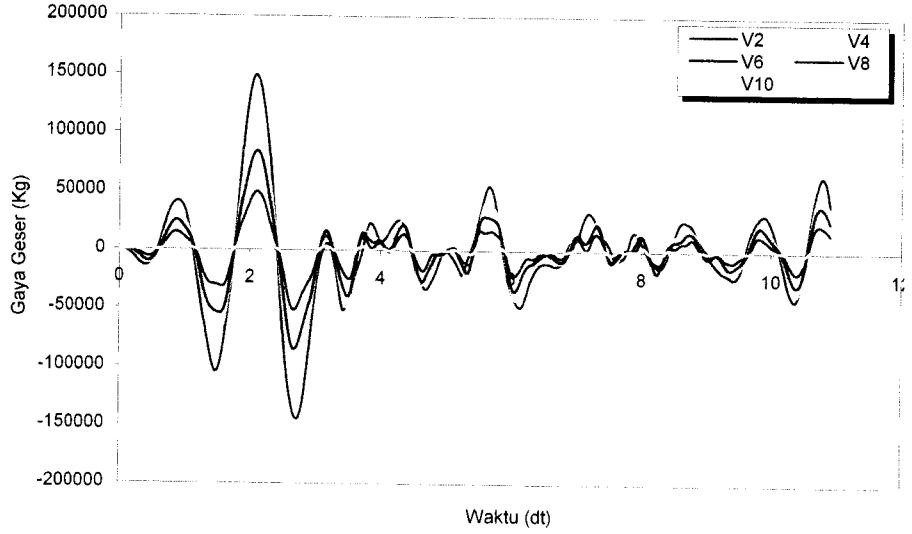
Tipikal



Setback 1

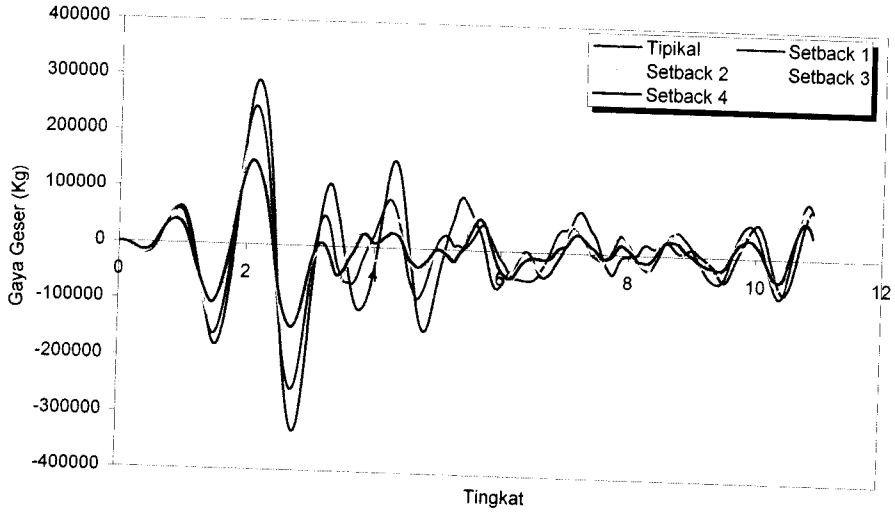


Setback 2

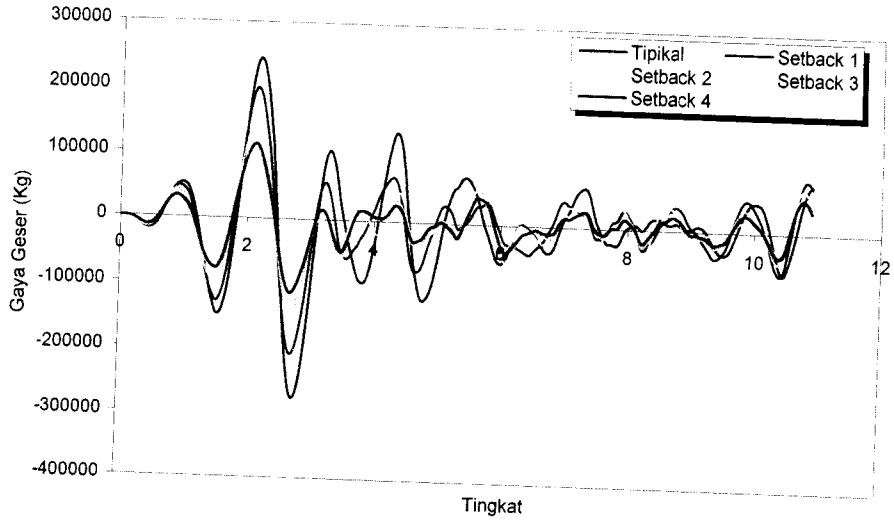


Setback 4

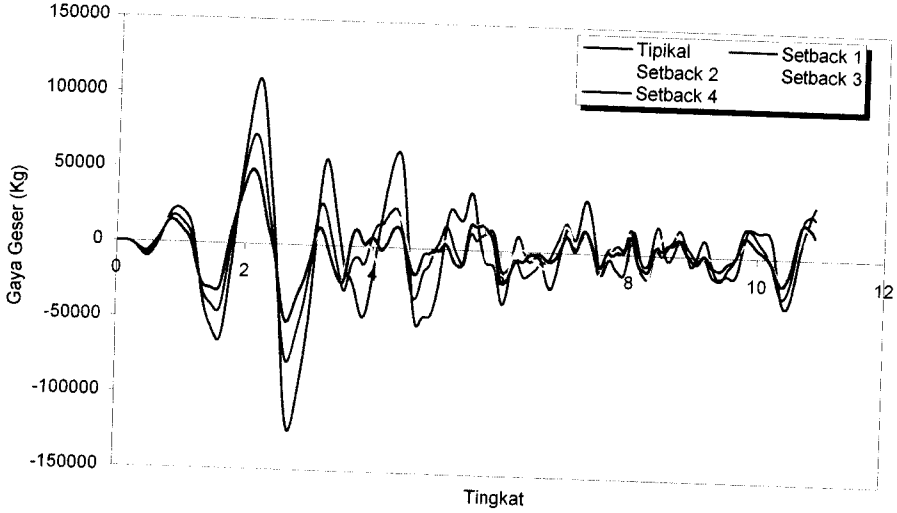
Gambar 5.104 Gaya Geser Struktur Tingkat 10 Akibat Gempa Bucharest



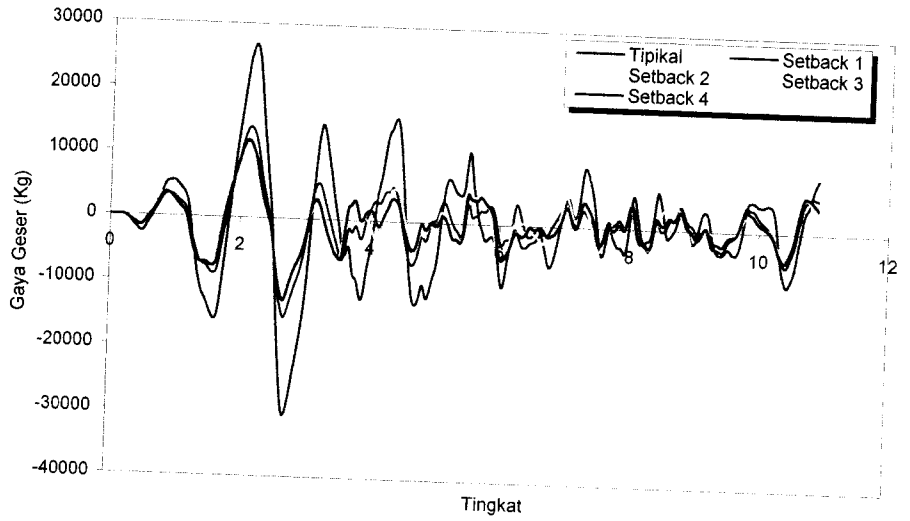
Tingkat 2



Tingkat 4

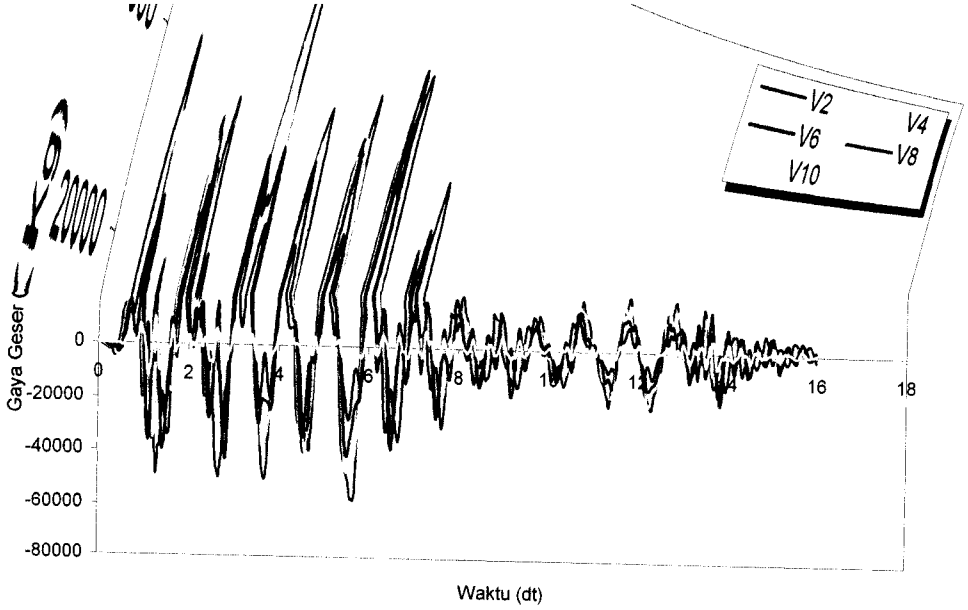


Tingkat 8

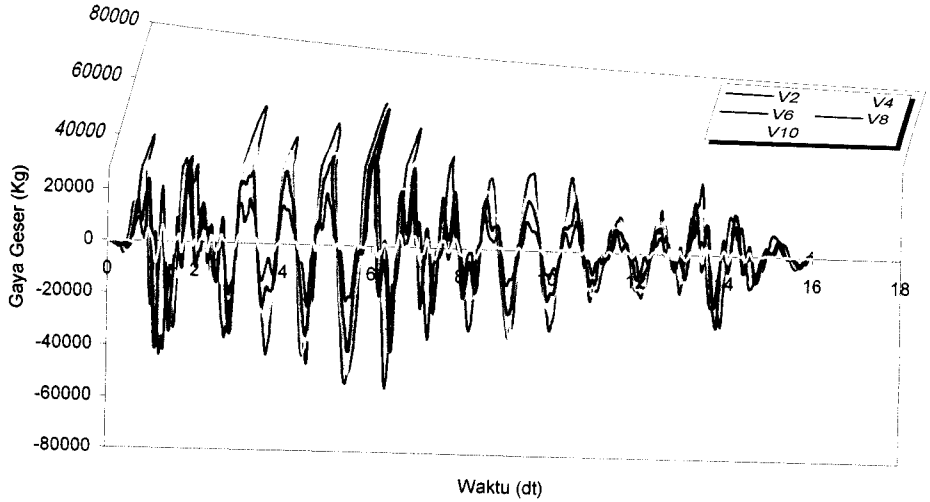


Tingkat 10

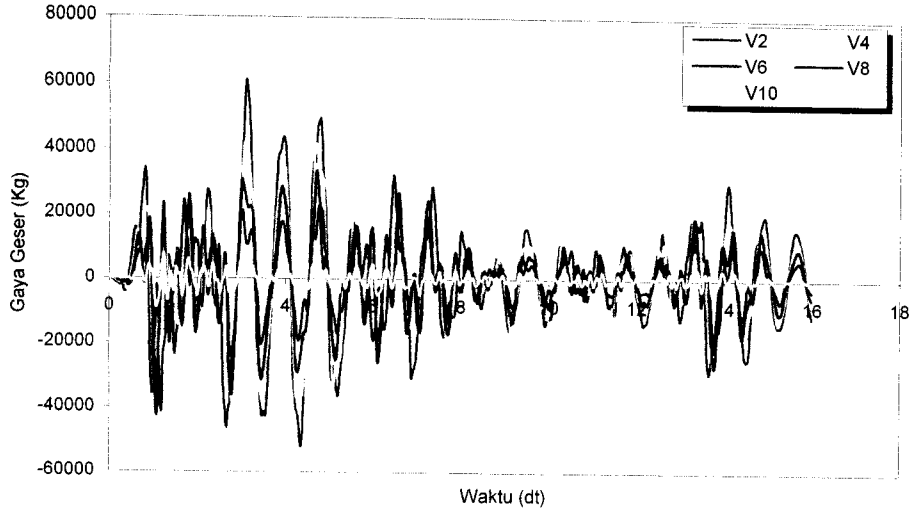
Gambar 5.105 Perbandingan Gaya Geser Struktur Tingkat 10 Akibat Gempa Bucharest



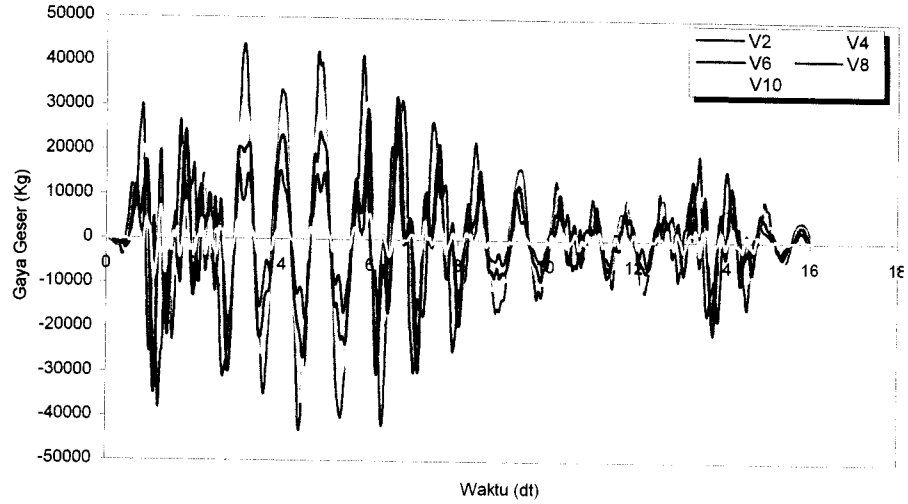
Tipikal



Setback 1

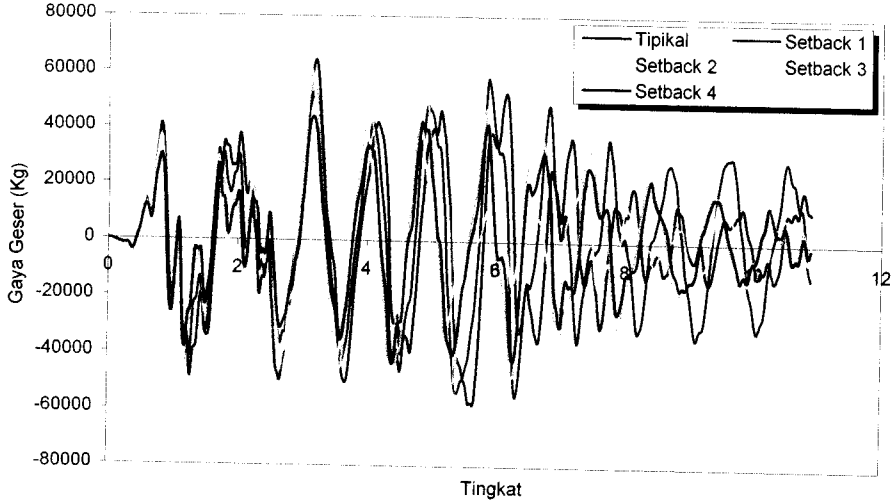


Setback 3

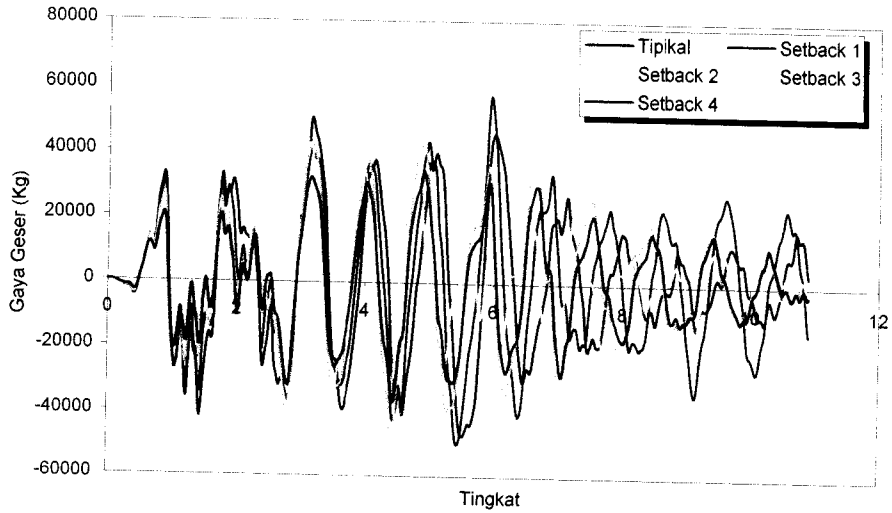


Setback 4

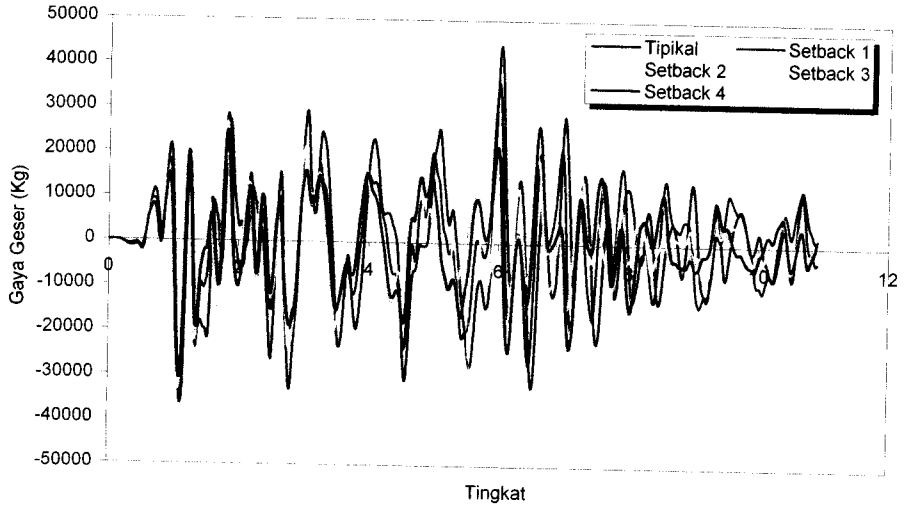
Gambar 5.106 Gaya Geser Struktur Tingkat 10 Akibat Gempa El Centro



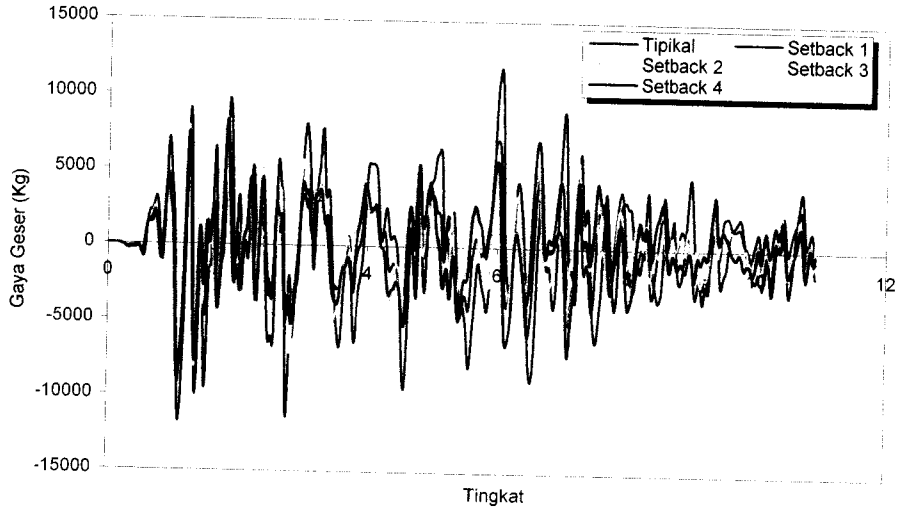
Tingkat 2



Tingkat 4

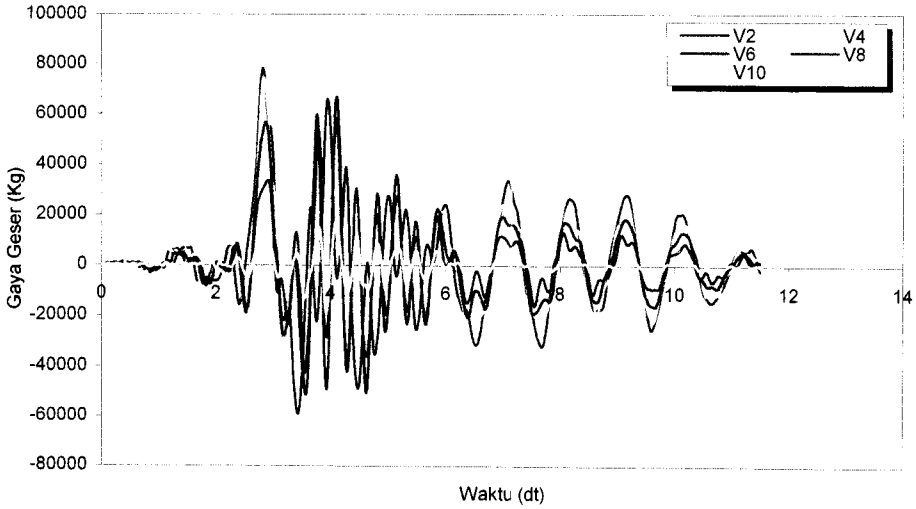


Tingkat 8

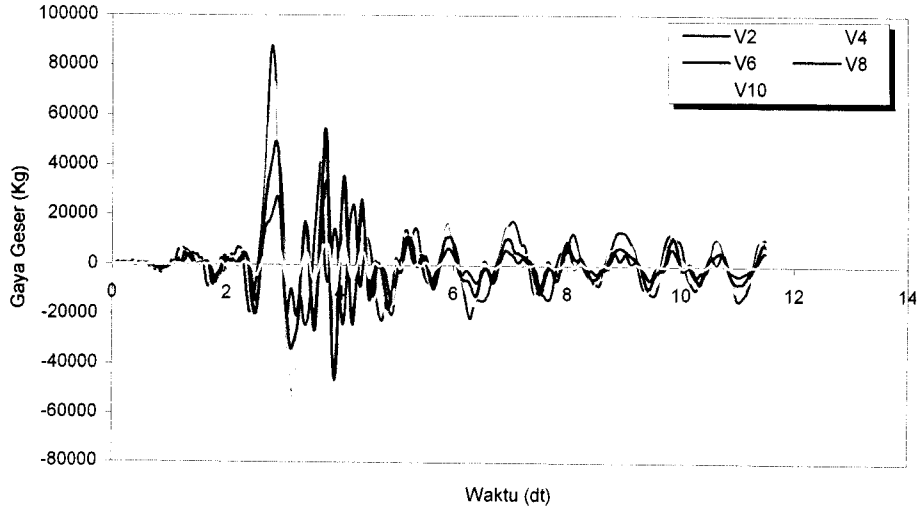


Tingkat 10

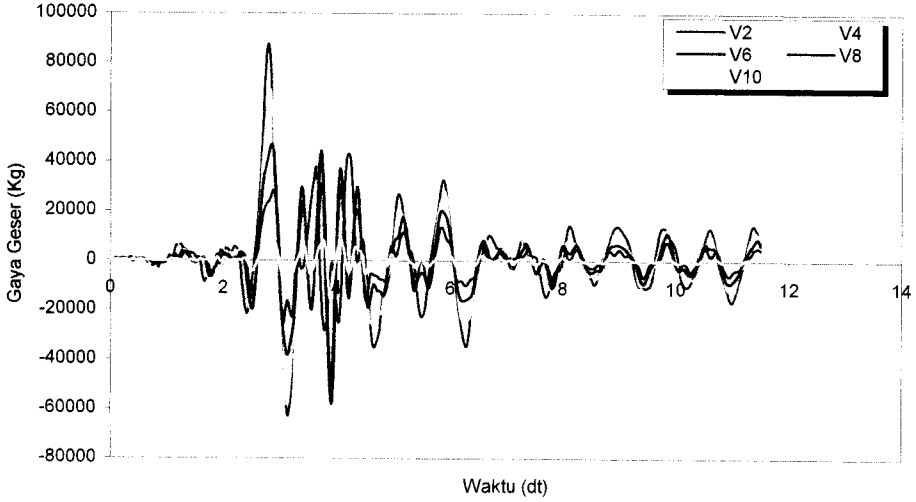
Gambar 5.107 Perbandingan Gaya Geser Struktur Tingkat 10 Akibat Gempa El Centro



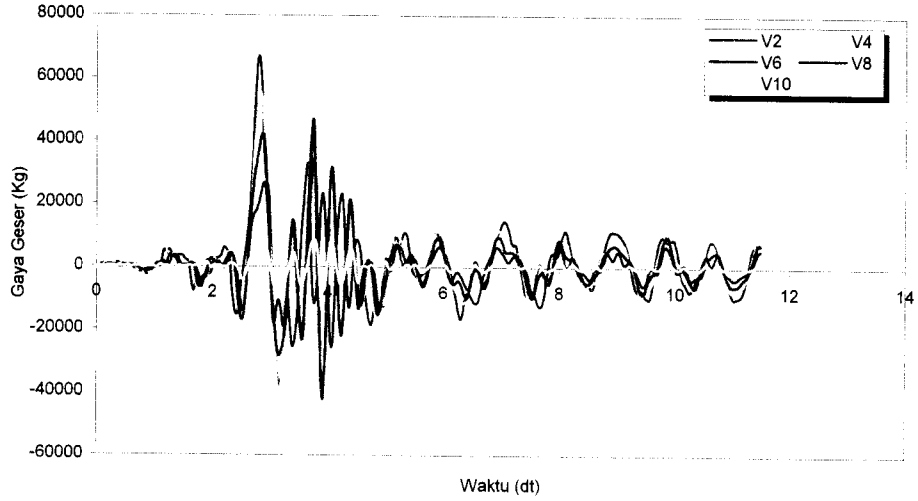
Tipikal



Setback 2

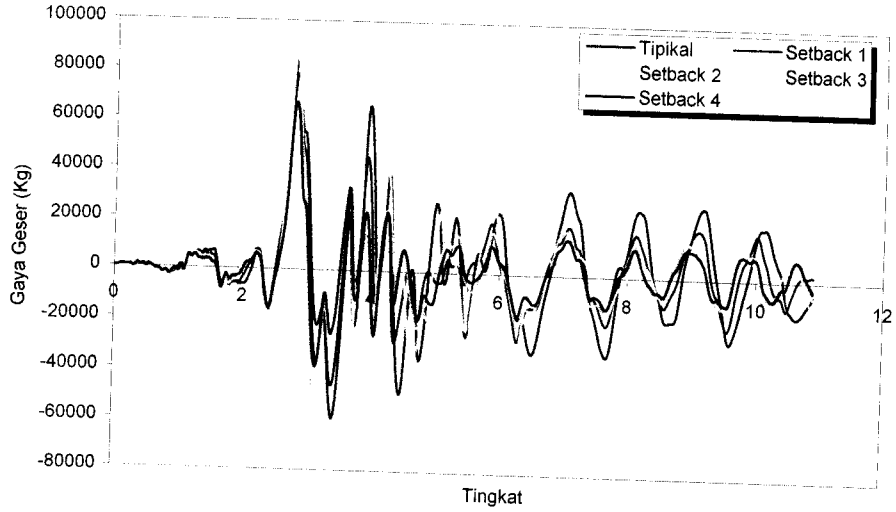


Setback 2

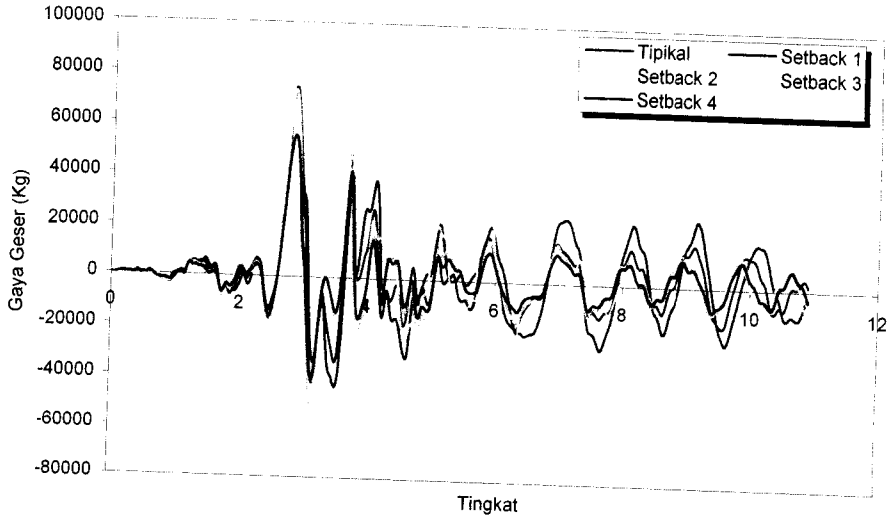


Setback 4

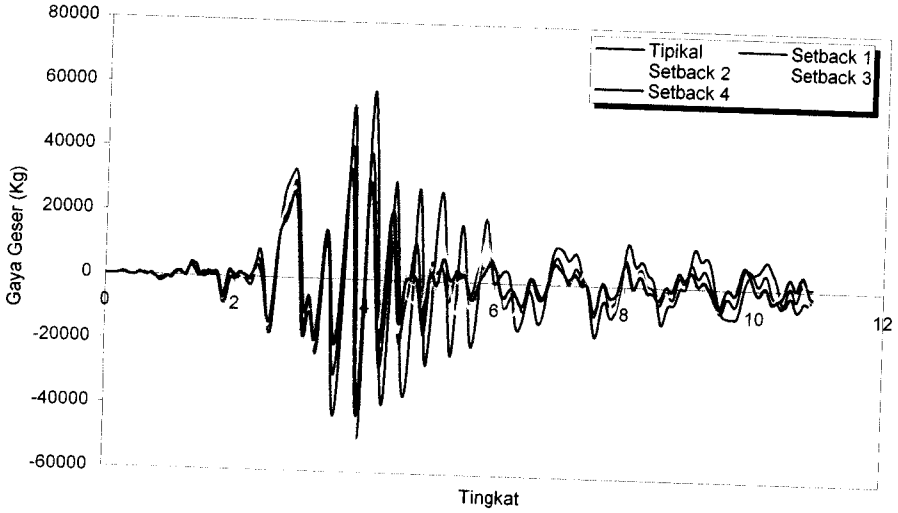
Gambar 5.108 Gaya Geser Struktur Tingkat 10 Akibat Gempa GIlroy



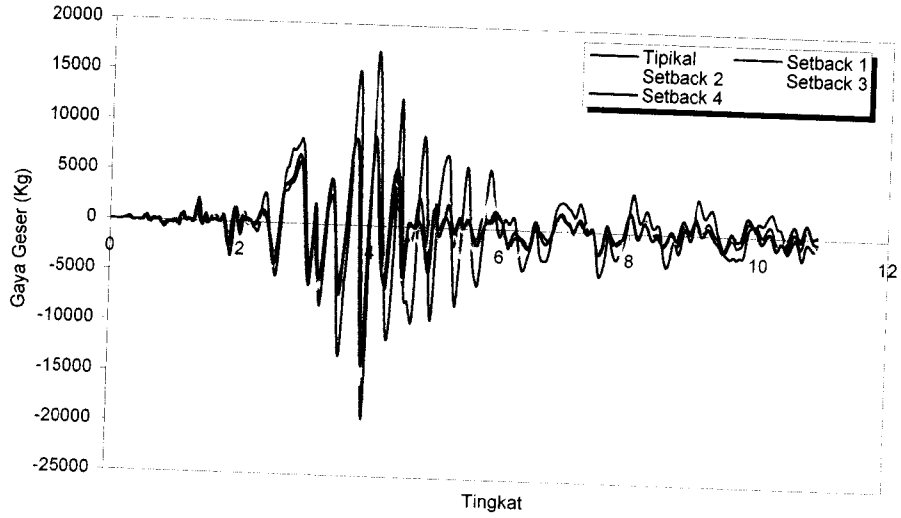
Tingkat 2



Tingkat 4

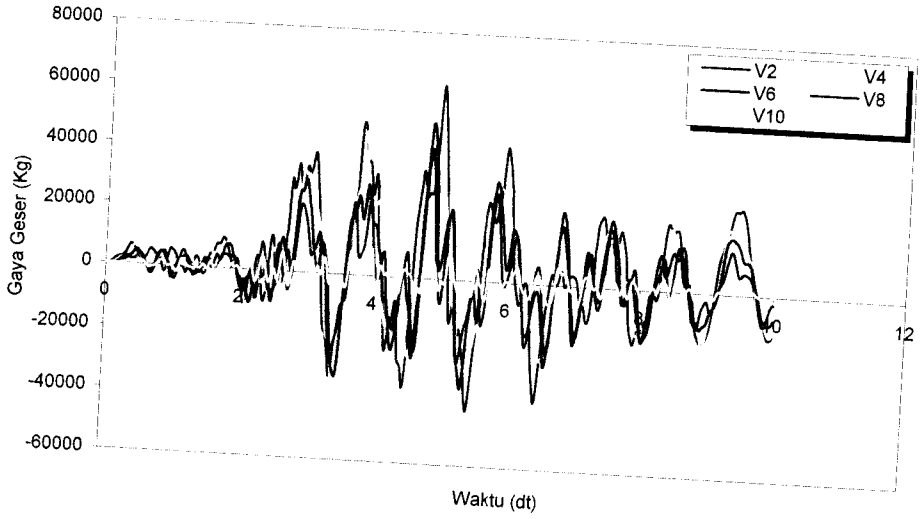


Tingkat 8

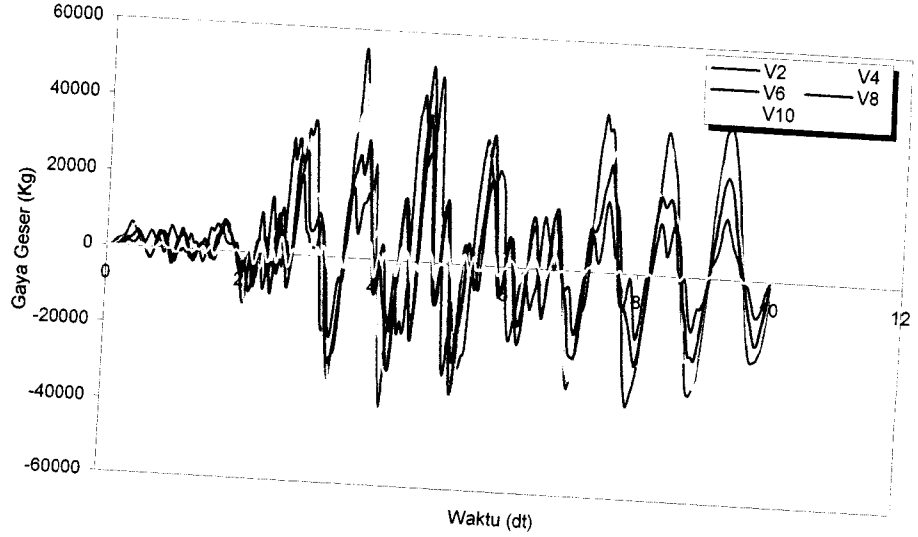


Tingkat 10

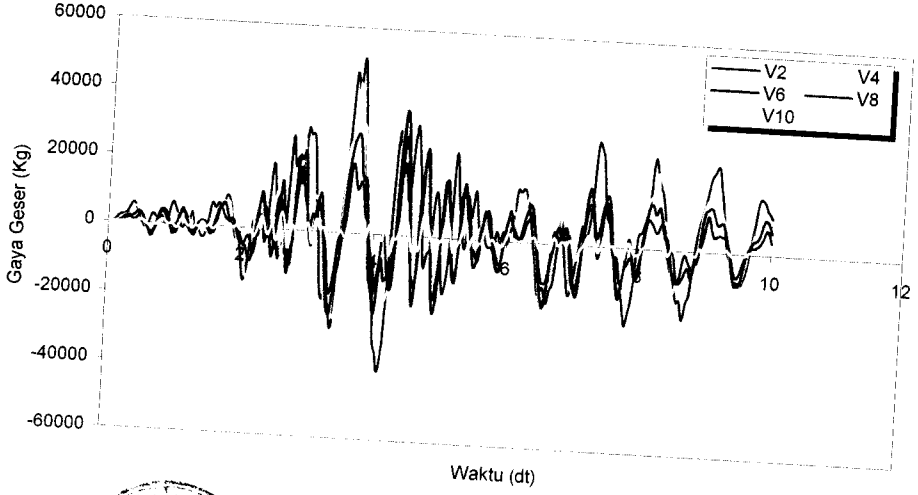
Gambar 5.109 Perbandingan Gaya Geser Struktur Tingkat 10 Akibat Gempa Gllroy



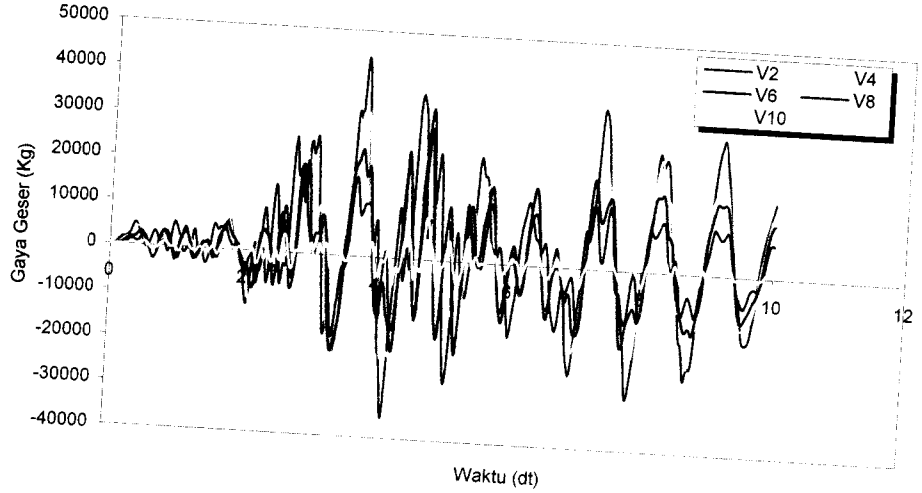
Tipikal



Setback 1

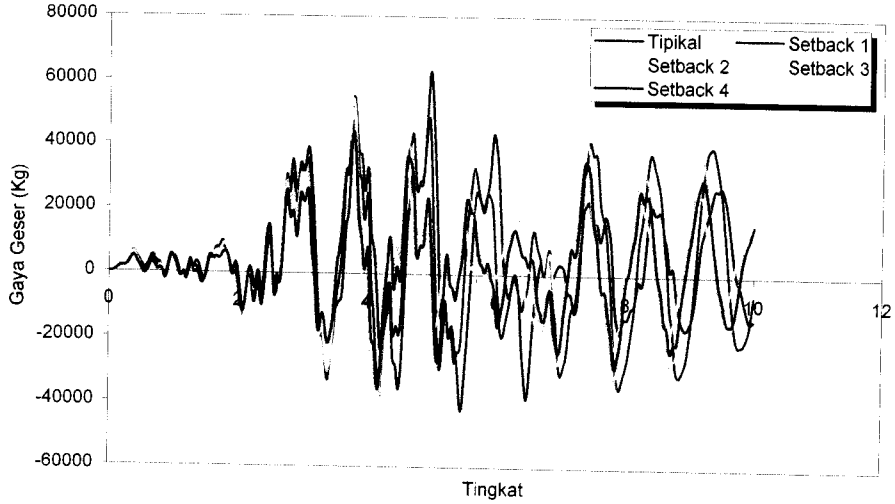


Setback 3

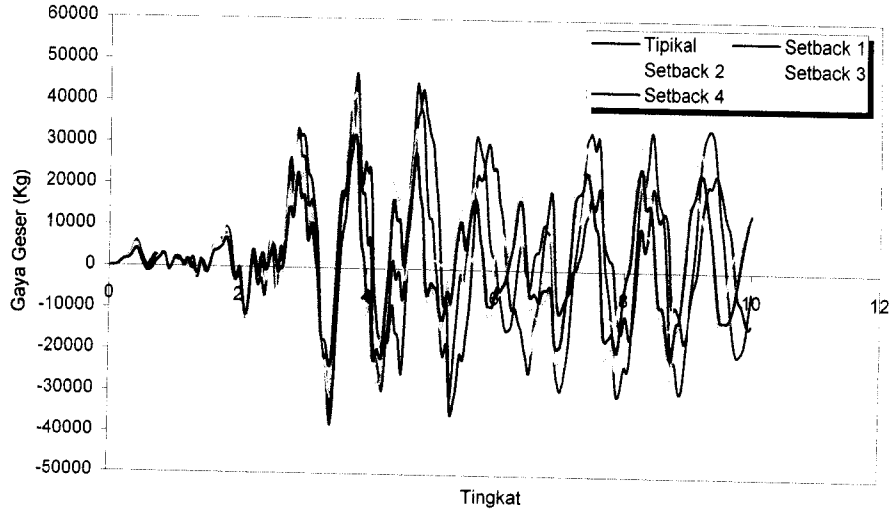


Setback 4

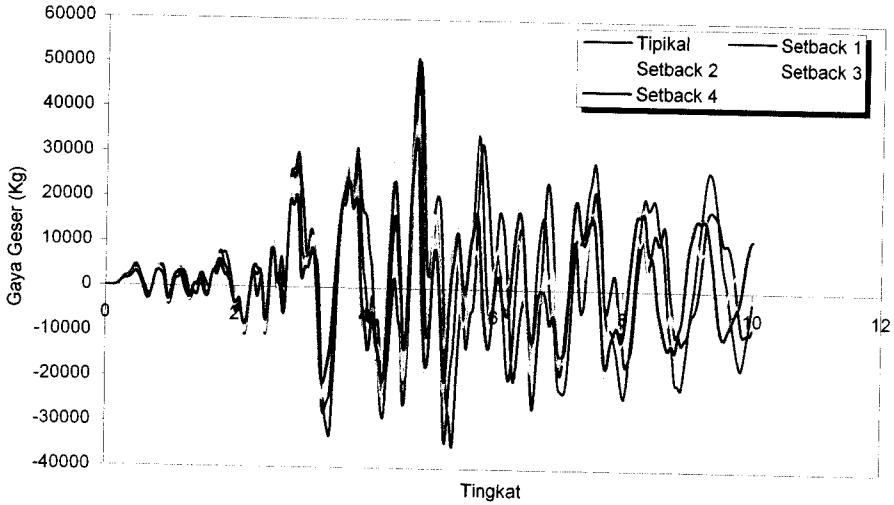
Gambar 5.110 Gaya Geser Struktur Tingkat 10 Akibat Gempa Koyna



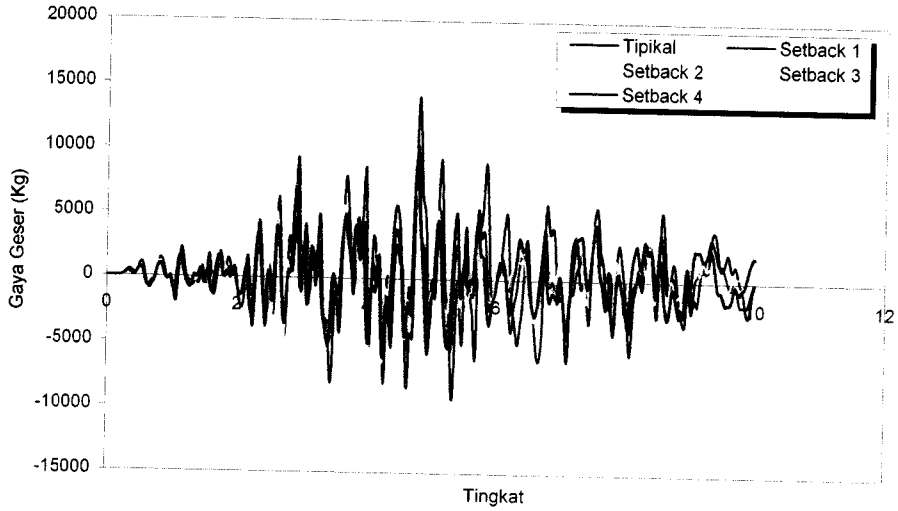
Tingkat 2



Tingkat 4

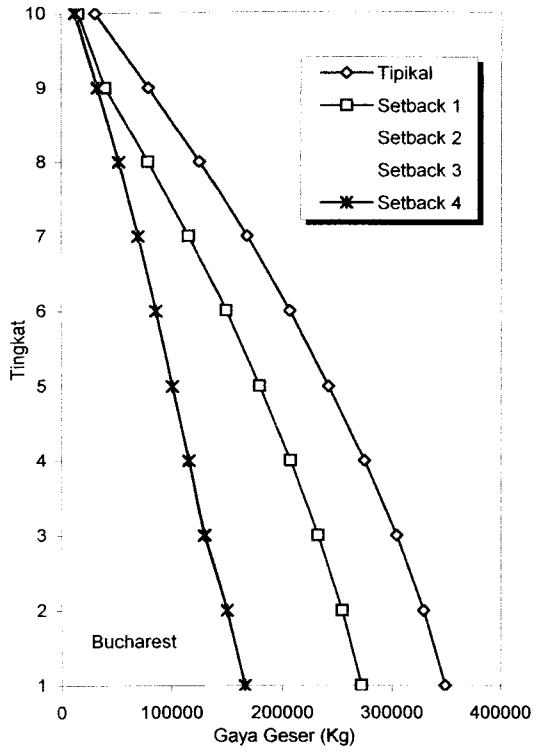


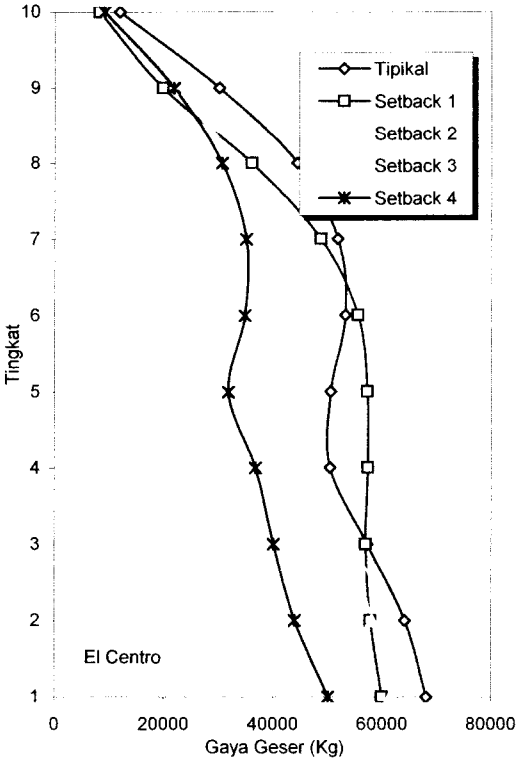
Tingkat 6

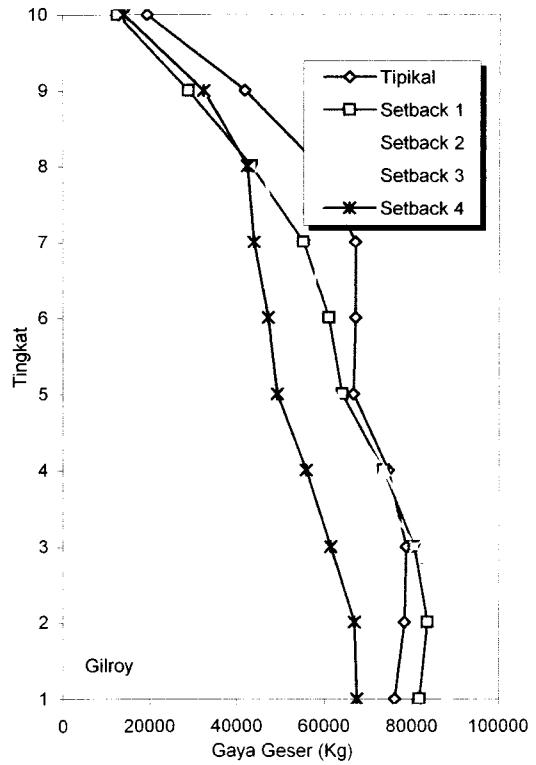


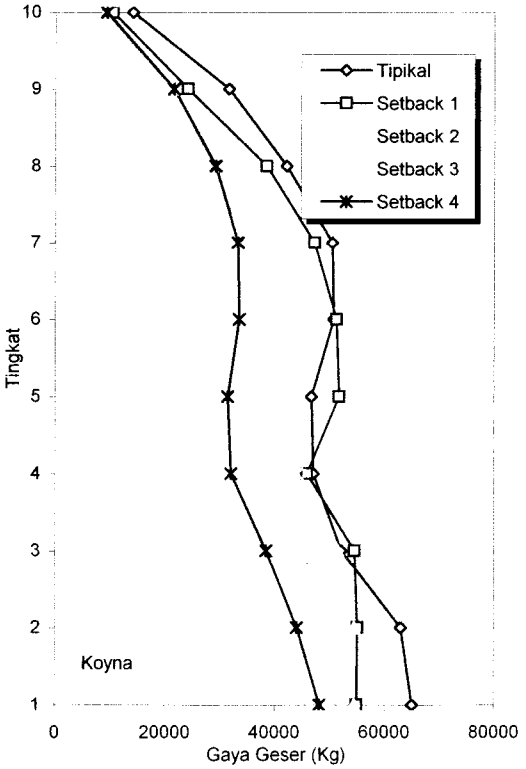
Tingkat 10

Gambar 5.111 Perbandingan Gaya Geser Struktur Tingkat 10 Akibat Gempa Koyna

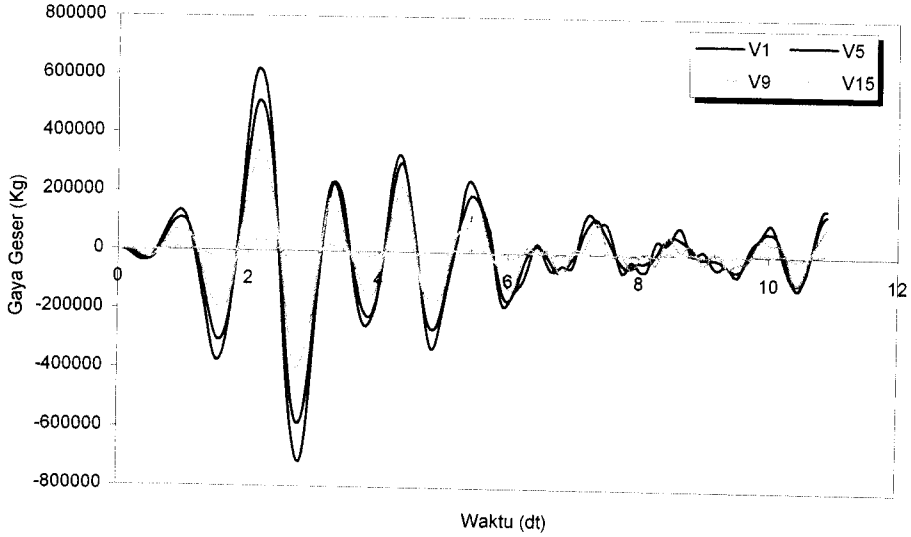




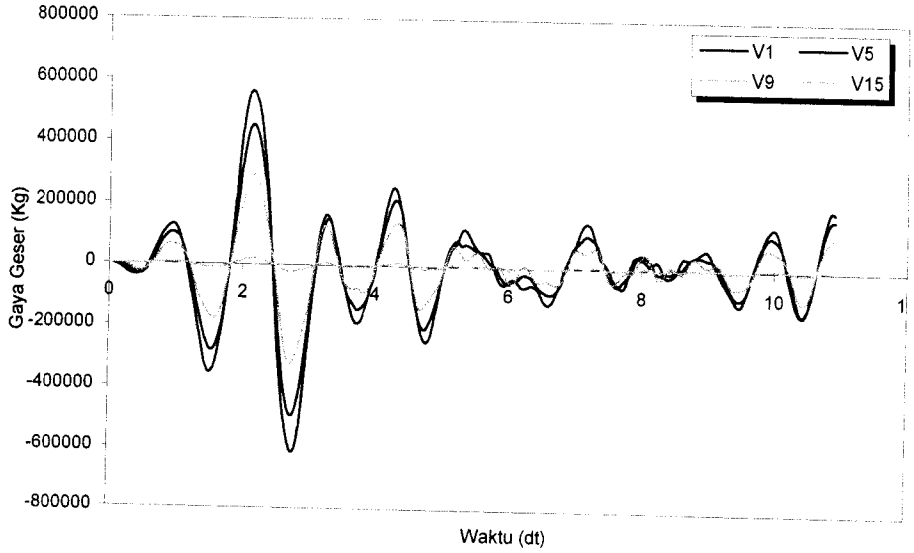




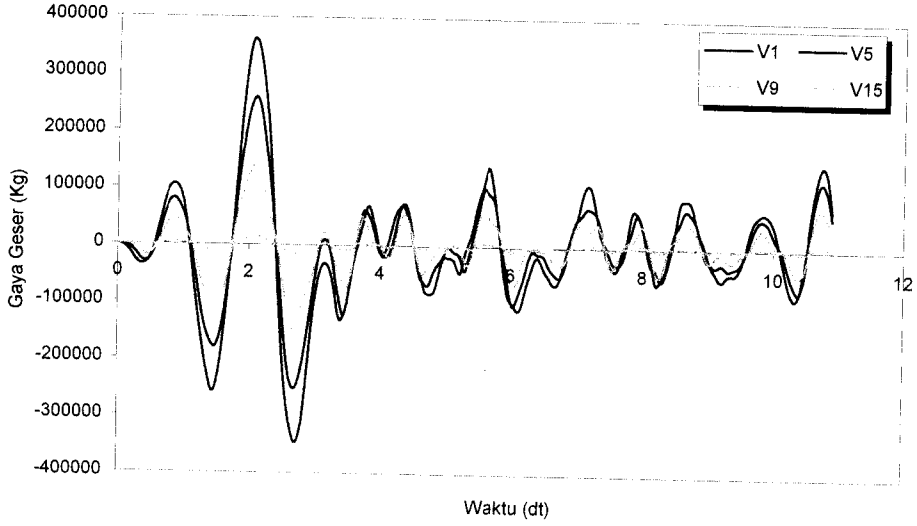
Gambar 5.112 Gaya Geser Struktur Maksimum Tingkat 10 Akibat 4 Gempa



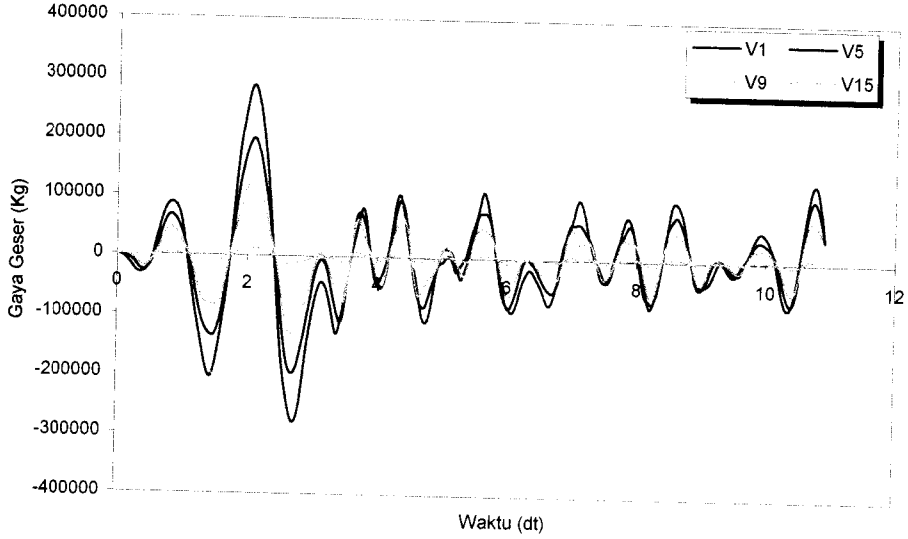
Tipikal



Setback 1

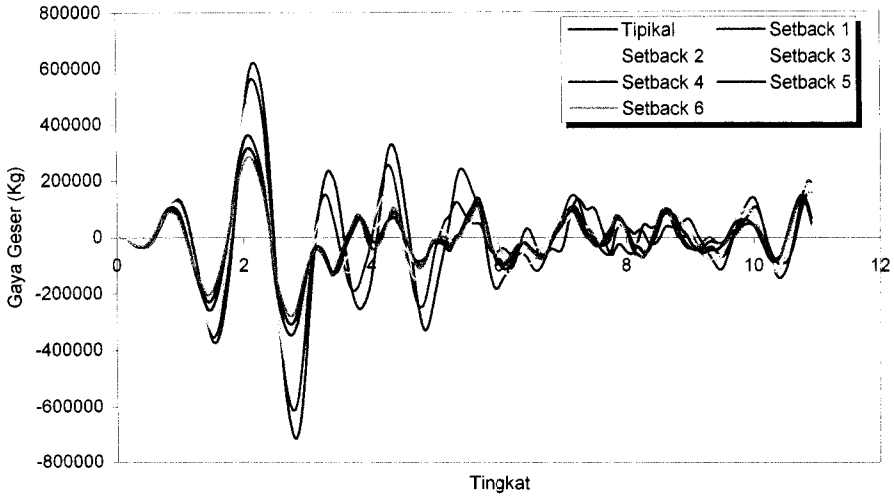


Setback 4

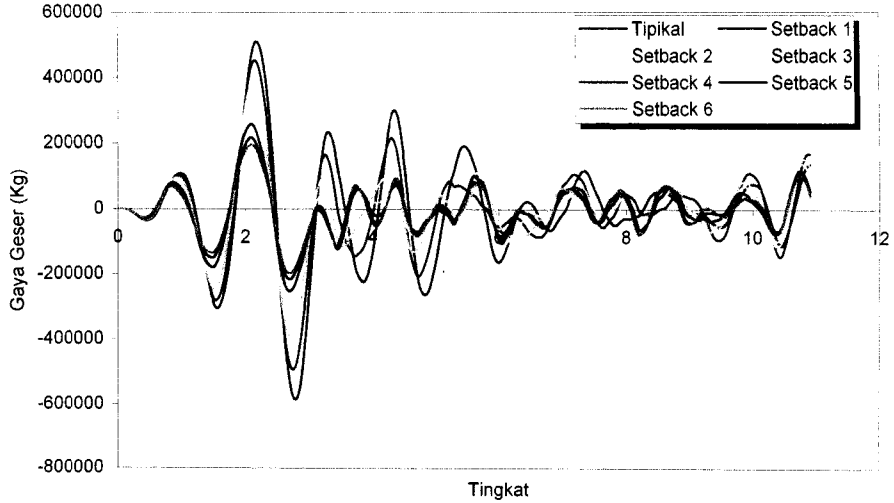


Setback 6

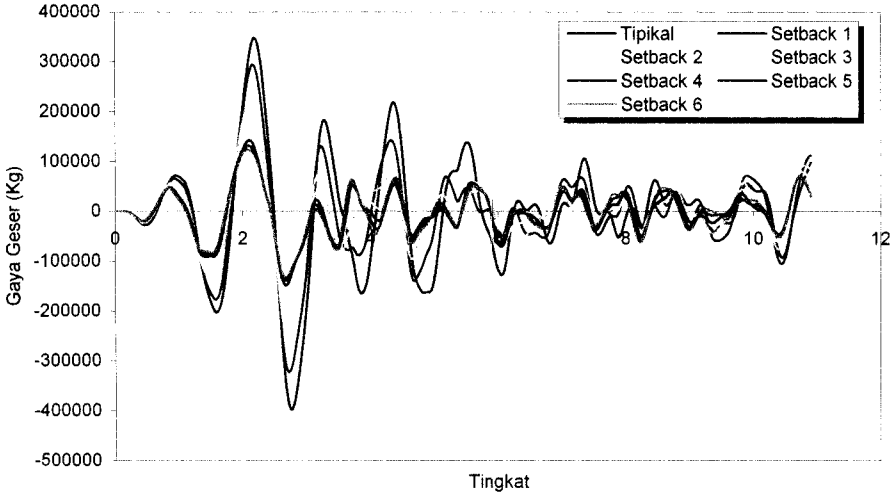
Gambar 5.113 Gaya Geser Struktur Tingkat 15 Akibat Gempa Bucharest



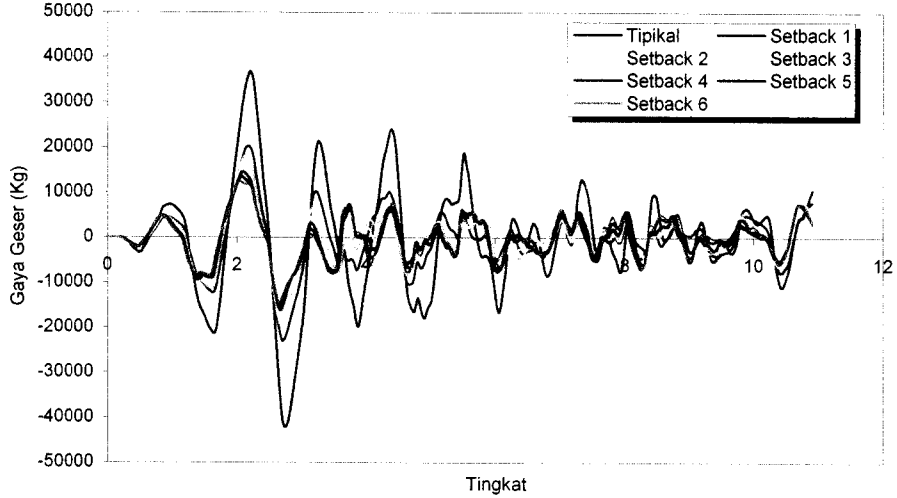
Tingkat 1



Tingkat 5

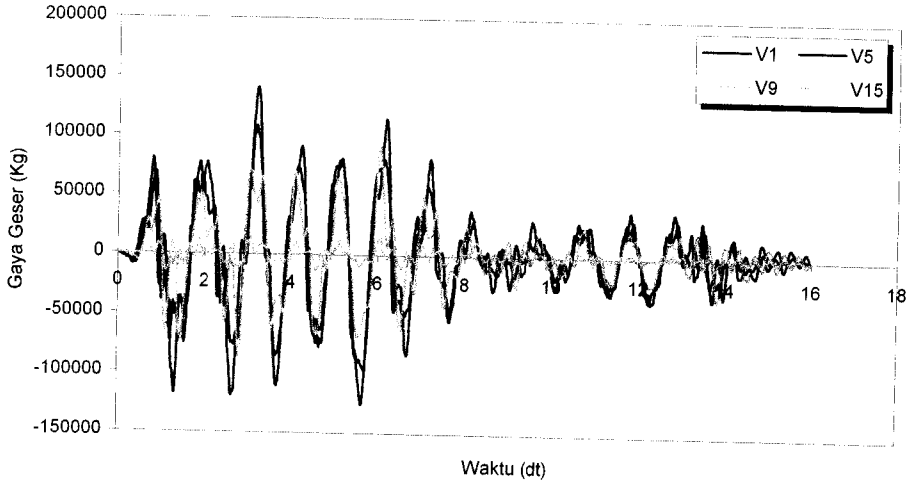


Tingkat 9

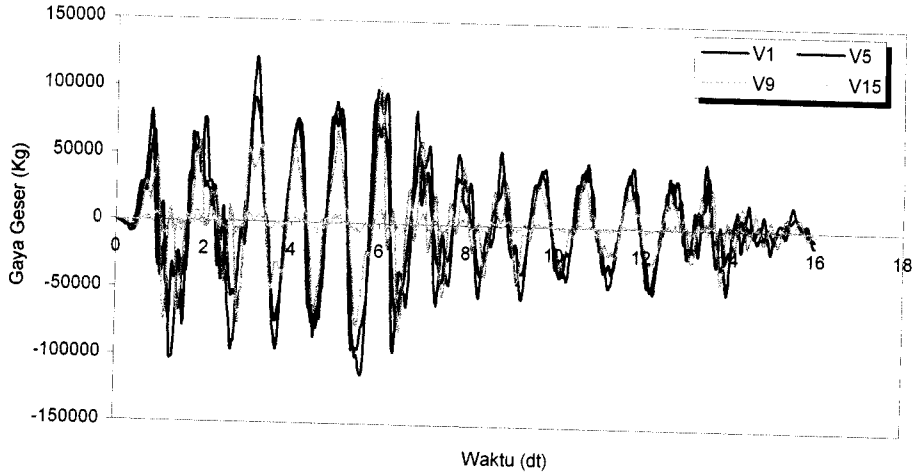


Tingkat 15

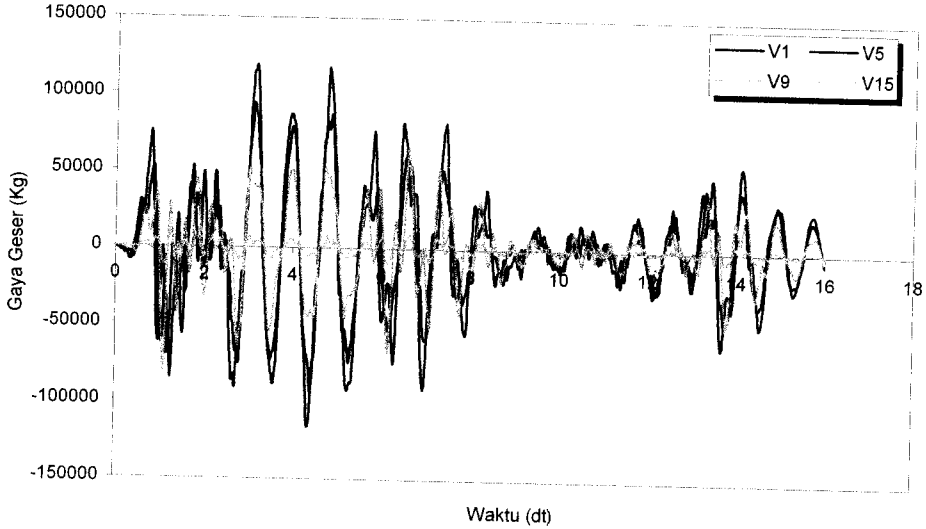
Gambar 5.114 Perbandingan Gaya Geser Struktur Tingkat 15 Akibat Gempa Bucharest



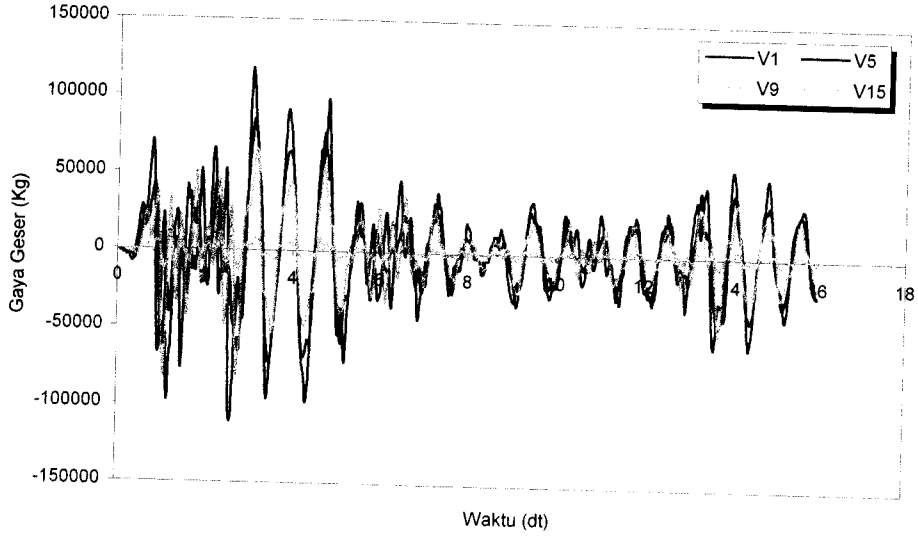
Tipikal



Setback 1

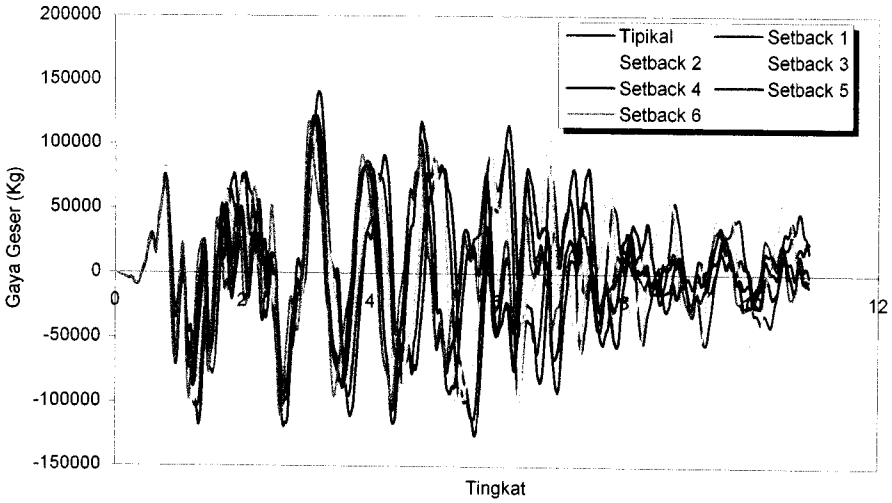


Setback 4

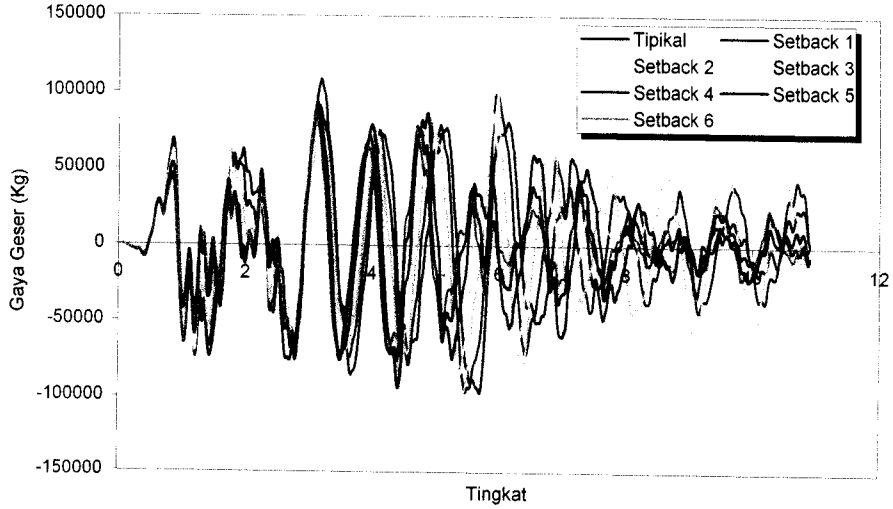


Setback 6

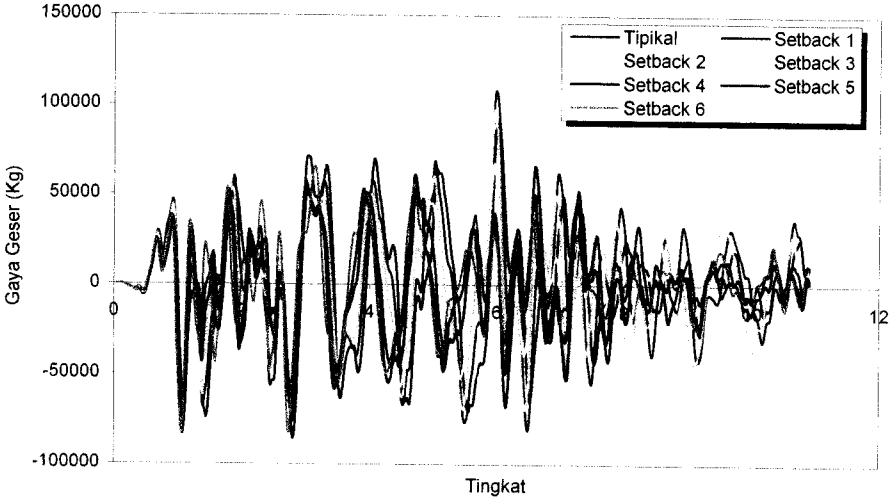
Gambar 5.115 Gaya Geser Struktur Tingkat 15 Akibat Gempa El Centro



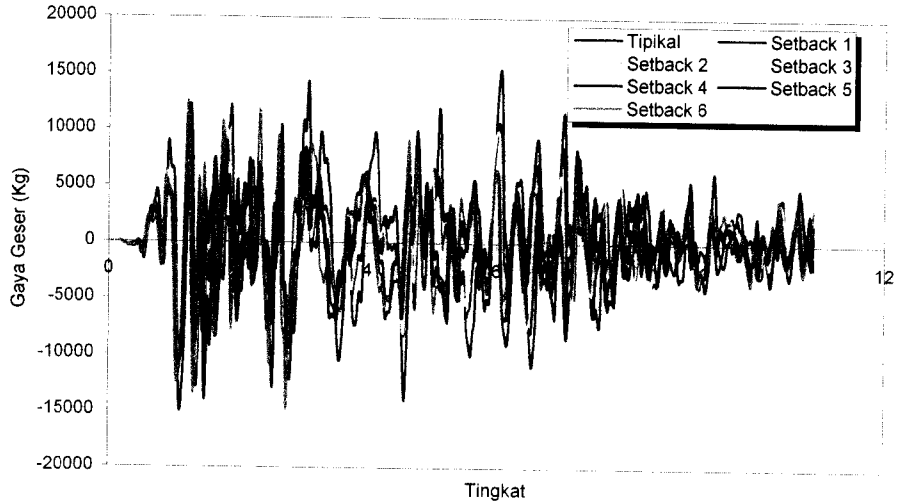
Tingkat 1



Tingkat 5

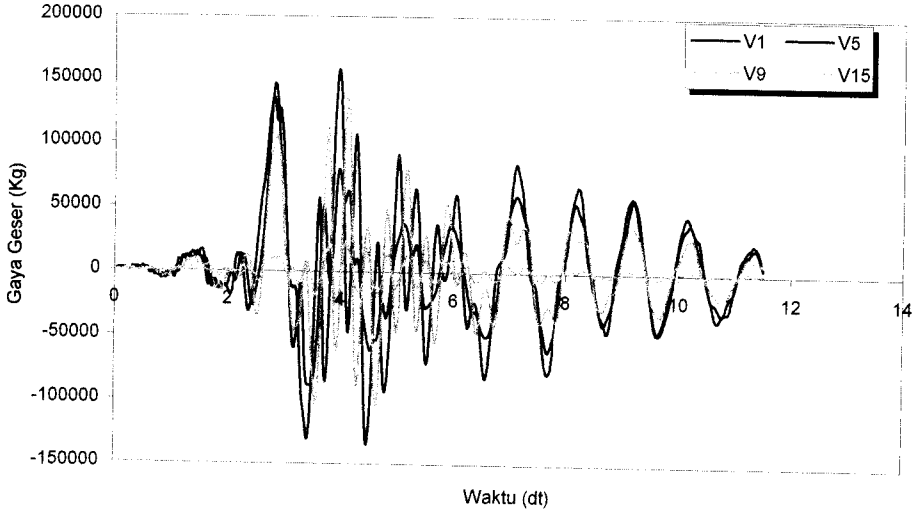


Tingkat 9

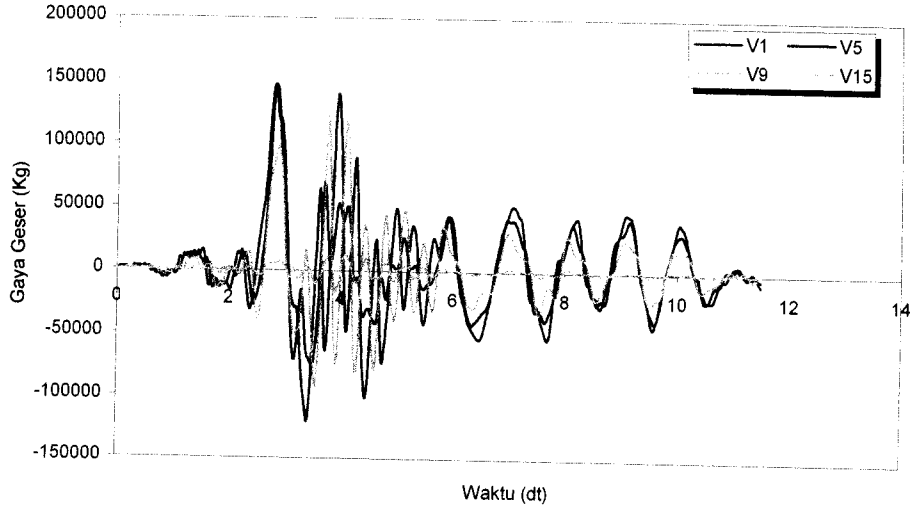


Tingkat 15

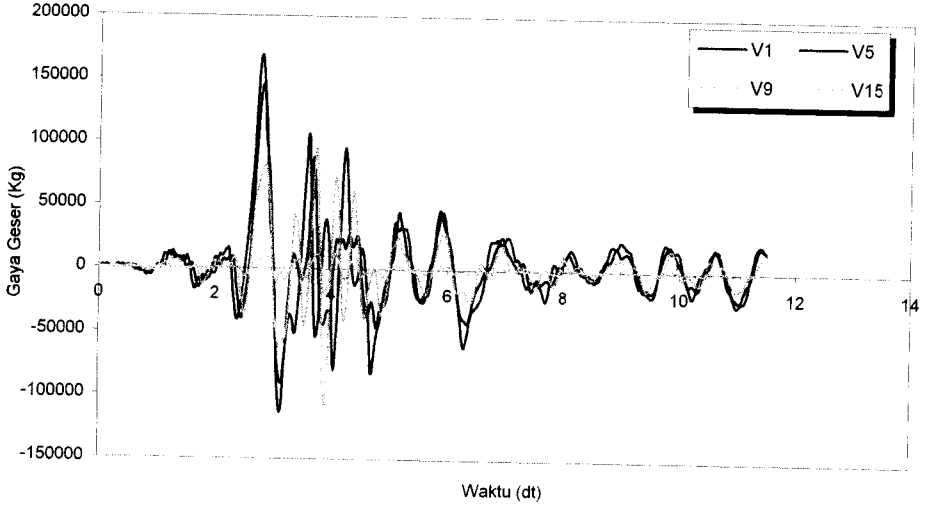
Gambar 5.116 Perbandingan Gaya Geser Struktur Tingkat 15 Akibat Gempa El Centro



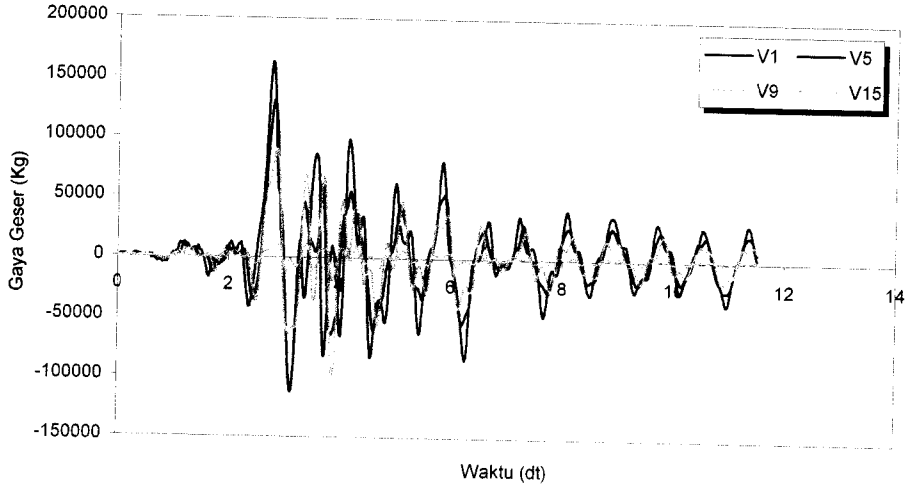
Tipikal



Setback 1

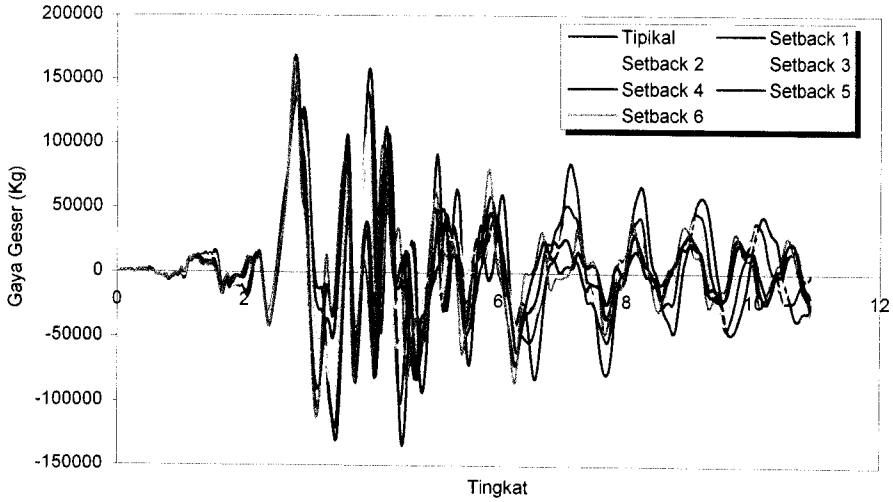


Setback 4

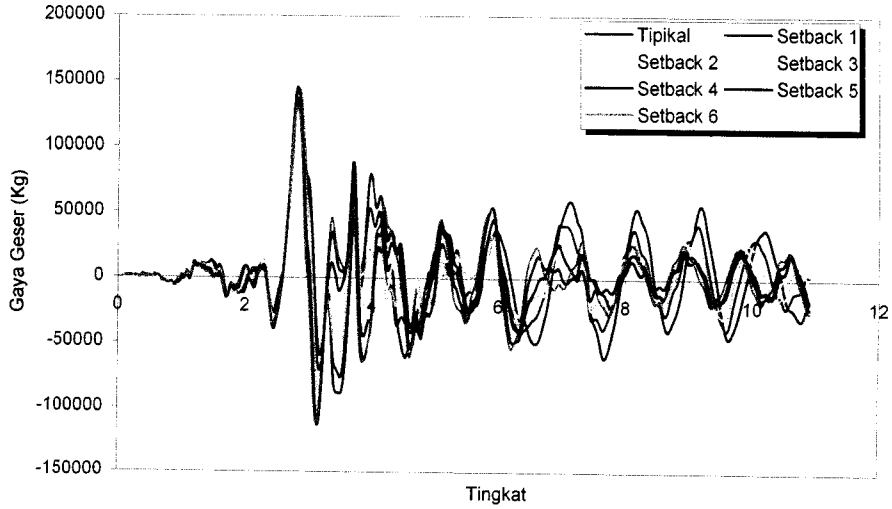


Setback 6

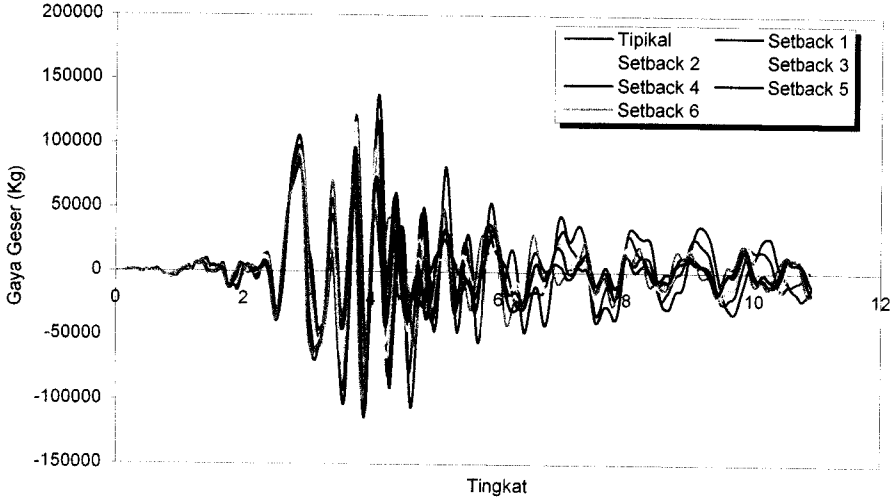
Gambar 5.117 Gaya Geser Struktur Tingkat 15 Akibat Gempa Gilroy



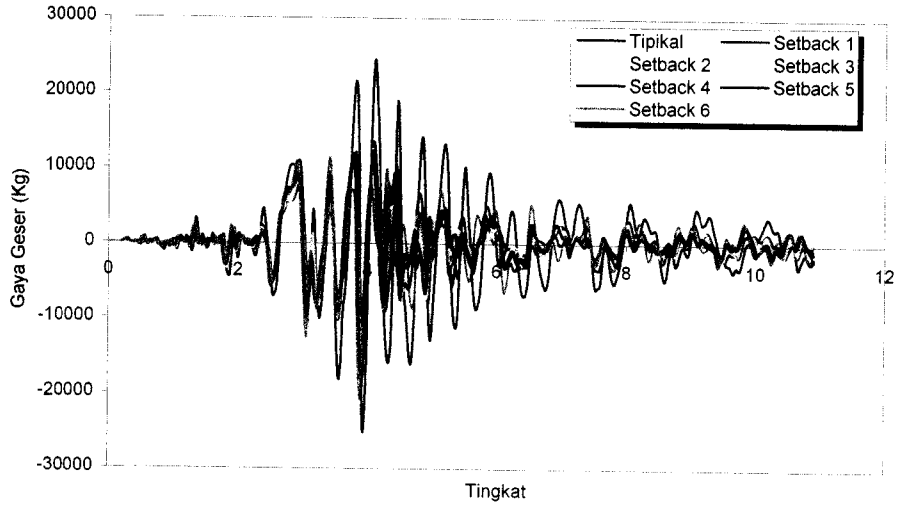
Tingkat 1



Tingkat 5

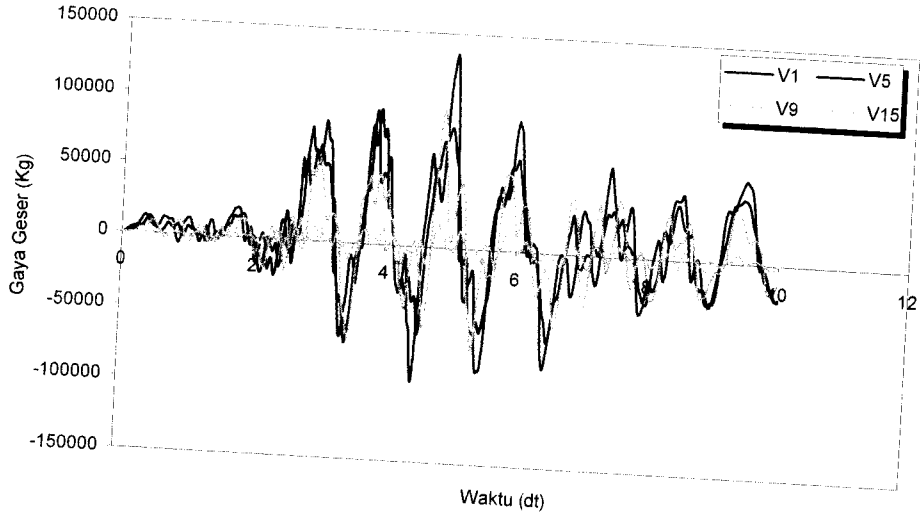


Tingkat 9

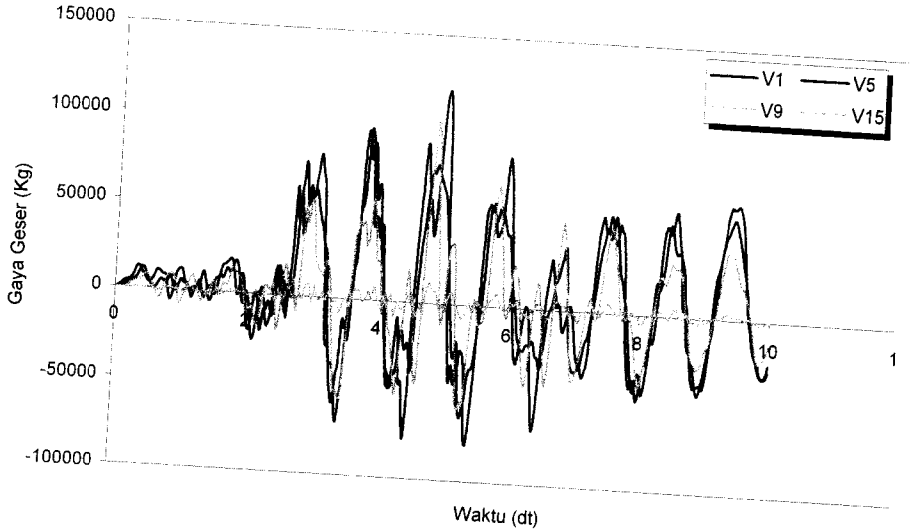


Tingkat 15

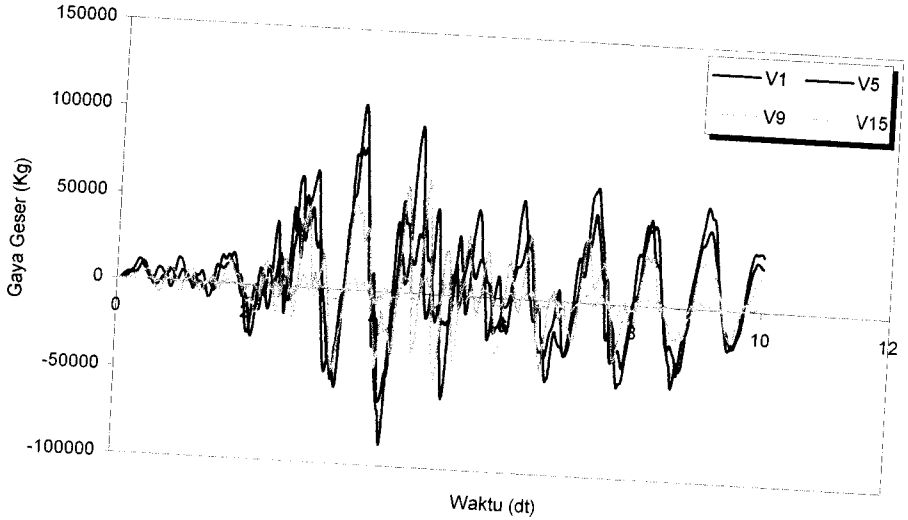
Gambar 5.118 Perbandingan Gaya Geser Struktur Tingkat 15 Akibat Gempa Gilroy



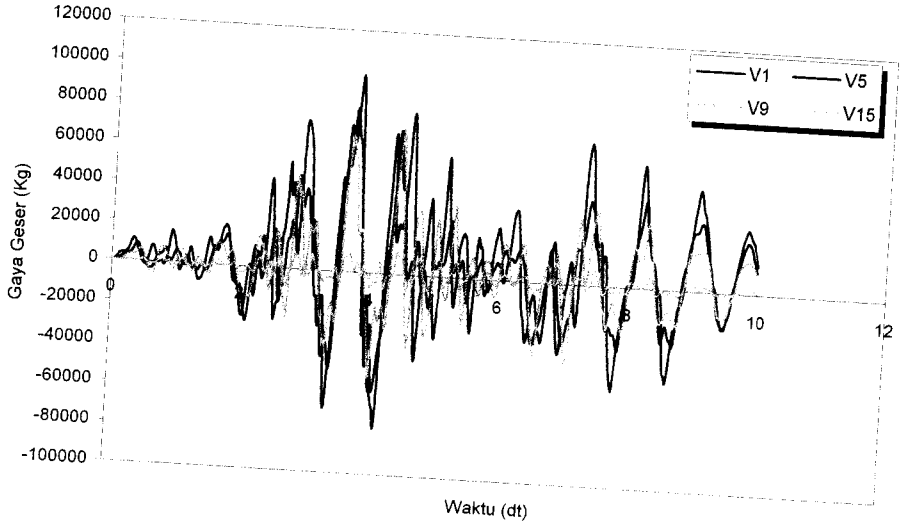
Tipikal



Setback 1

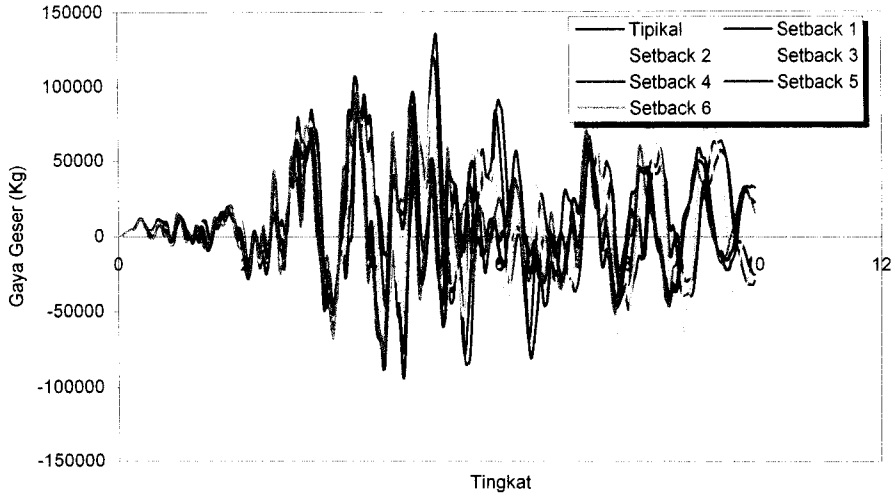


Setback 4

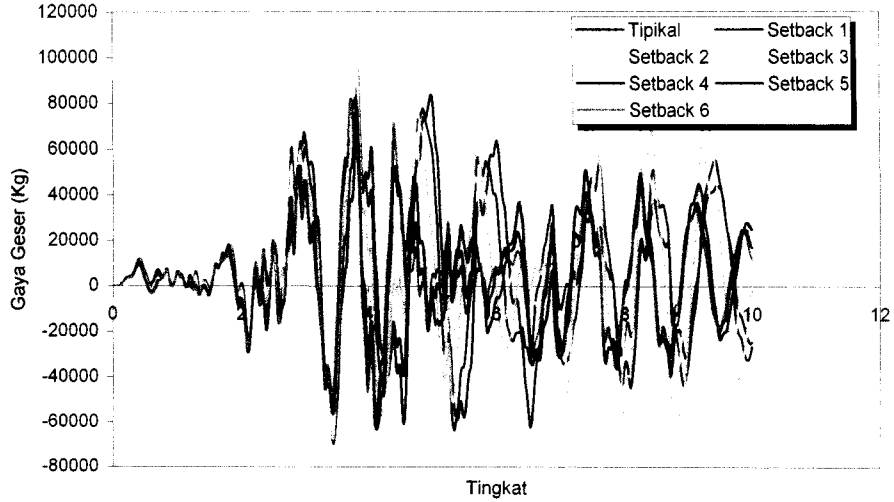


Setback 6

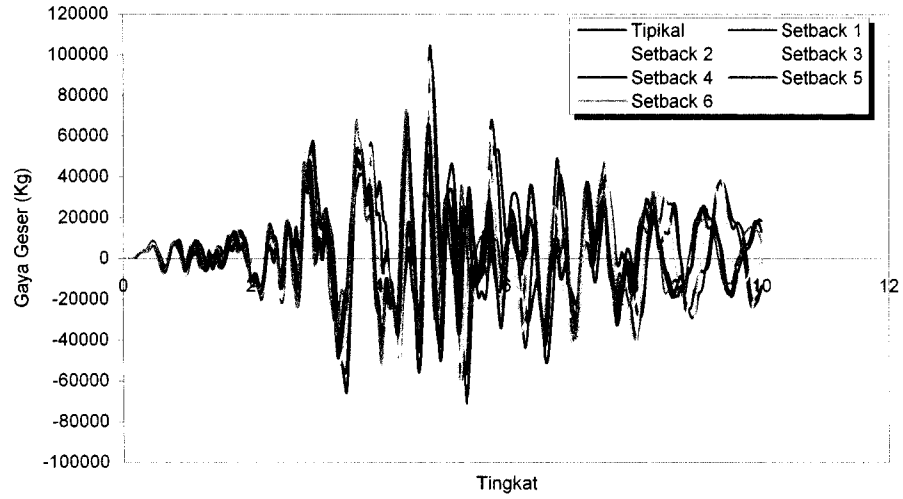
Gambar 5.119 Gaya Geser Struktur Tingkat 15 Akibat Gempa Koyna



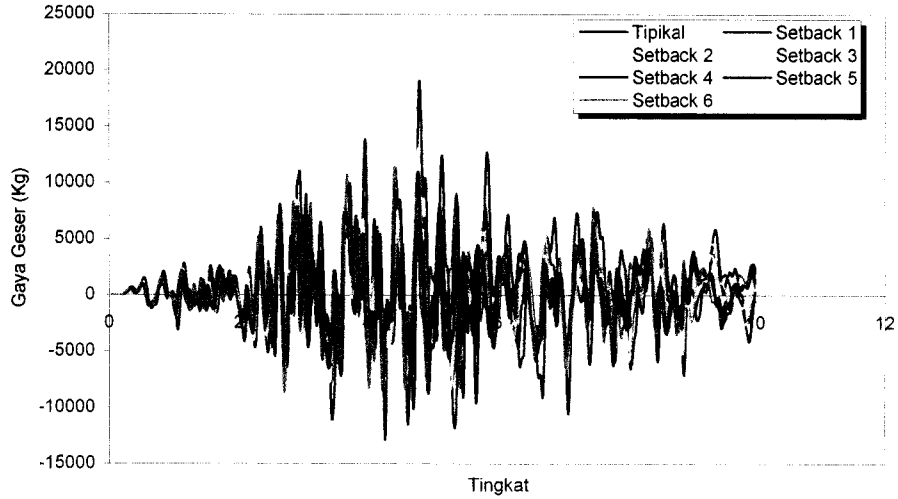
Tingkat 1



Tingkat 5

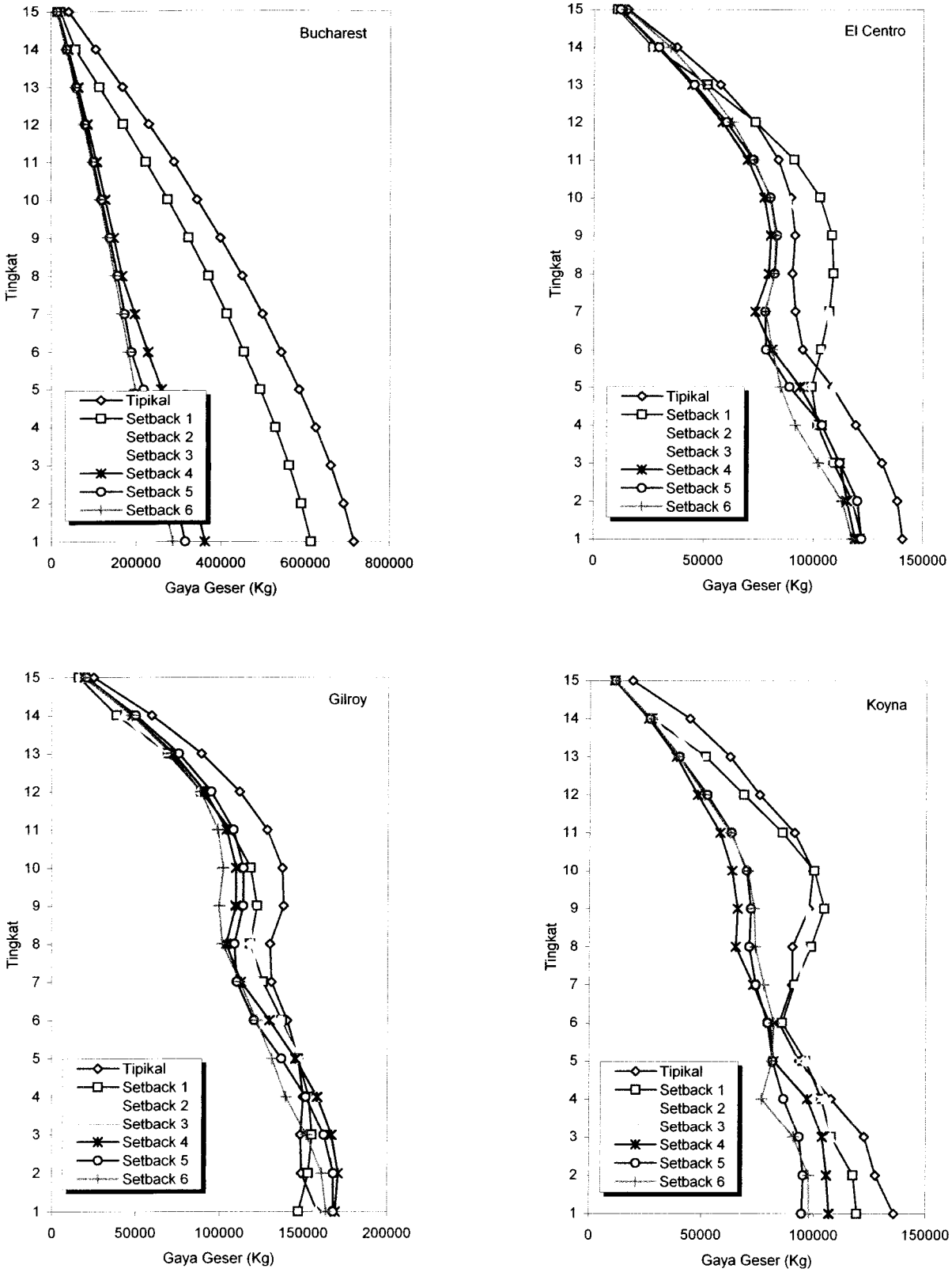


Tingkat 9

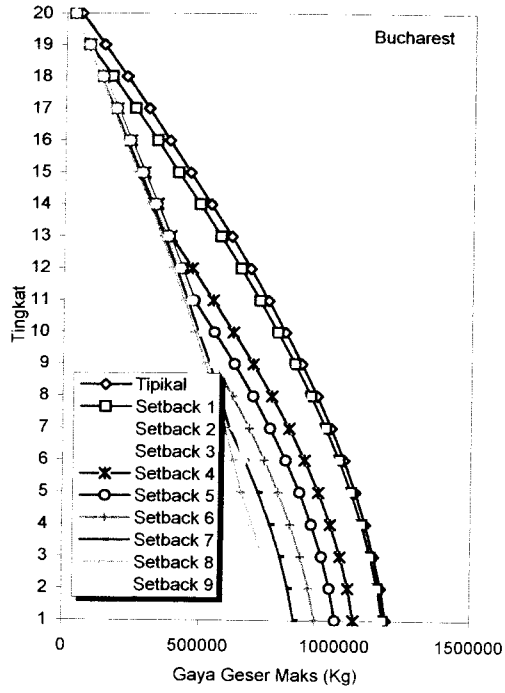


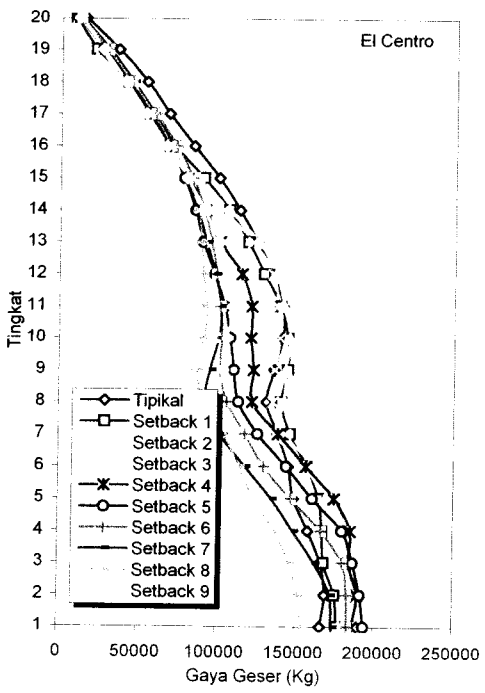
Tingkat 15

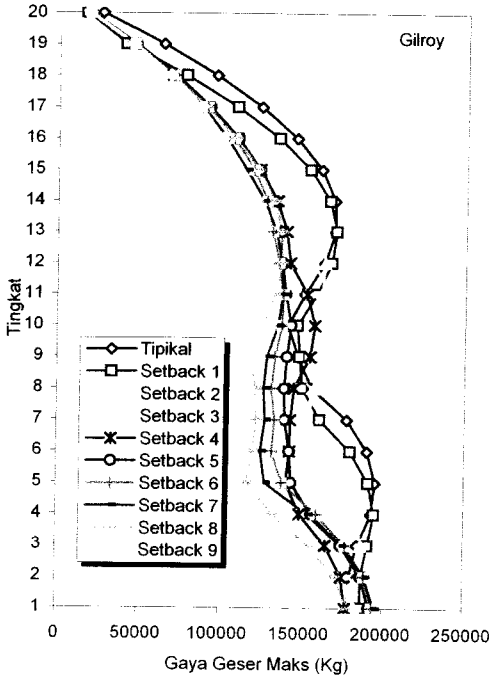
Gambar 5.120 Perbandingan Gaya Geser Struktur Tingkat 15 Akibat Gempa Koyna

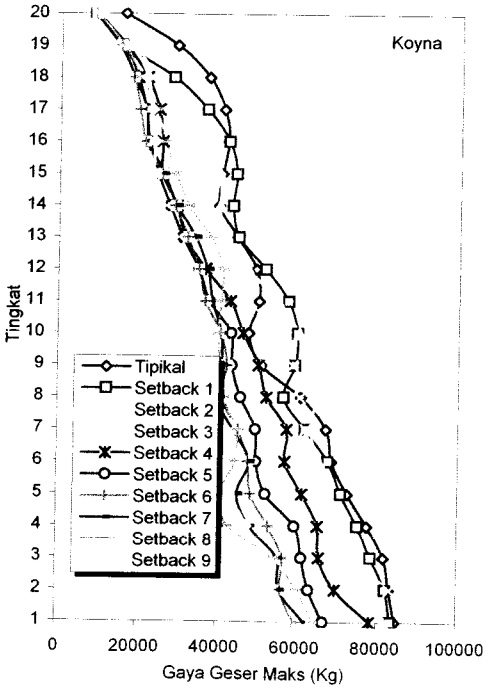


Gambar 5.121 Gaya Geser Maksimum Struktur Tingkat 15 Akibat 4 Gempa









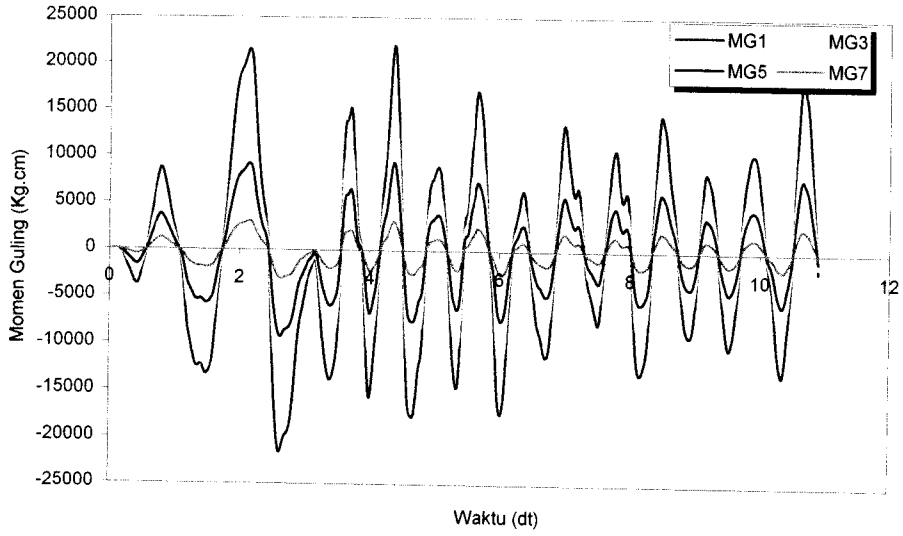
Gambar 5.122 Gaya Geser Maksimum Struktur Tingkat 20 Akibat 4 Gempa

5.4.6 Momen Guling

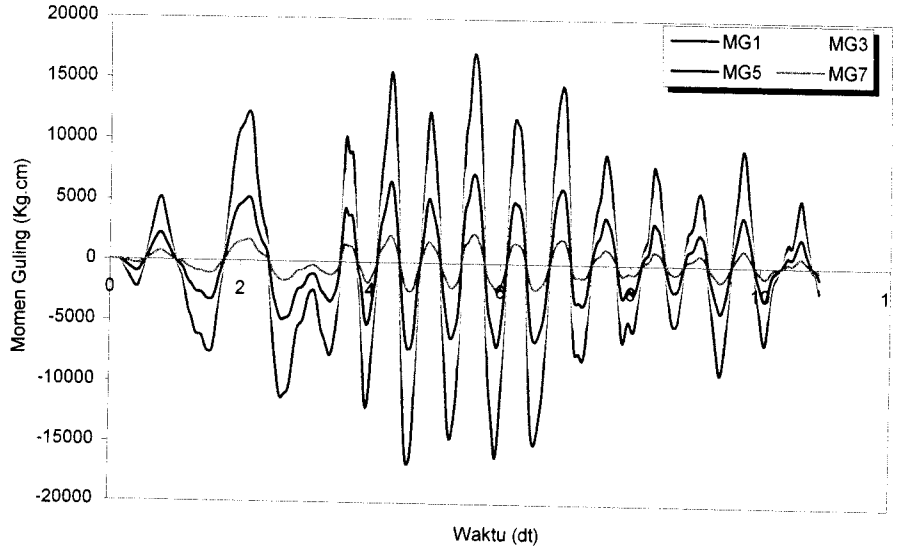
Momen guling merupakan perkalian antara gaya horizontal antar tingkat dengan tinggi tiap tingkat. Dihitung berdasarkan atas persamaan (3.59).

Dari program ini dapat disajikan nilai-nilai *Momen Guling* untuk struktur bangunan tingkat 7, 10, 15, 20 dengan 4 variasi gempa pada Gambar 5.123 sampai dengan Gambar 5.150. Dengan memperhatikan Gambar 5.123 sampai dengan Gambar 5.150 tersebut, maka dapat dilihat bahwa Nilai *Momen Guling* semakin ke atas nilainya akan semakin kecil. Hal tersebut disebabkan karena *Momen Guling* merupakan perkalian dari gaya horisontal dengan tinggi tingkat. Sedangkan semakin ke atas jarak tingkat tersebut ke tingkat yang paling atas semakin berkurang jika dibandingkan dengan jarak tingkat pertama ke tingkat paling atas.

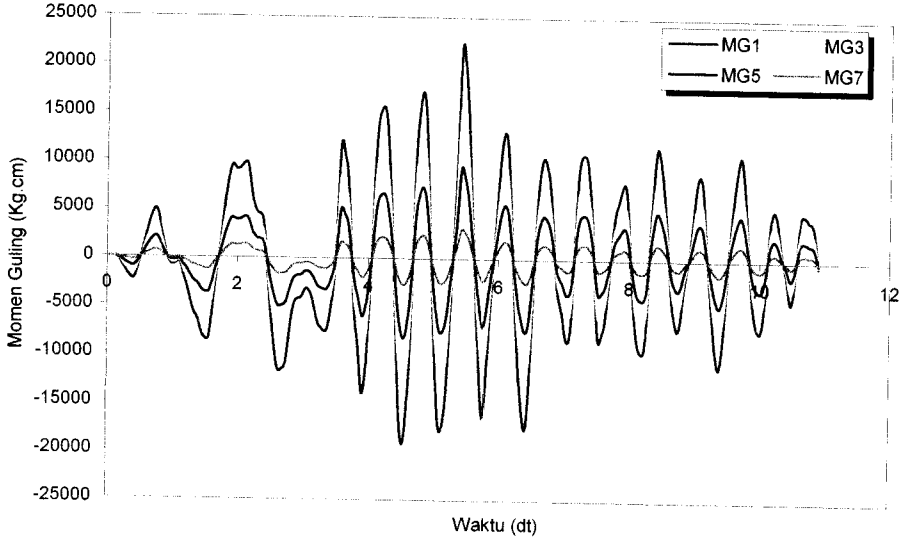
Nilai *Momen Guling* akan semakin mengecil pada struktur tipikal ke setback vertikal yang paling kritis dimana terdapat pengurangan massa dan kekakuan secara vertikal. Hal ini disebabkan karena *Momen Guling* tergantung pada gaya horizontal tingkat dan tinggi tingkat. Pada pembahasan diatas nilai gaya horisontal tingkat dari struktur tipikal sampai setback vertikal yang paling kritis semakin mengecil karena adanya pengurangan muka lantai secara vertikal (setback vertikal) maka hal tersebut menyebabkan *Momen Guling* juga ikut mengecil. Pada pembebanan gempa Elcentro dan Gilroy nilai *Momen Guling* sangat fluktuatif itu karena perbedaan periode (T). Nilai *Momen Guling* akibat gempa Koyna nilainya semakin rapat ini dikarenakan gempa Koyna berfrekuensi tinggi.



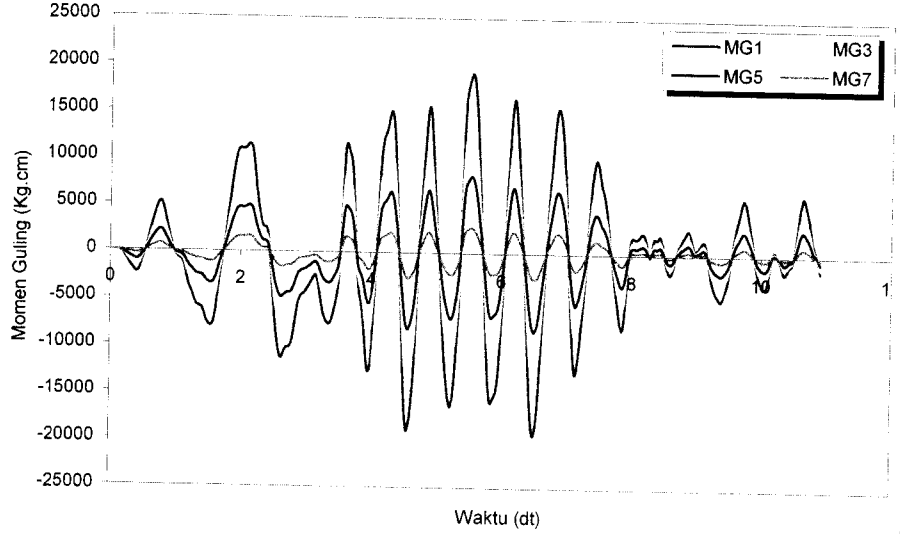
Tipikal



Setback 1

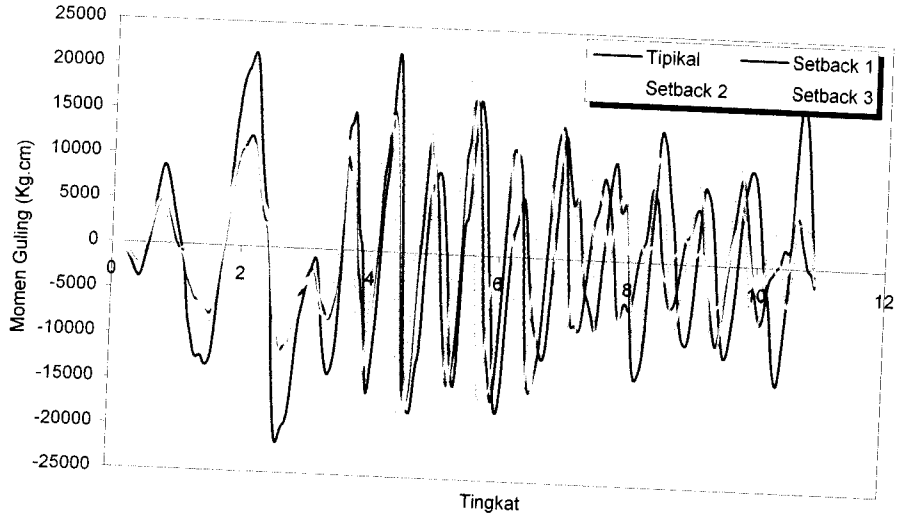


Setback 2

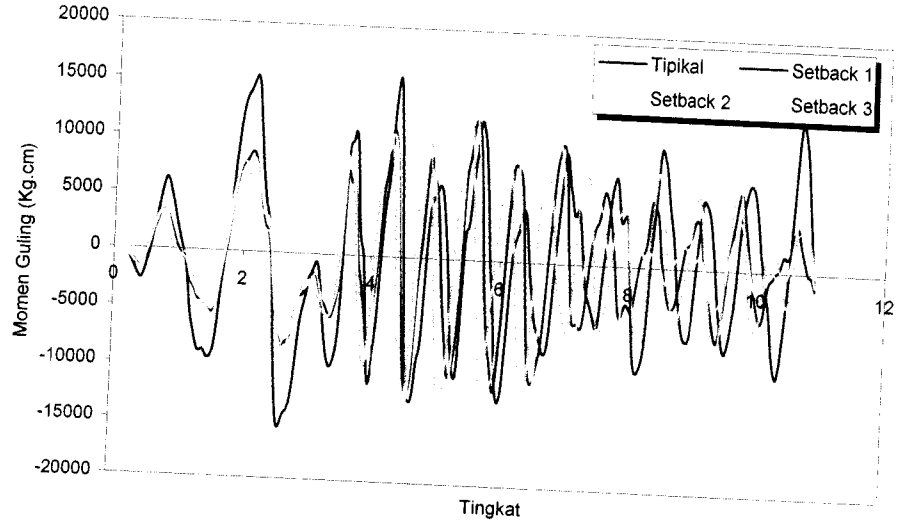


Setback 3

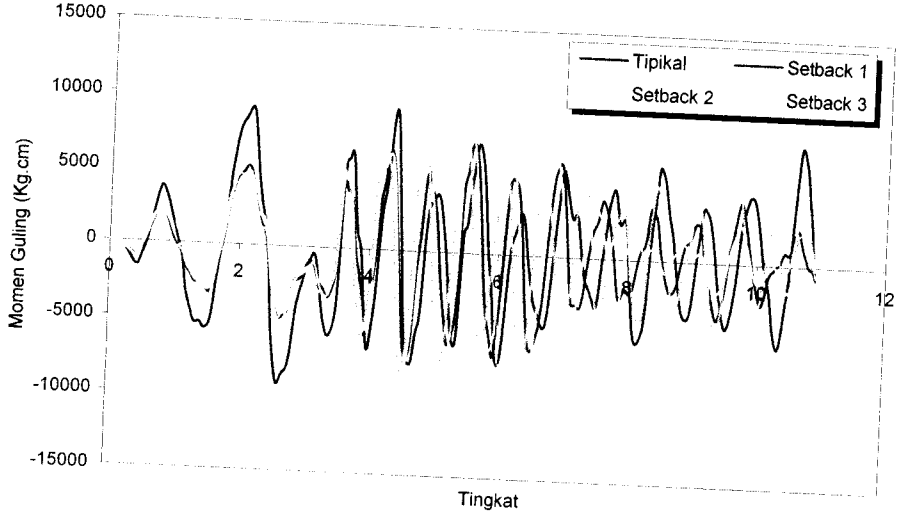
Gambar 5.123 Momen Guling Struktur Tingkat 7 Akibat Gempa Bucharest



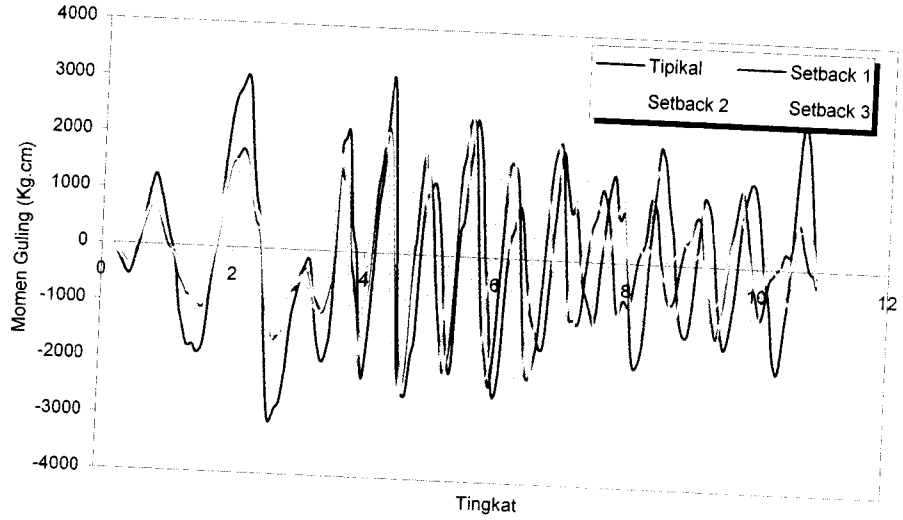
Tingkat 1



Tingkat 3

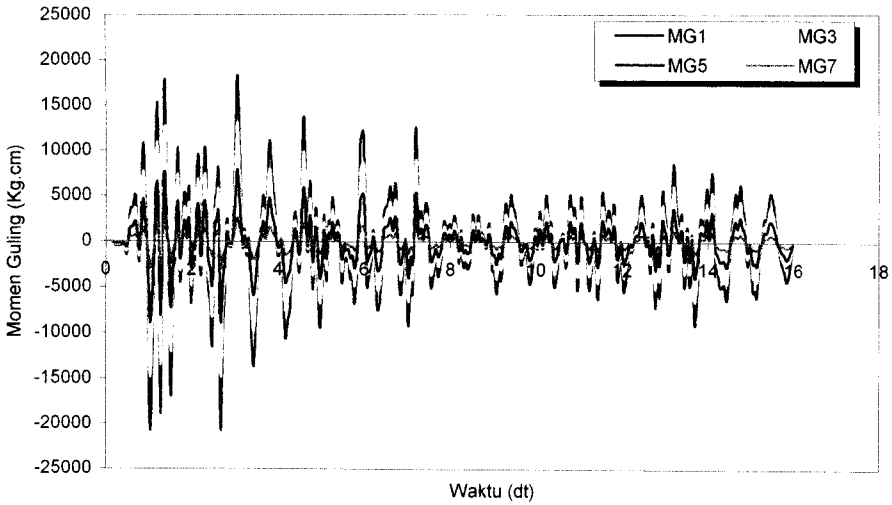


Tingkat 5

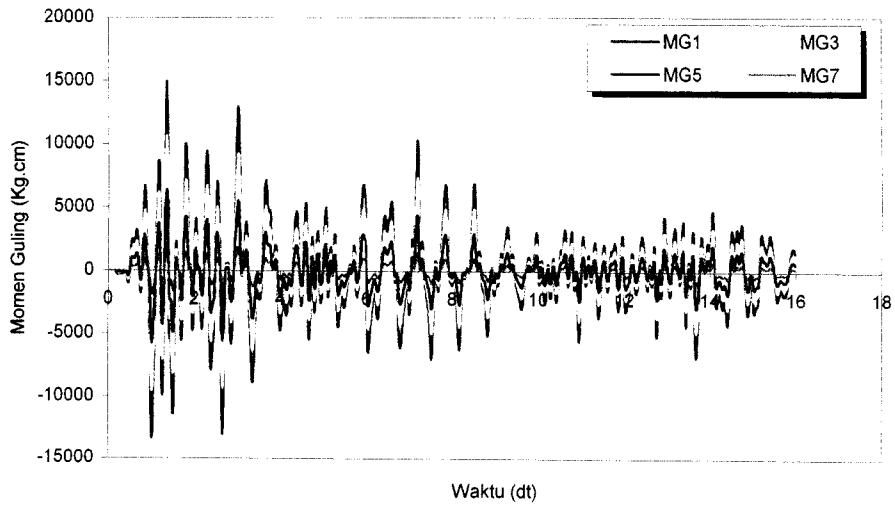


Tingkat 7

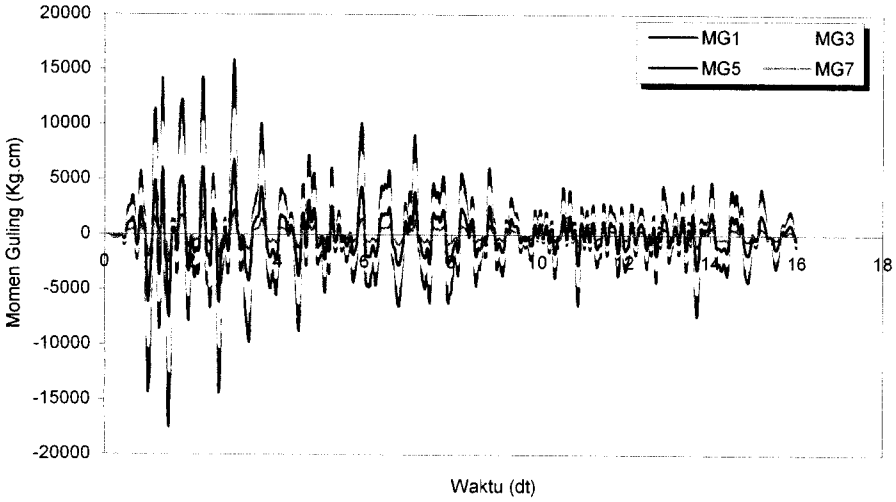
Gambar 5.124 Perbandingan Momen Guling Struktur Tingkat 7 Akibat Gempa Bucharest



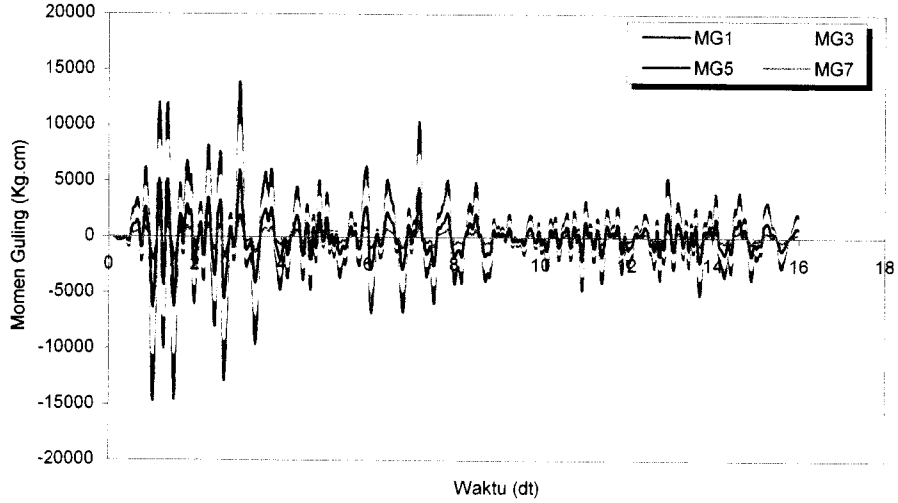
Tipikal



Setback 1

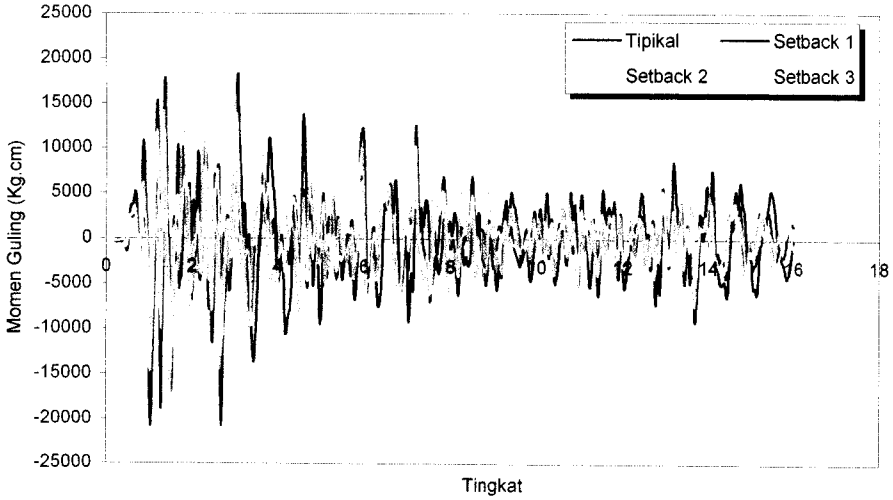


Setback 2

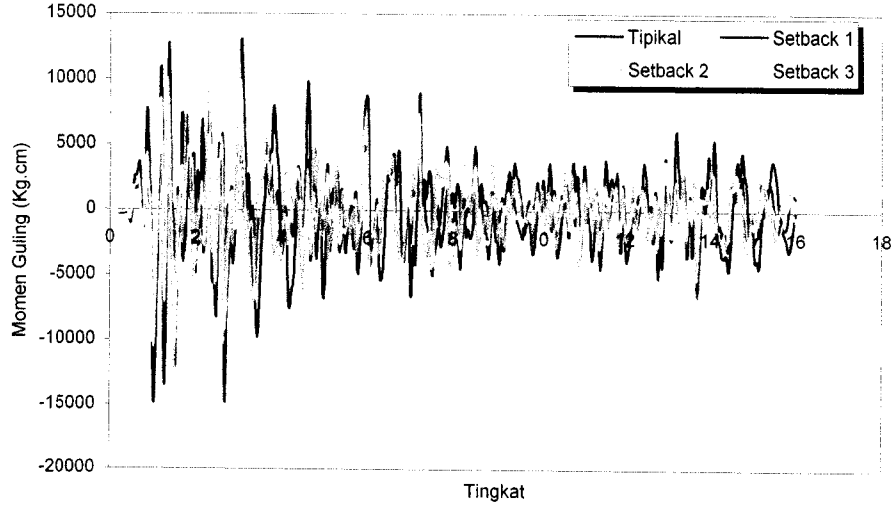


Setback 3

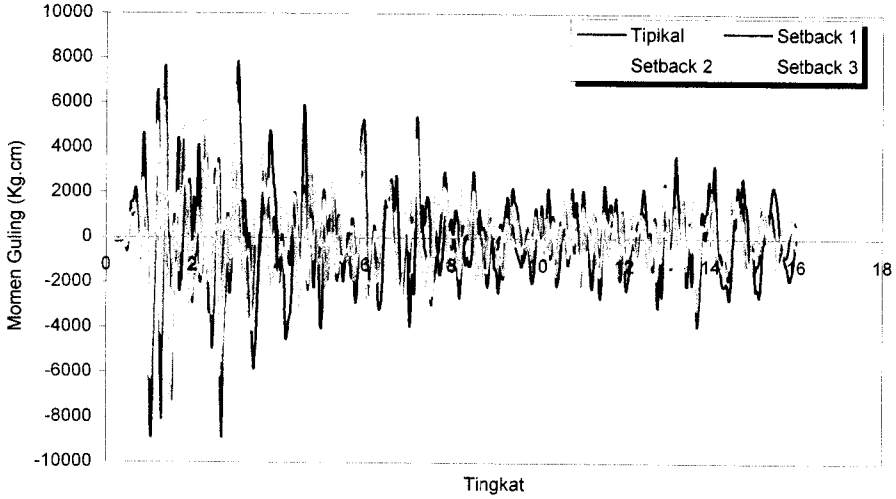
Gambar 5.125 Momen Guling Struktur Tingkat 7 Akibat Gempa El Centro



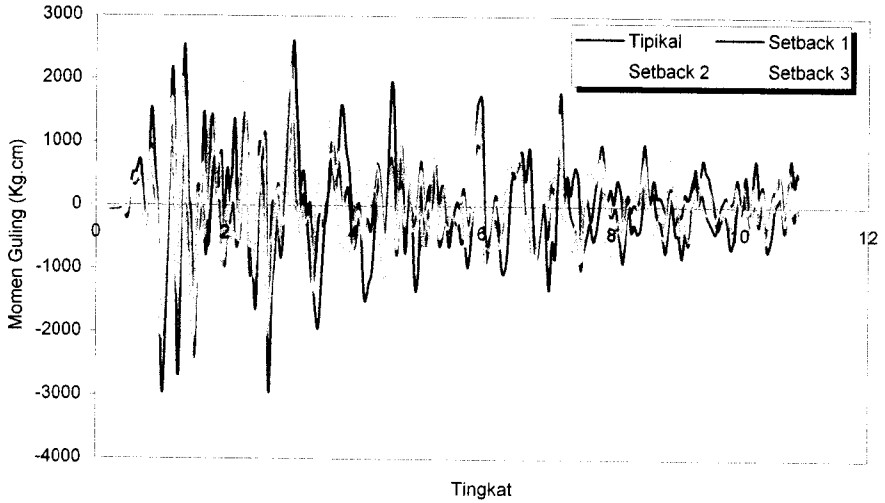
Tingkat 1



Tingkat 3

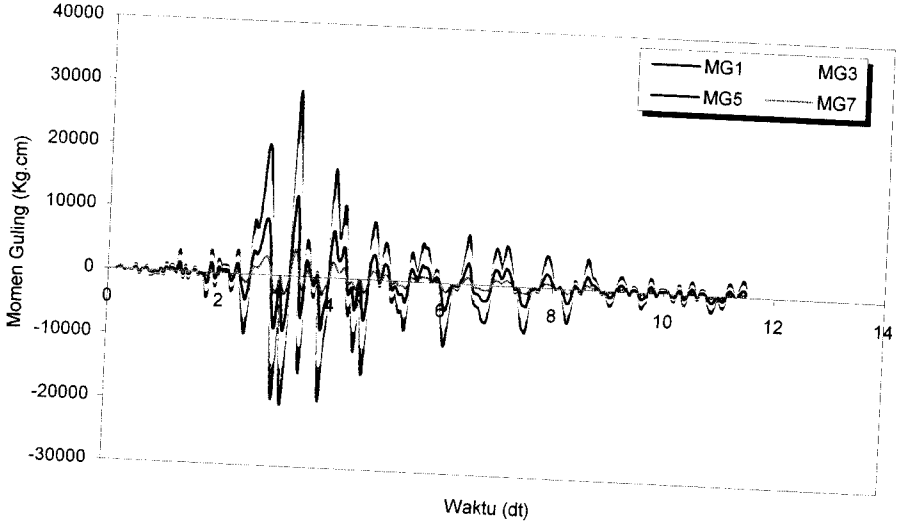


Tingkat 5

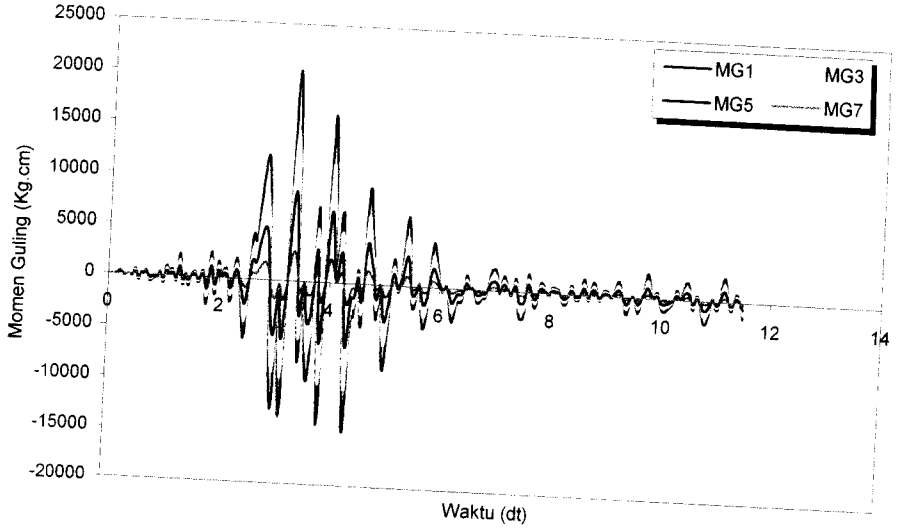


Tingkat 7

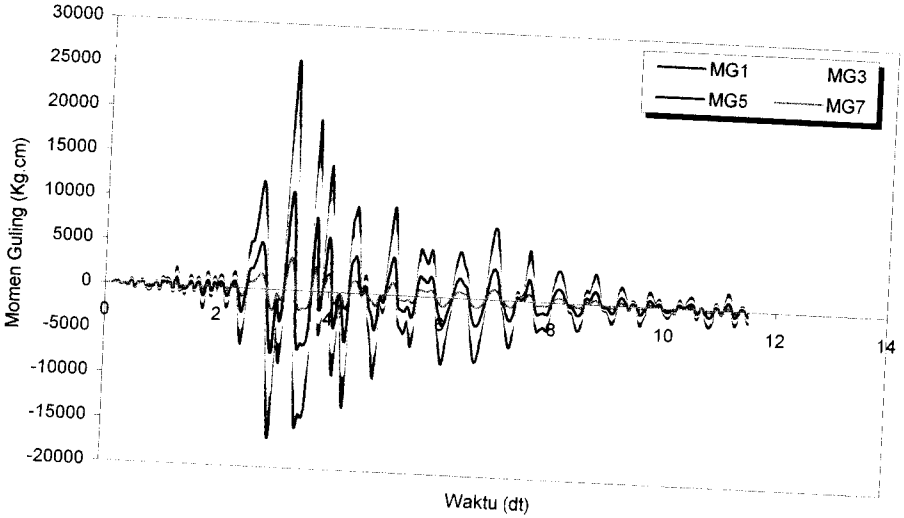
Gambar 5.126 Perbandingan Momen Guling Struktur Tingkat 7 Akibat Gempa El Centro



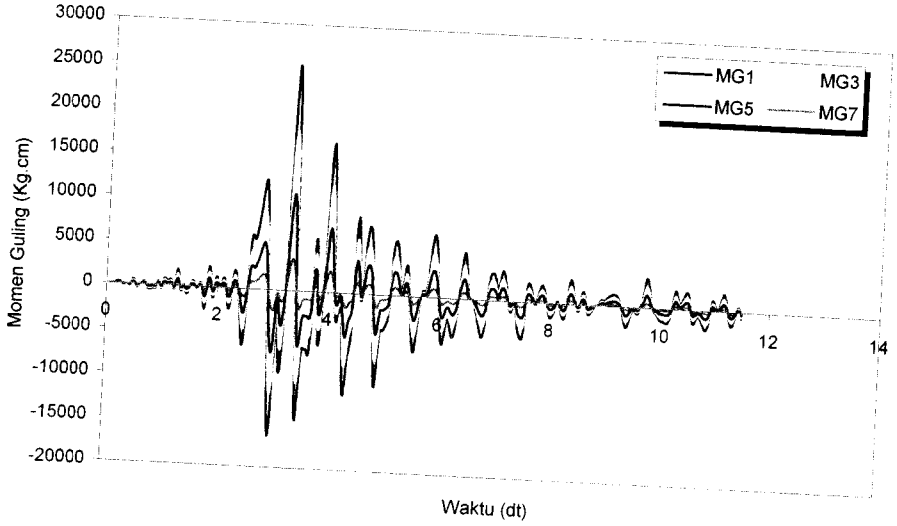
Tipikal



Setback 1

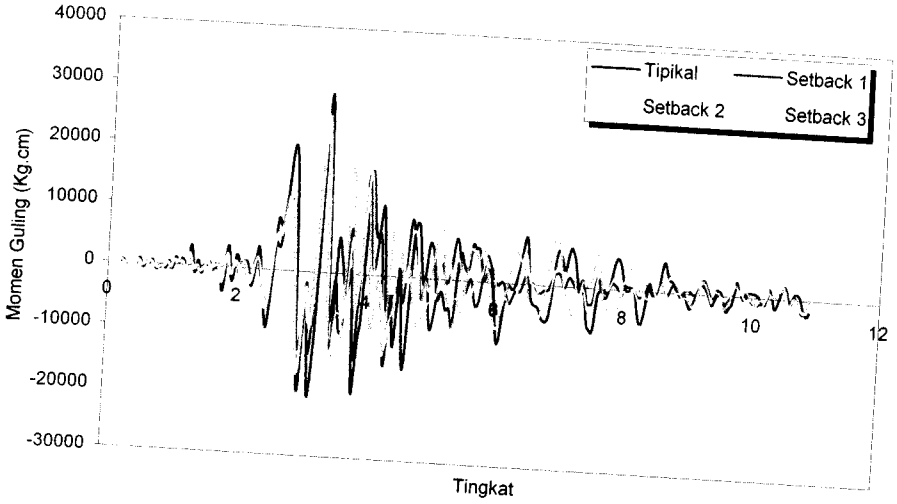


Setback 2

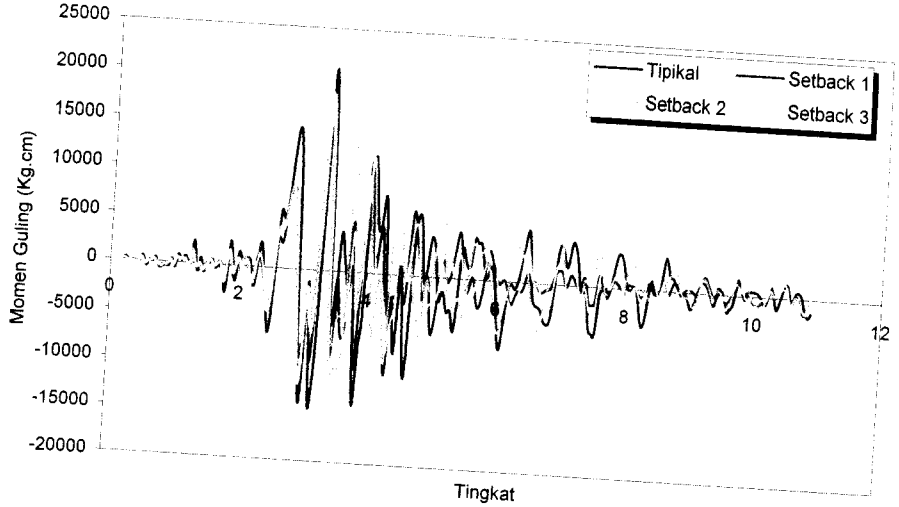


Setback 3

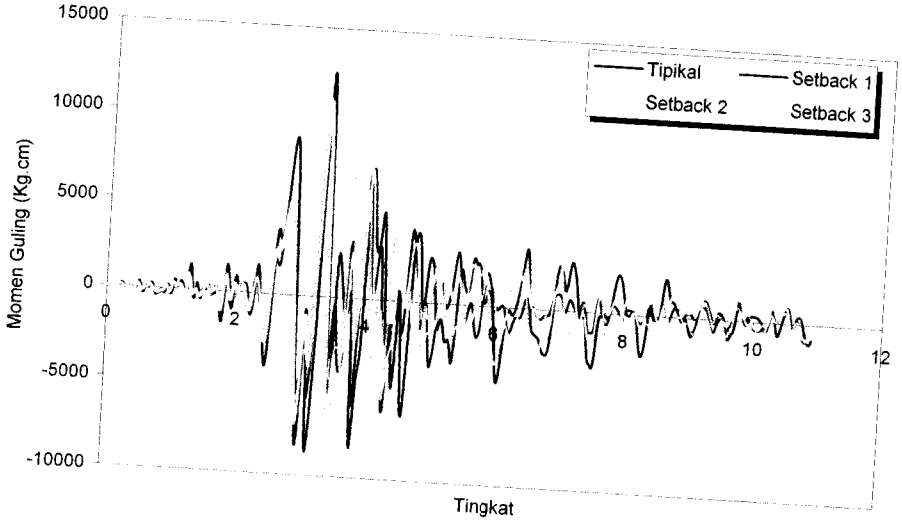
Gambar 5.127 Momen Guling Struktur Tingkat 7 Akibat Gempa Gilroy



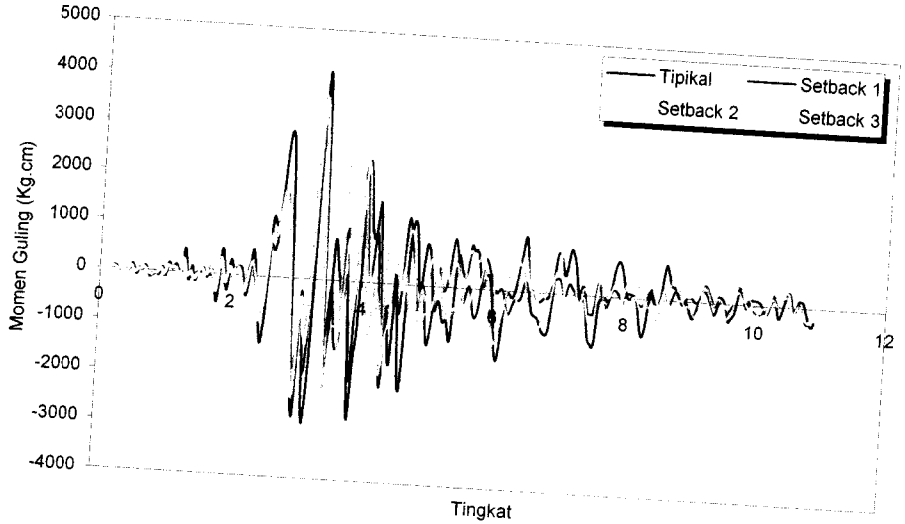
Tingkat 1



Tingkat 3

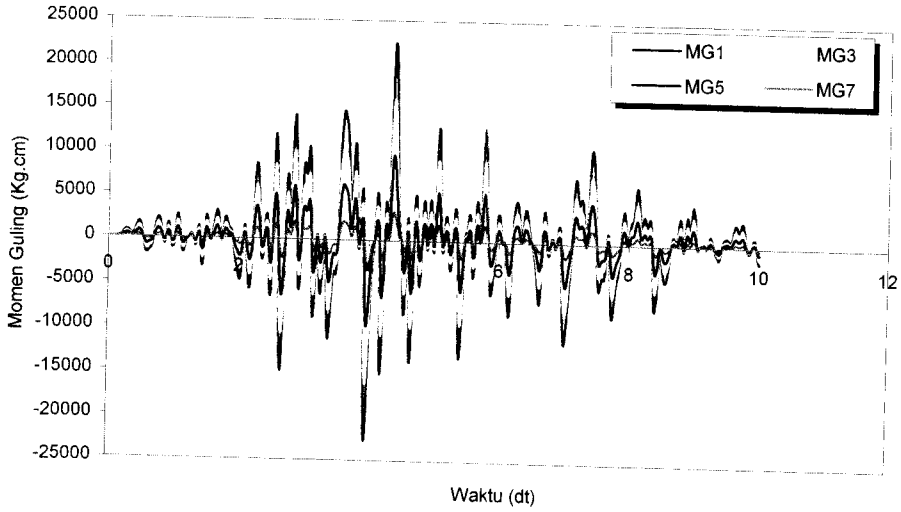


Tingkat 5

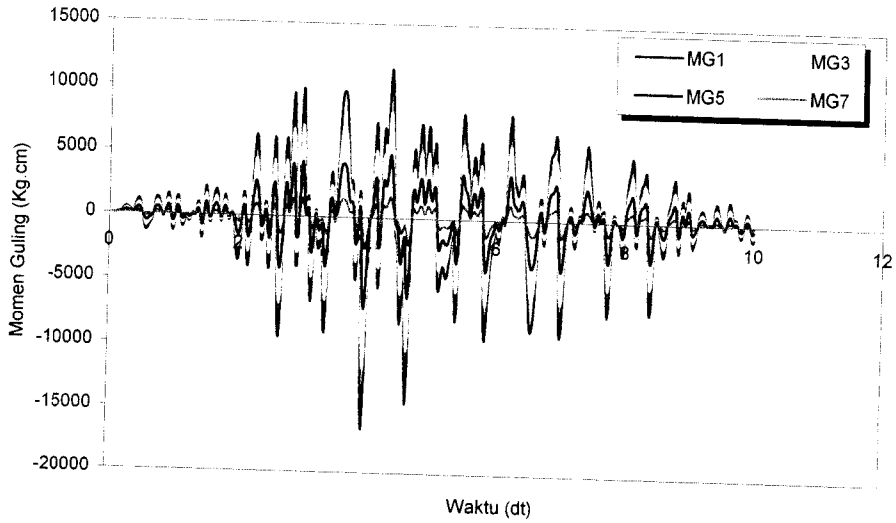


Tingkat 7

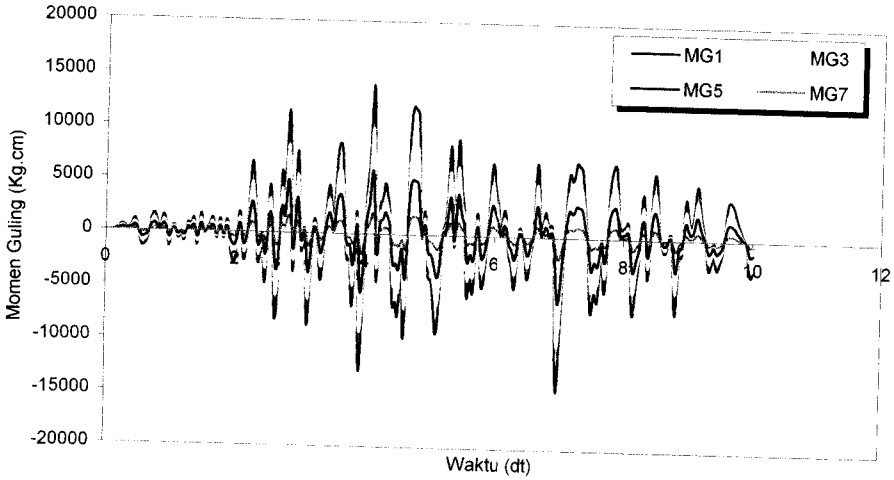
Gambar 5.128 Perbandingan Momen Guling Struktur Tingkat 7 Akibat Gempa Gilroy



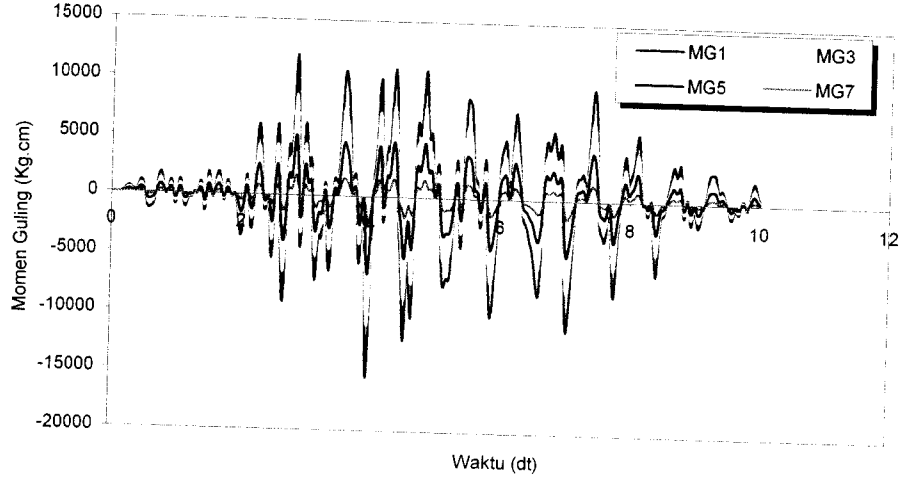
Tipikal



Setback 1

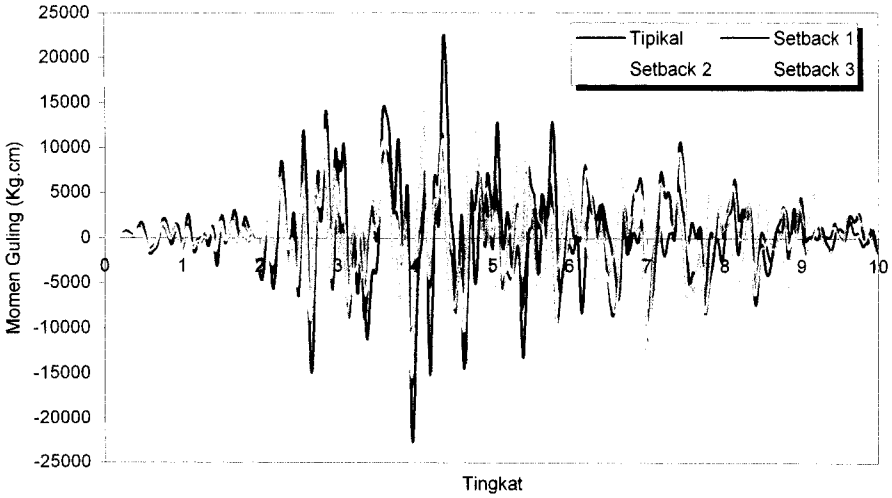


Setback 2

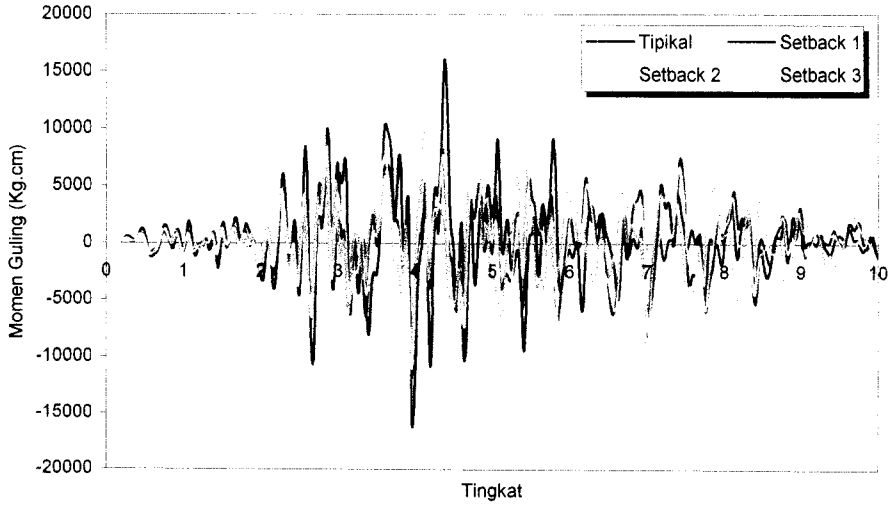


Setback 3

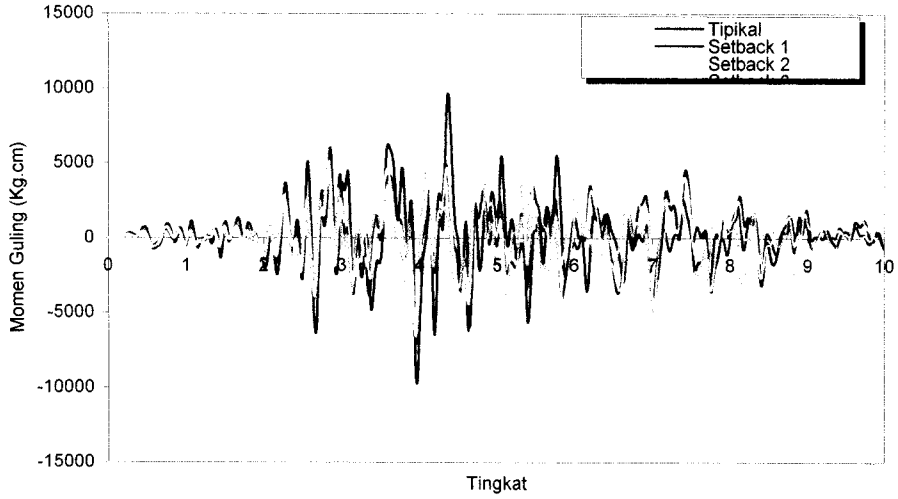
Gambar 5.129 Momen Guling Struktur Tingkat 7 Akibat Gempa Koyna



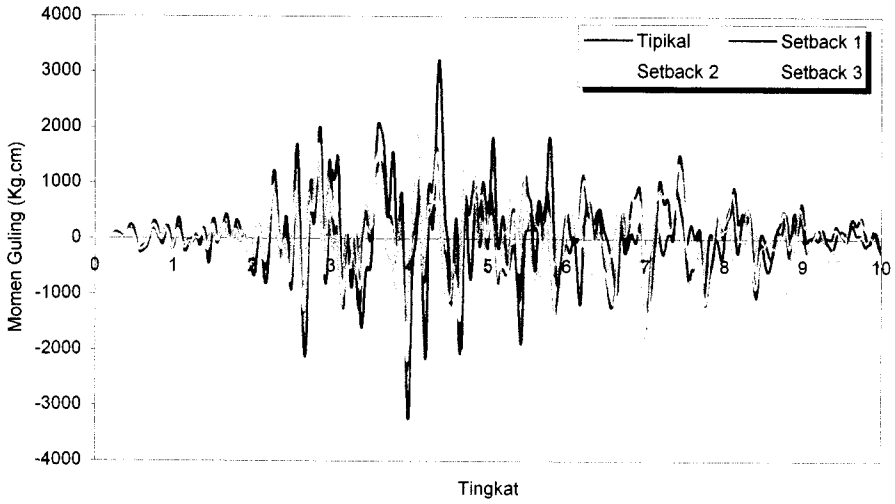
Tingkat 1



Tingkat 3

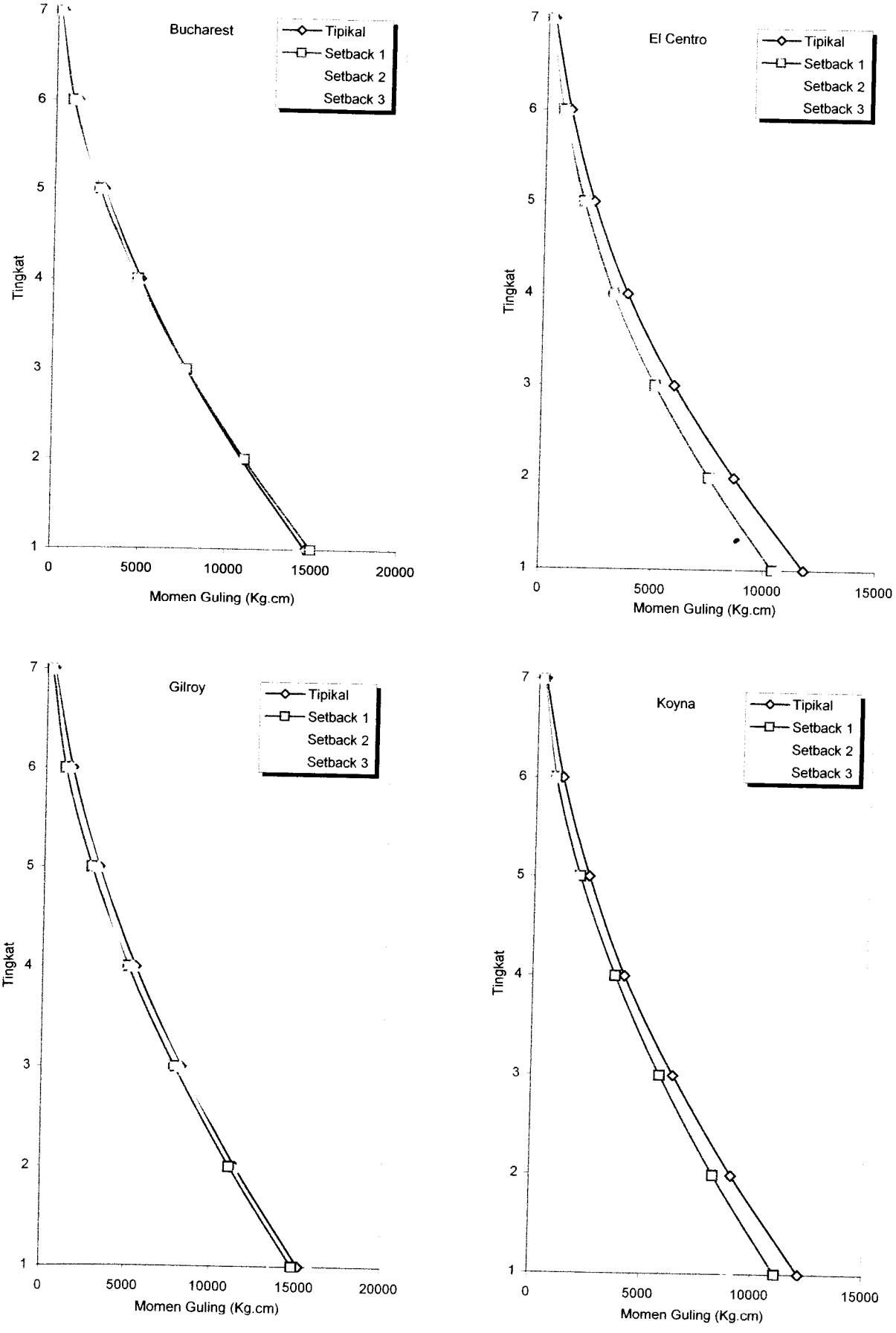


Tingkat 5

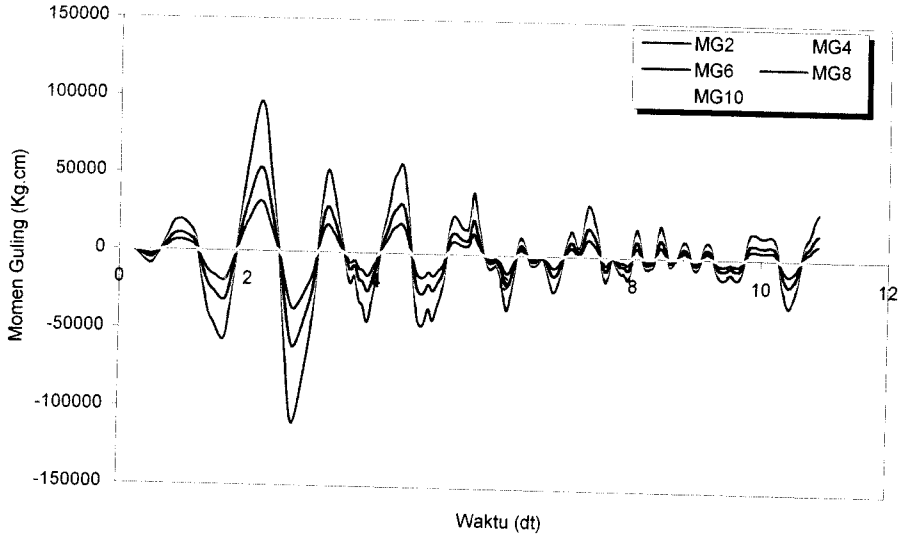


Tingkat 7

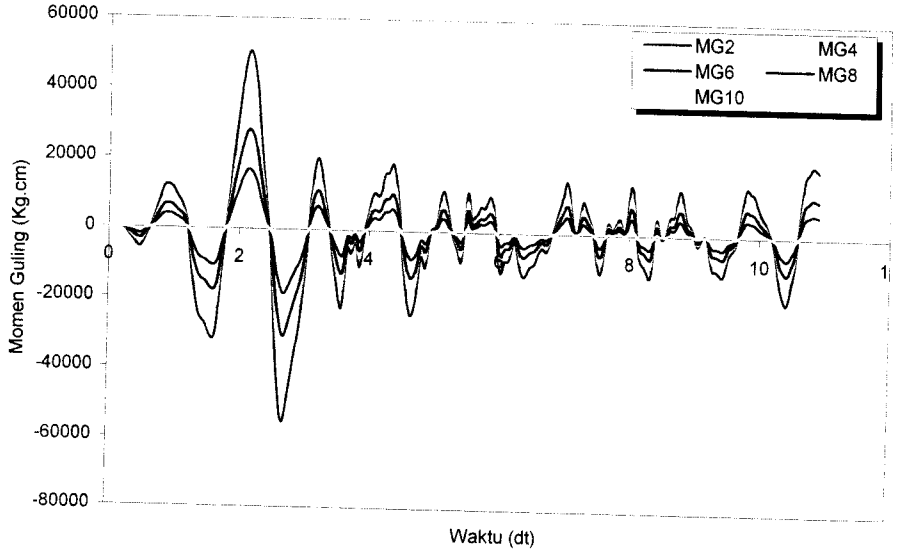
Gambar 5.130 Perbandingan Momen Guling Struktur Tingkat 7 Akibat Gempa Koyna



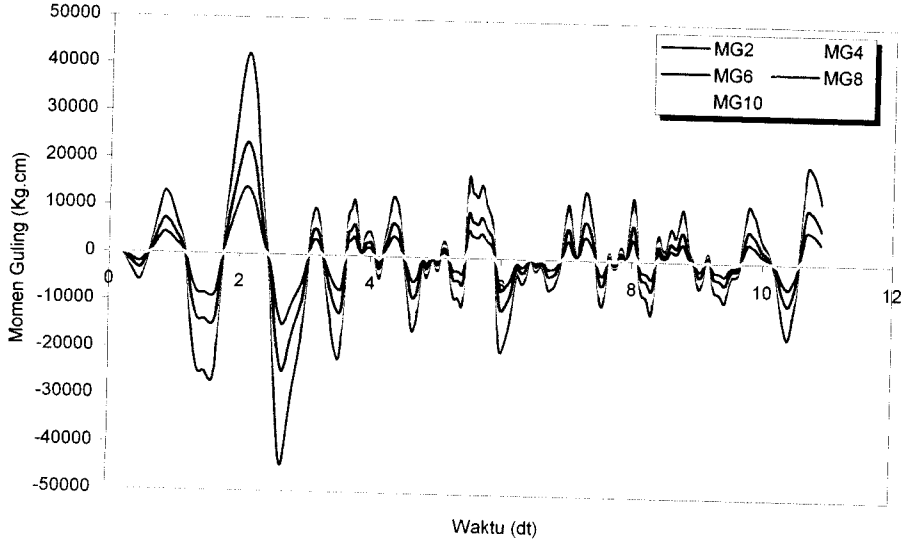
Gambar 5.131 Momen Guling Maksimum Struktur Tingkat 7 Akibat 4 Gempa



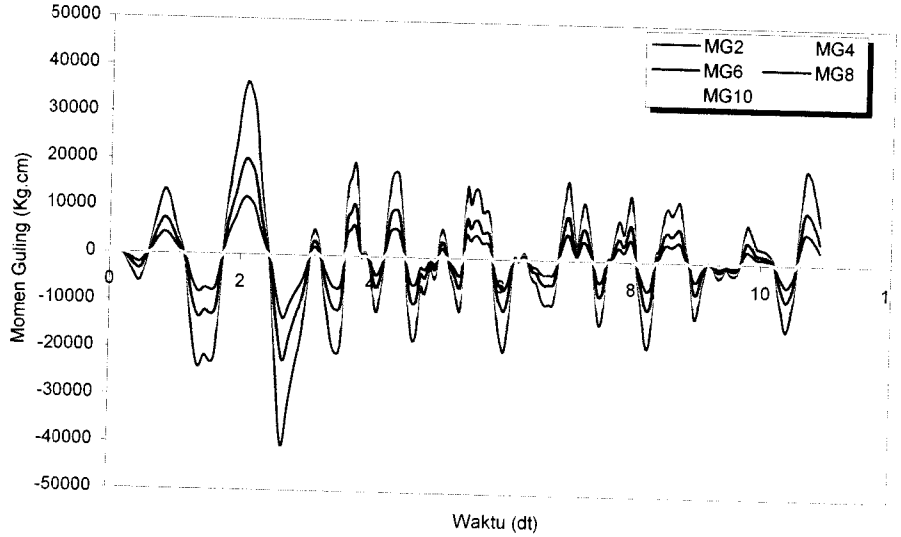
Tipikal



Setback 1

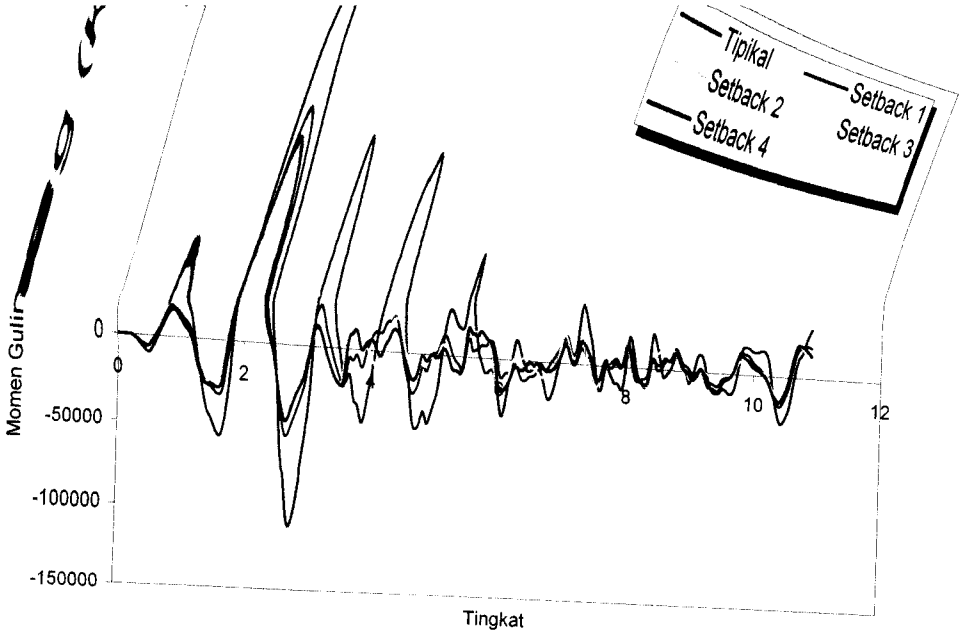


Setback 2

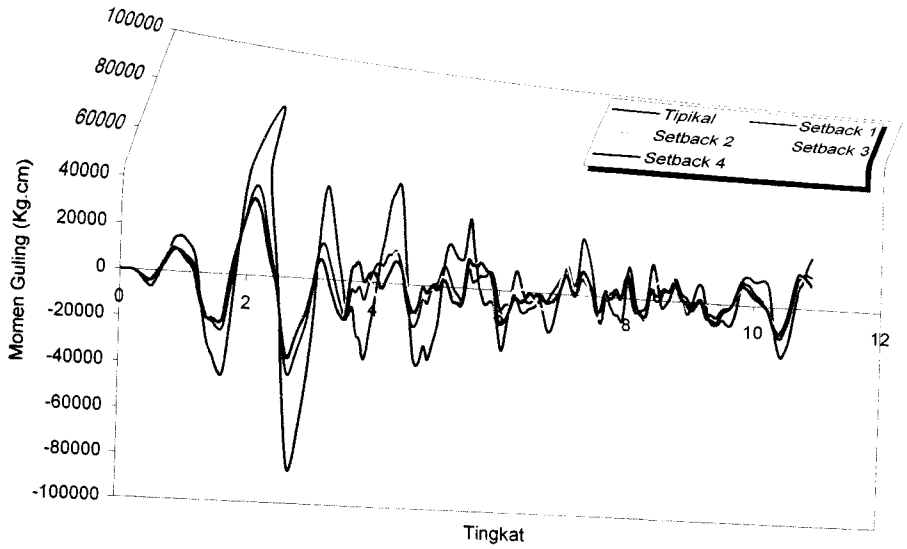


Setback 3

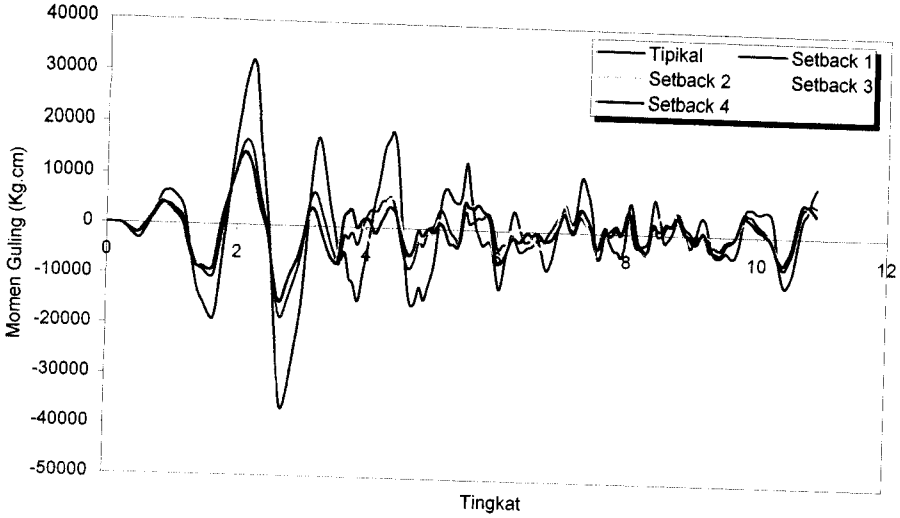
Gambar 5.132 Momen Guling Struktur Tingkat 10 Akibat Gempa Bucharest



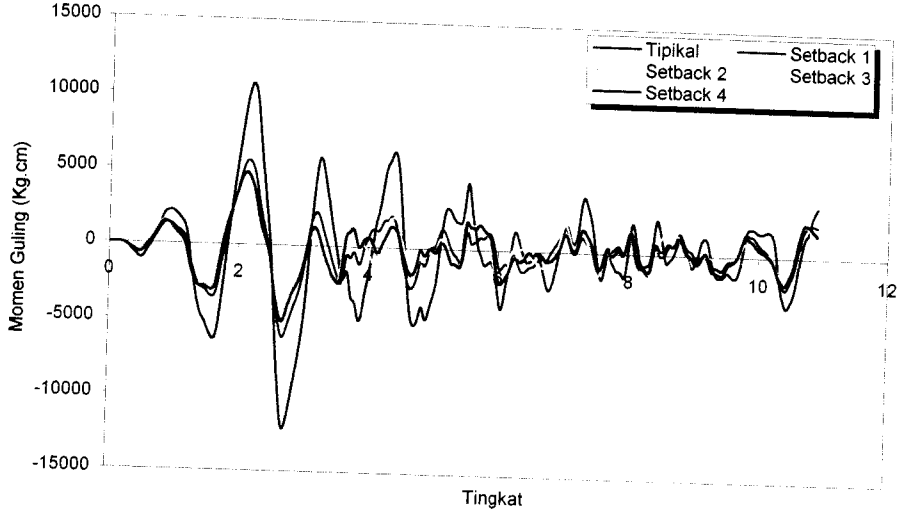
Tingkat 2



Tingkat 4

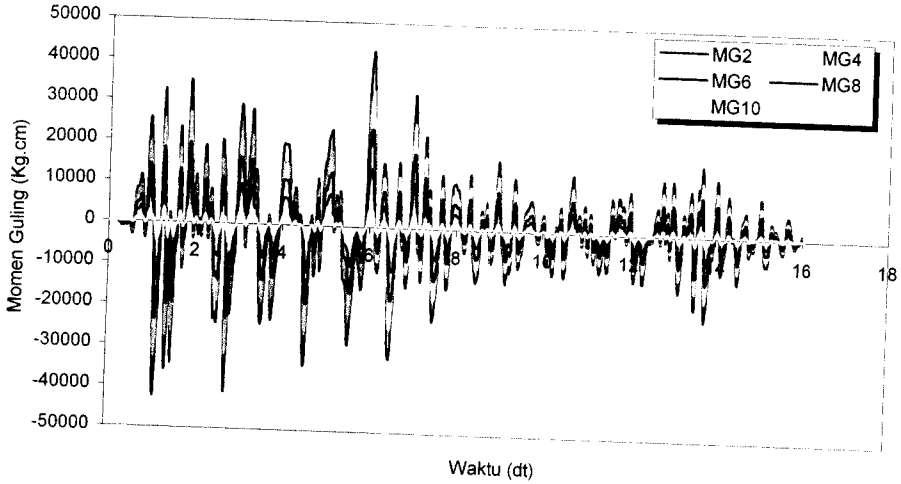


Tingkat 8

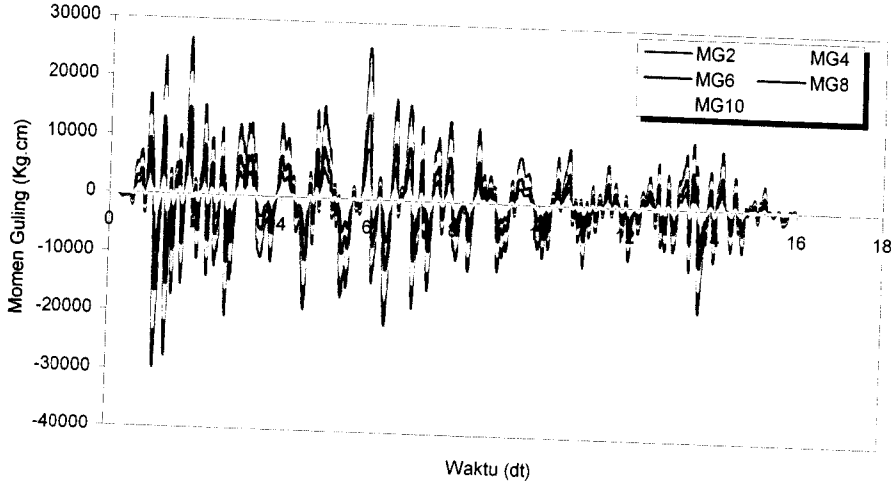


Tingkat 10

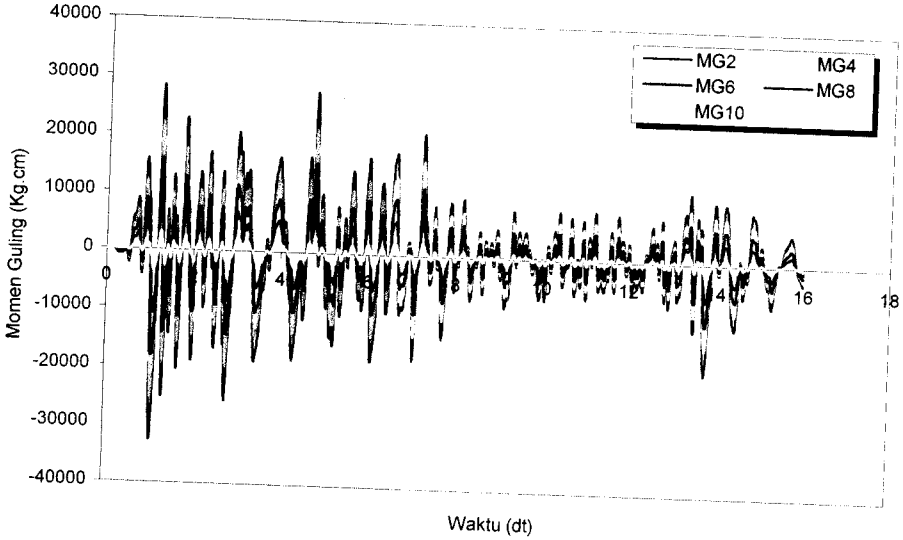
Gambar 5.133 Perbandingan Momen Guling Struktur Tingkat 10 Akibat Gempa Bucharest



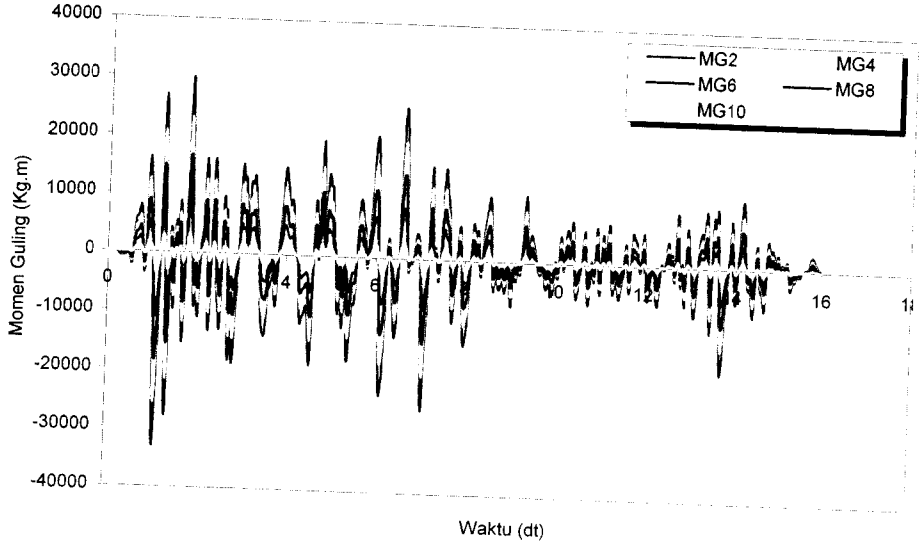
Tipikal



Setback 1

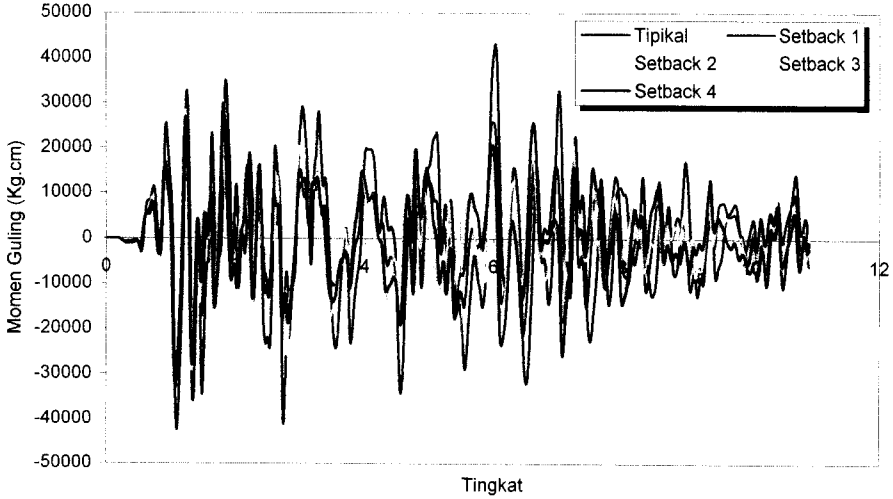


Setback 3

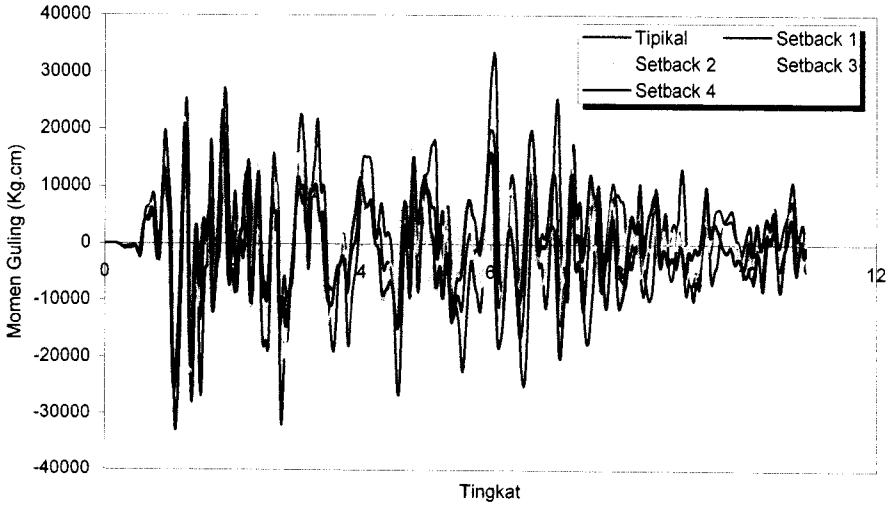


Setback 4

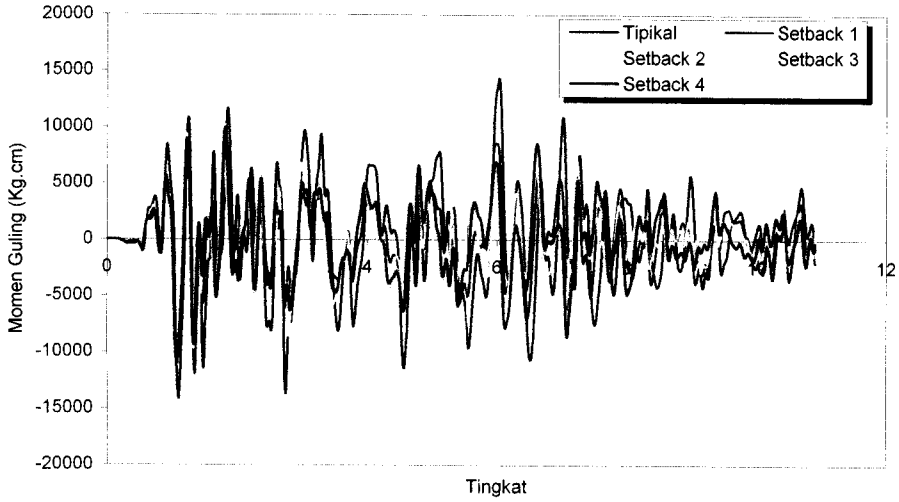
Gambar 5.134 Momen Guling Struktur Tingkat 10 Akibat Gempa El Centro



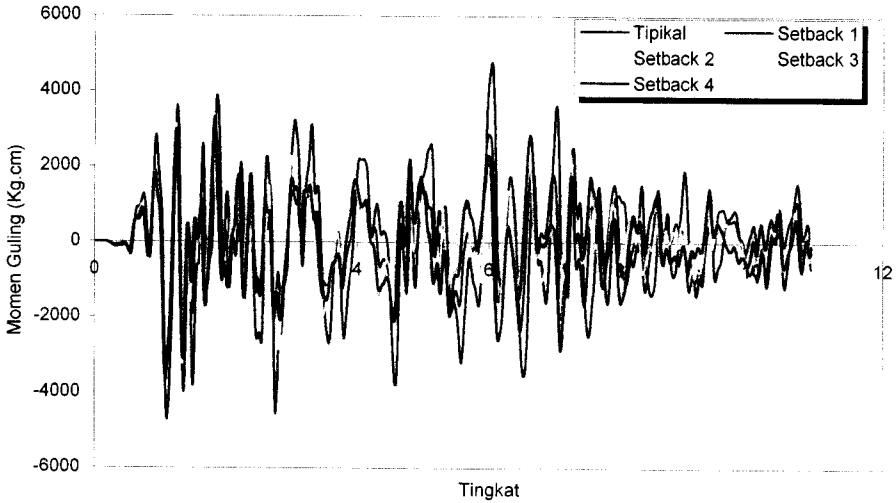
Tingkat 2



Tingkat 4

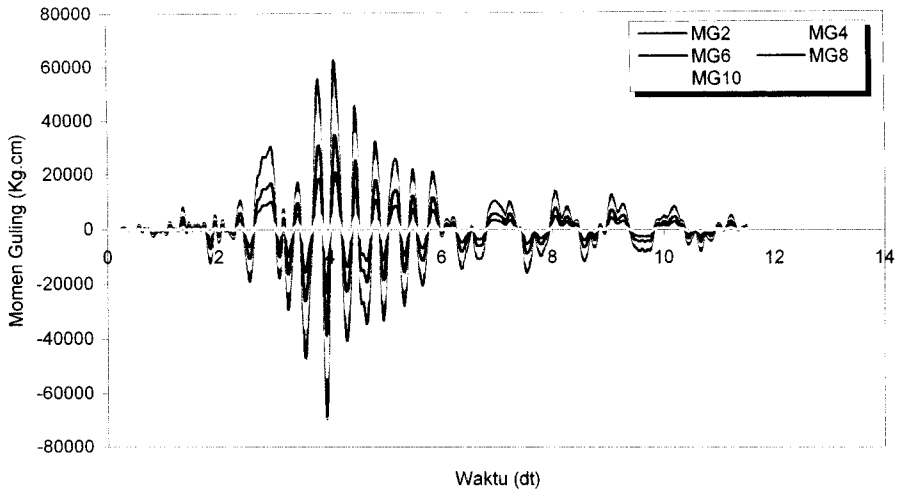


Tingkat 8

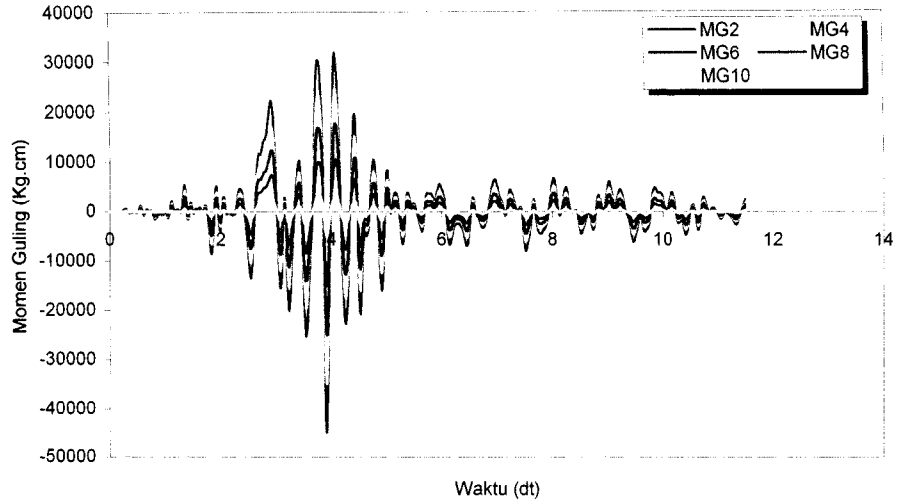


Tingkat 10

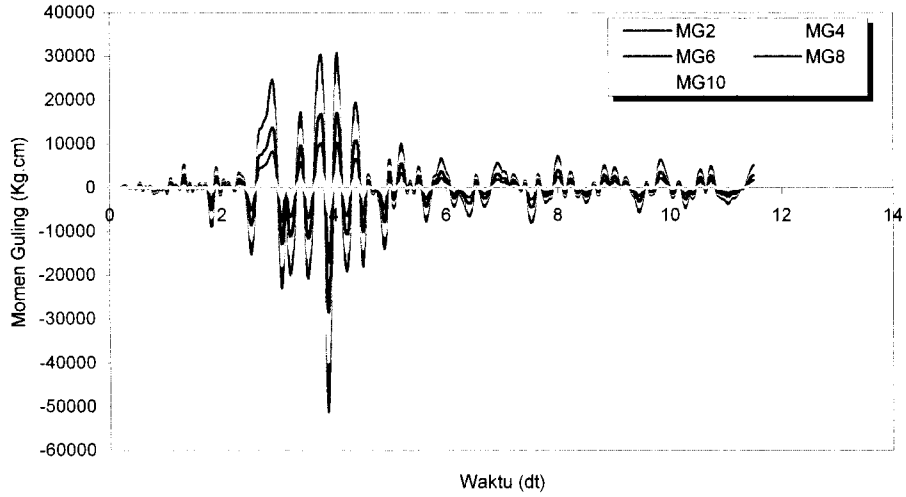
Gambar 5.135 Perbandingan Momen Guling Struktur Tingkat 10 Akibat Gempa El Centro



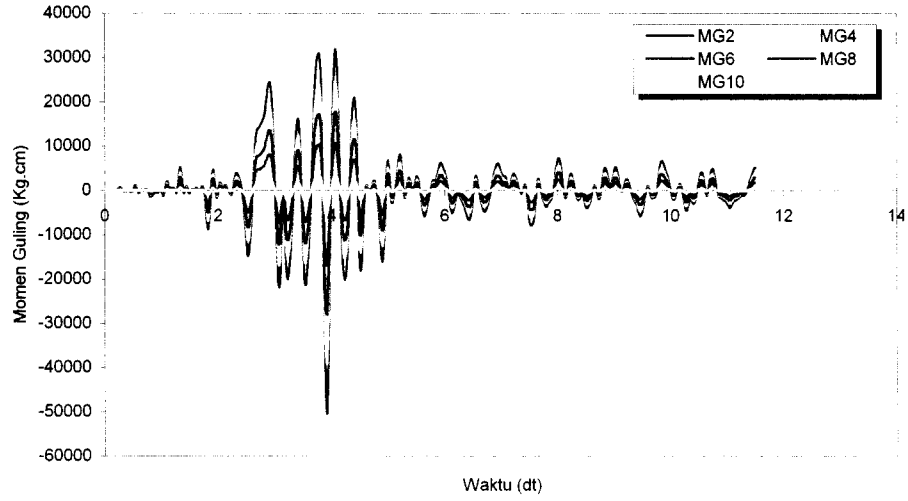
Tipikal



Setback 1

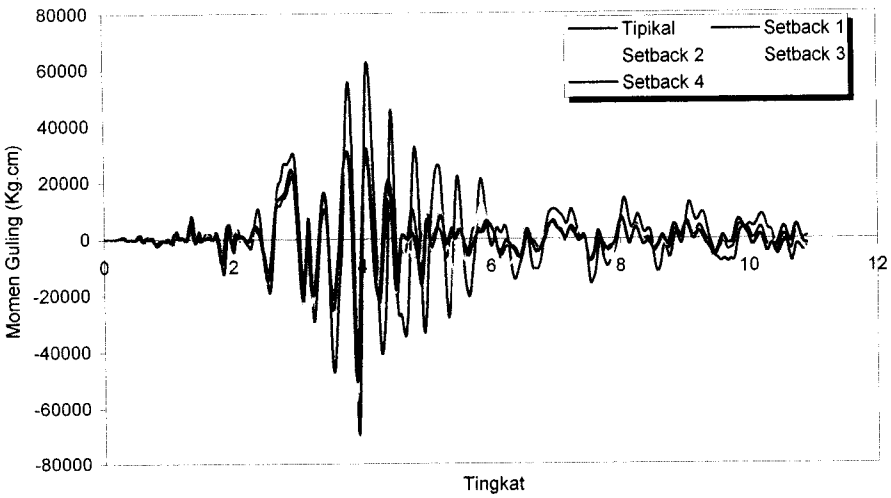


Setback 2

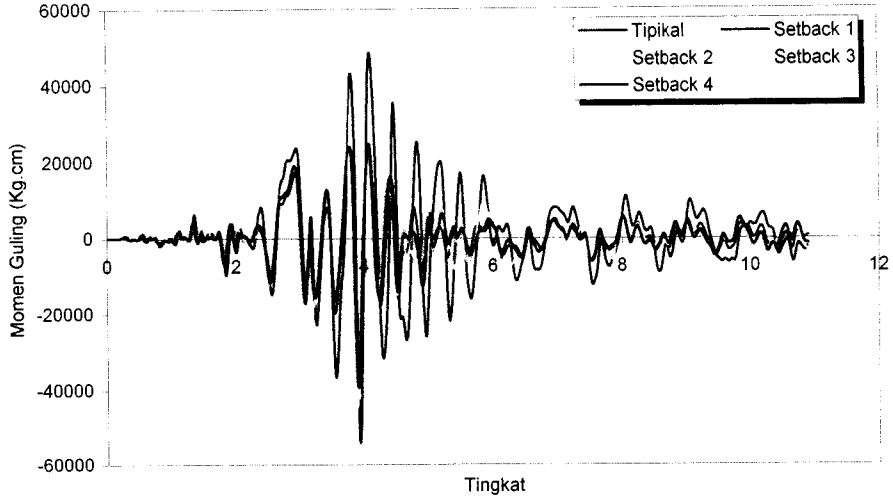


Setback 4

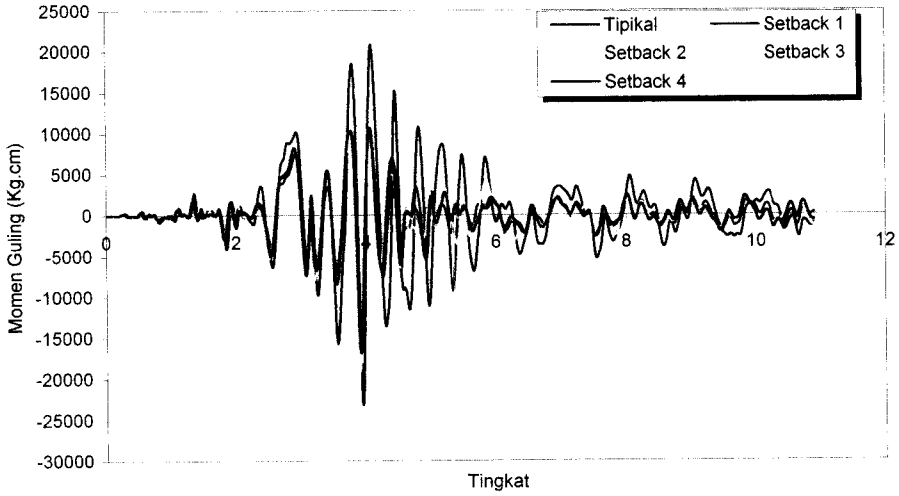
Gambar 5.136 Momen Guling Struktur Tingkat 10 Akibat Gempa Gilroy



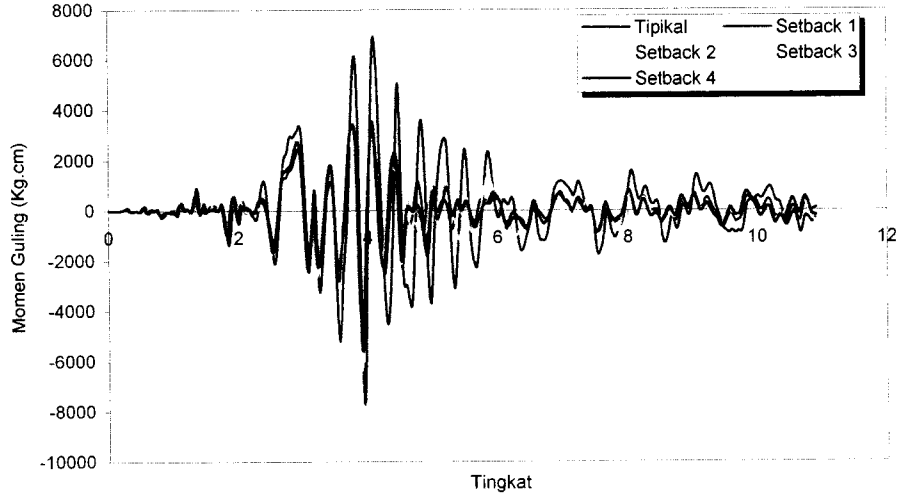
Tingkat 2



Tingkat 4

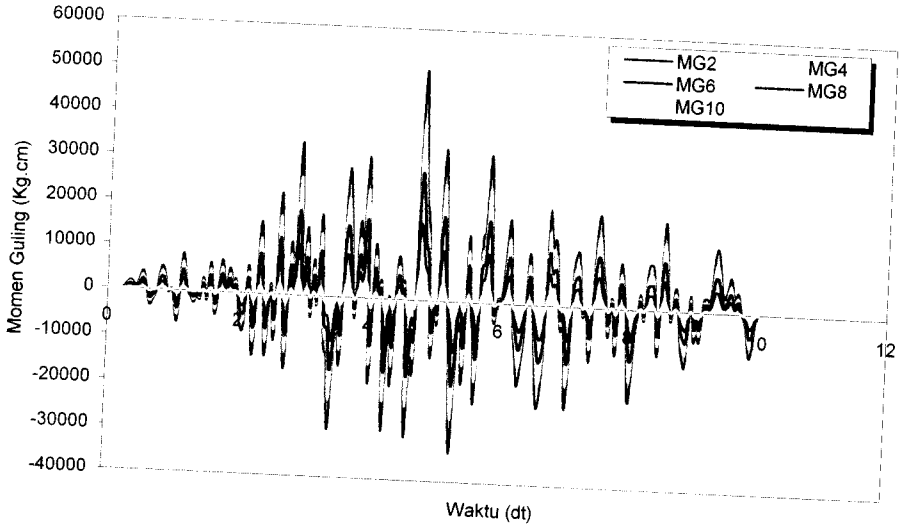


Tingkat 8

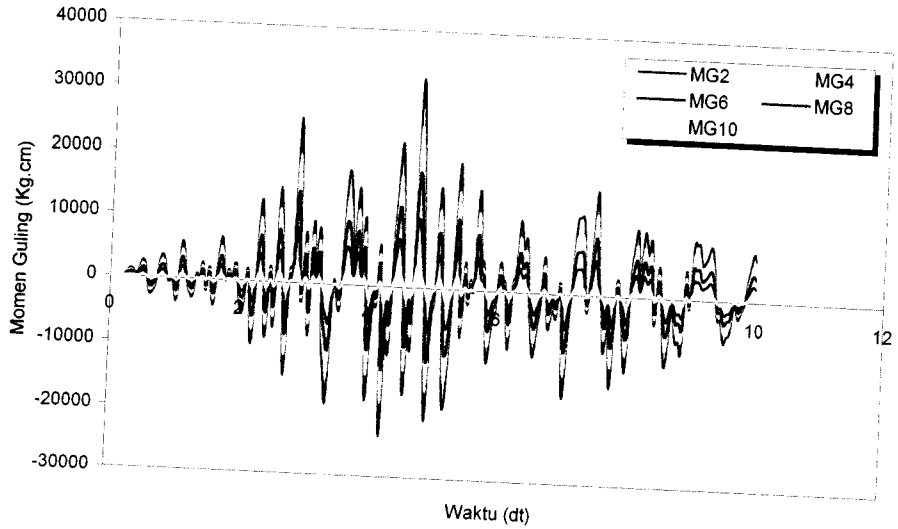


Tingkat 10

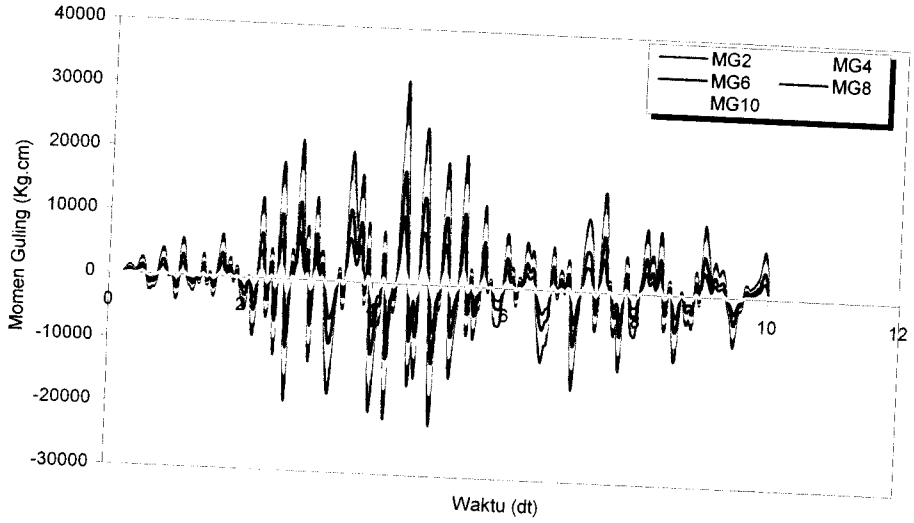
Gambar 5.137 Perbandingan Momen Guling Struktur Tingkat 10 Akibat Gempa Gilroy



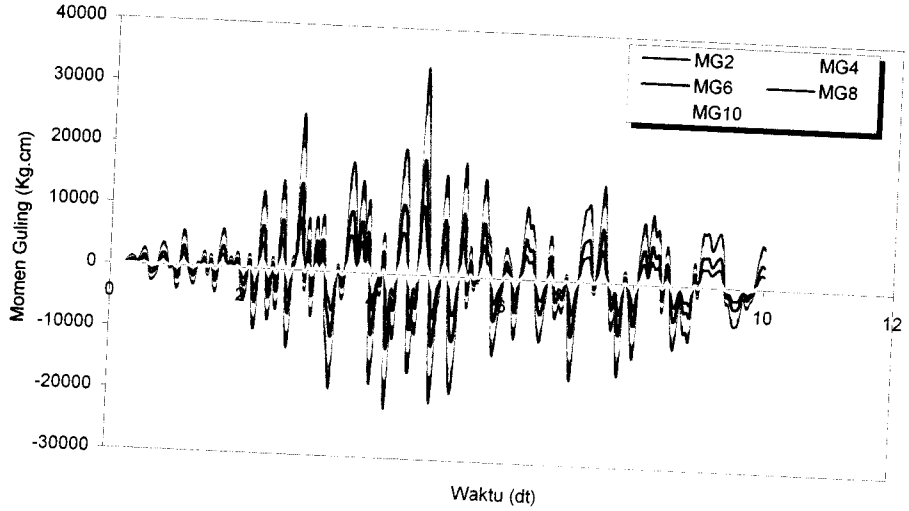
Tipikal



Setback 2

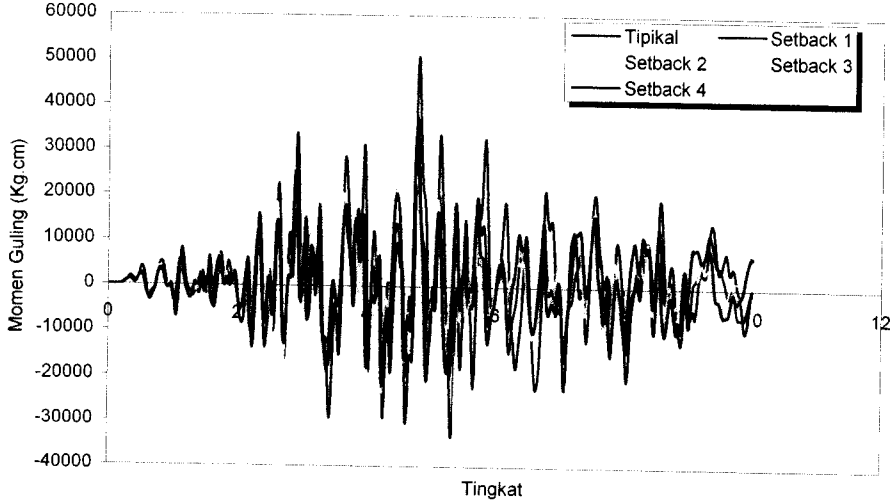


Setback 2

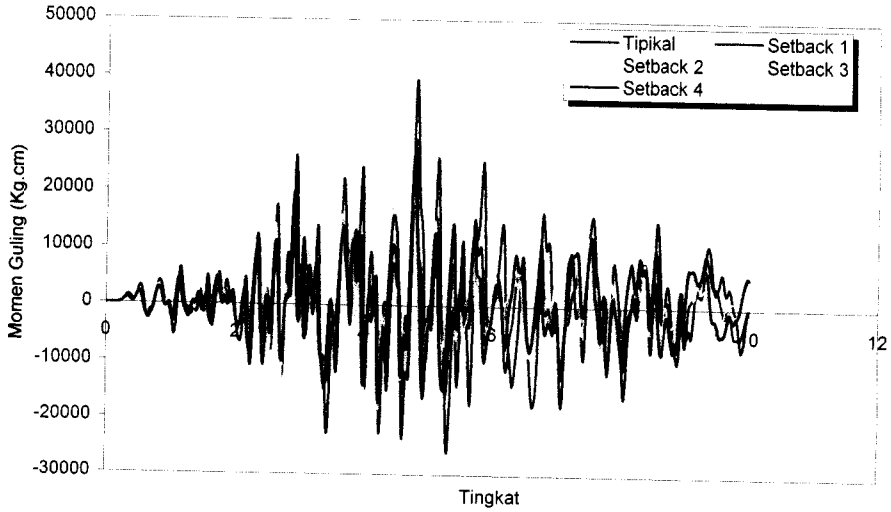


Setback 4

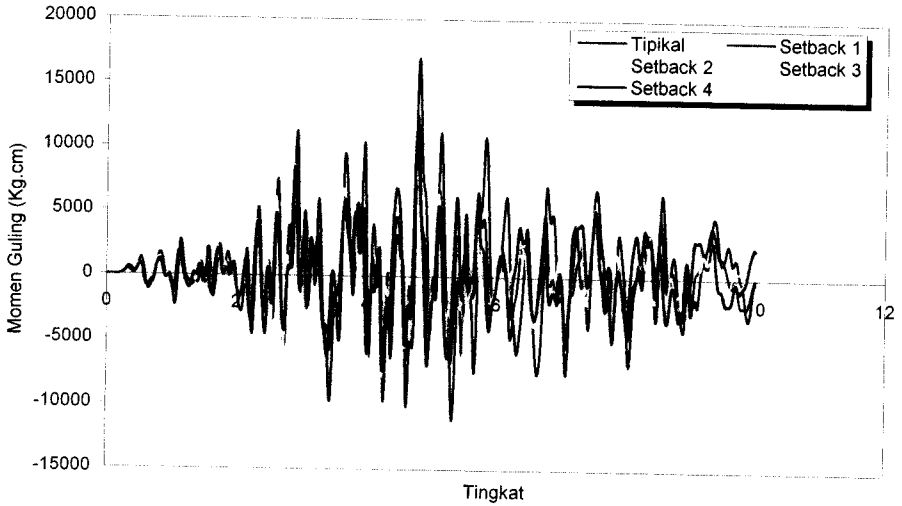
Gambar 5.138 Momen Guling Struktur Tingkat 10 Akibat Gempa Koyna



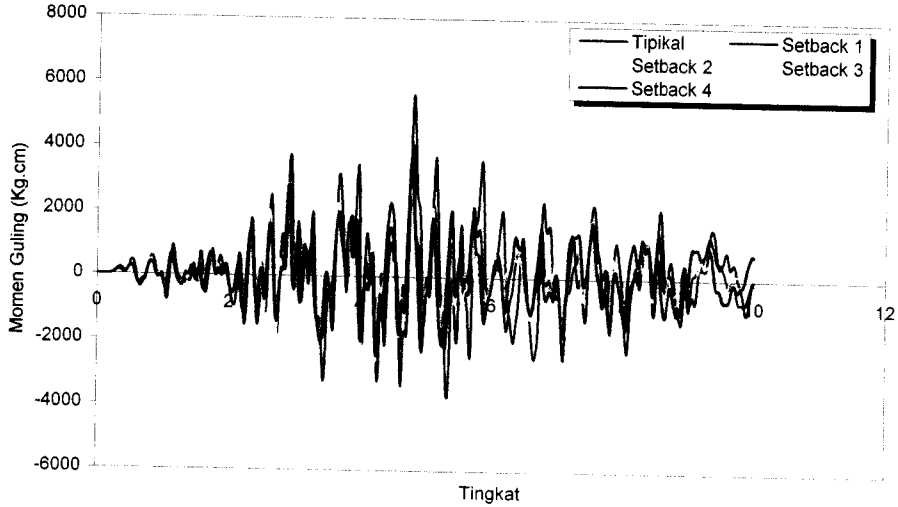
Tingkat 2



Tingkat 4

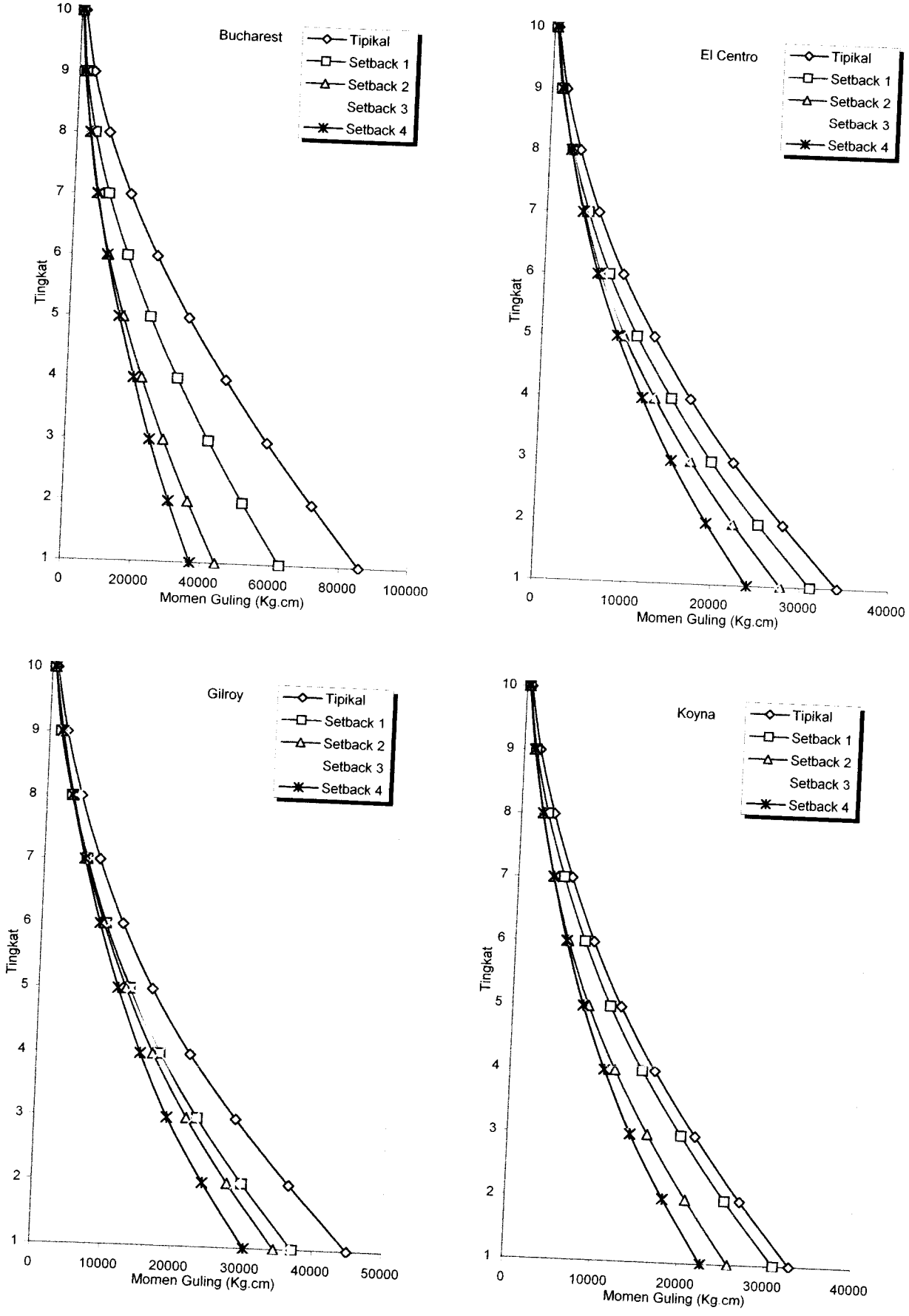


Tingkat 6

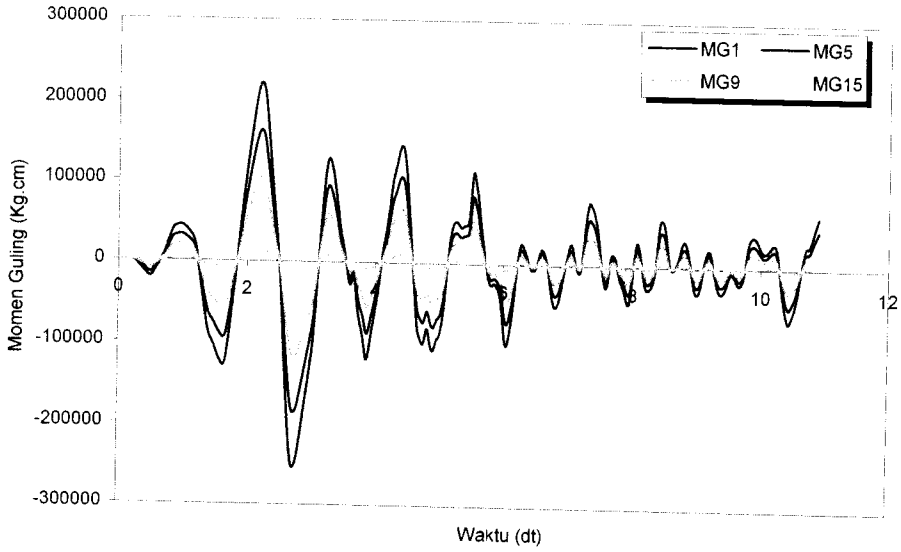


Tingkat 8

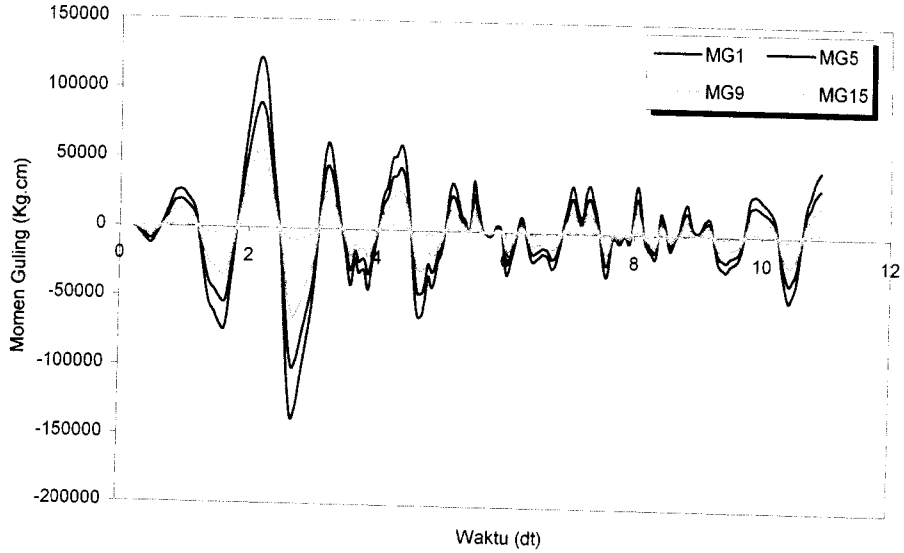
Gambar 5.139 Perbandingan Momen Guling Struktur Tingkat 10 Akibat Gempa Koyna



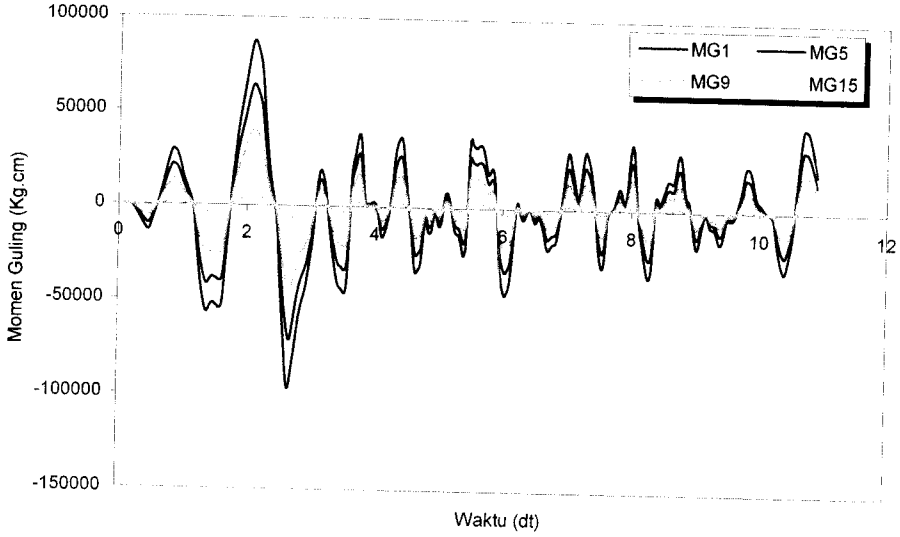
Gambar 5.140 Momen Guling Maksimum Struktur Tingkat 10 Akibat 4 Gempa



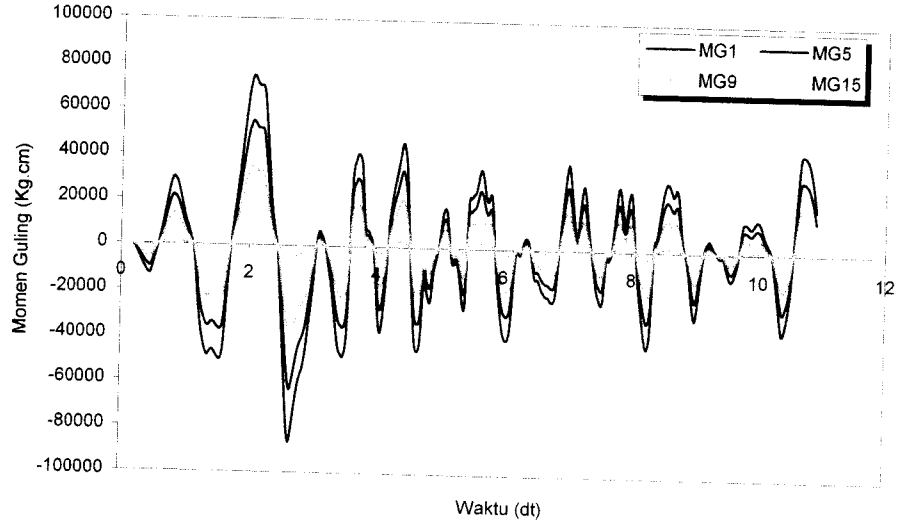
Tipikal



Setback 1

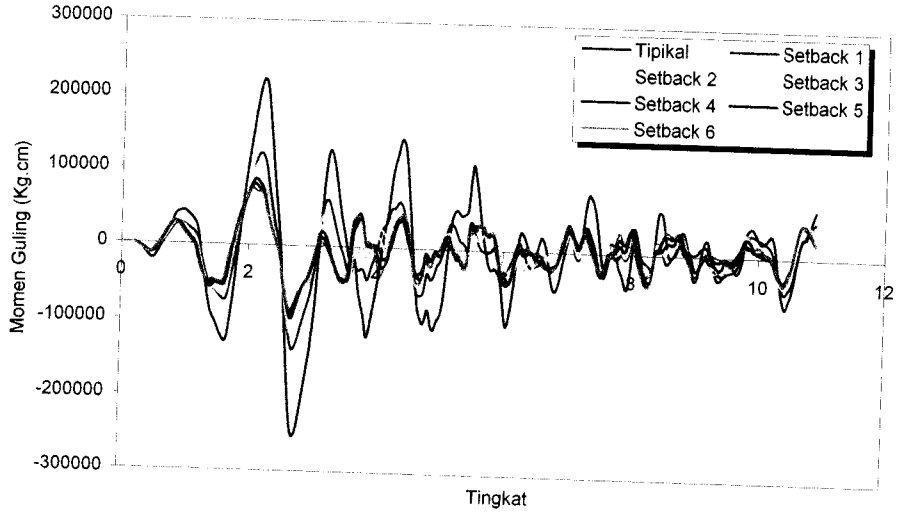


Setback 4

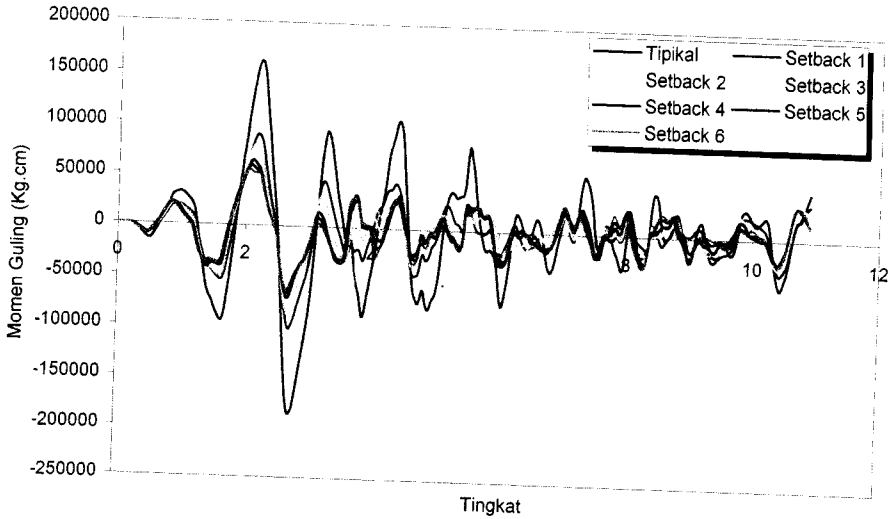


Setback 6

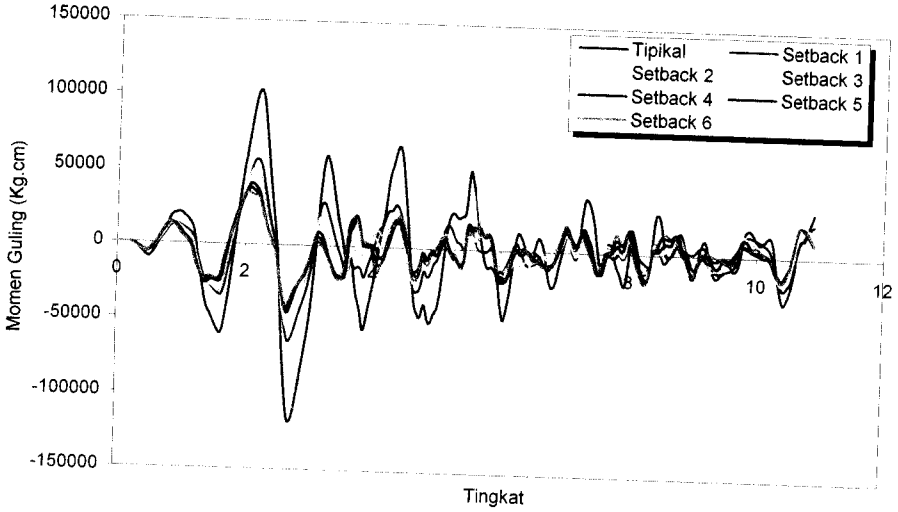
Gambar 5.141 Momen Guling Struktur Tingkat 15 Akibat Gempa Bucharest



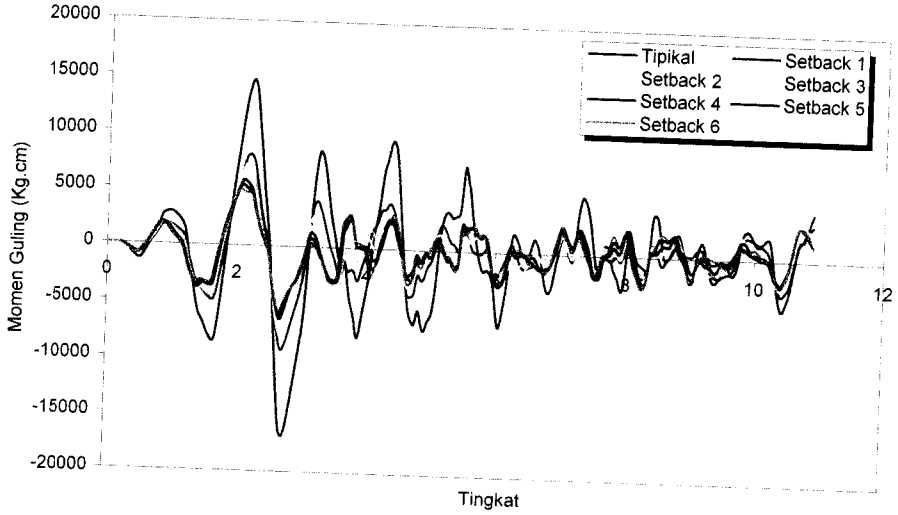
Tingkat 1



Tingkat 5

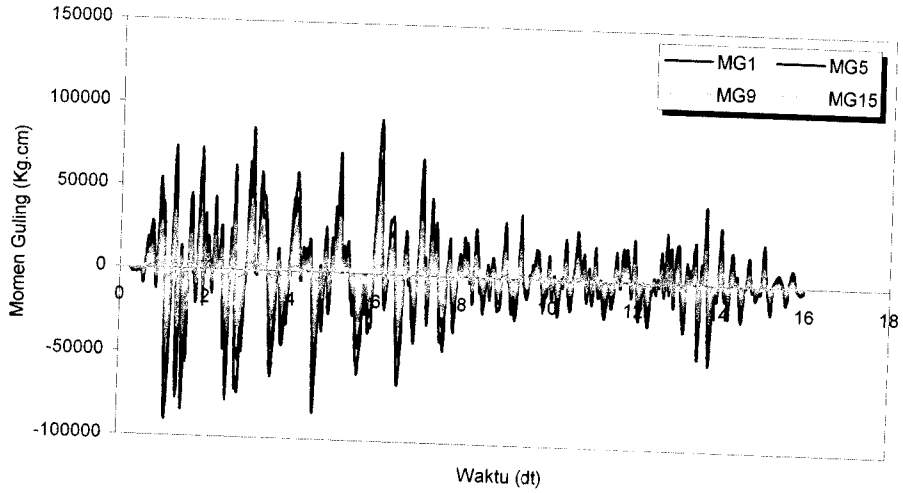


Tingkat 9

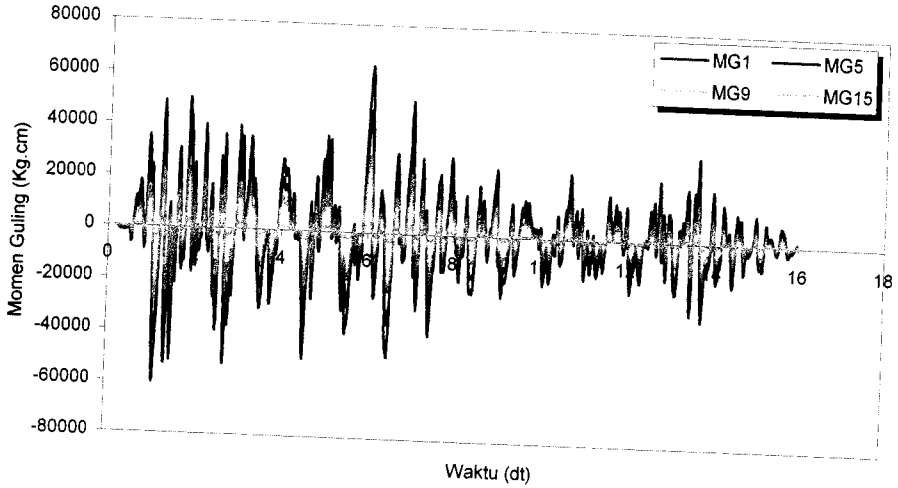


Tingkat 15

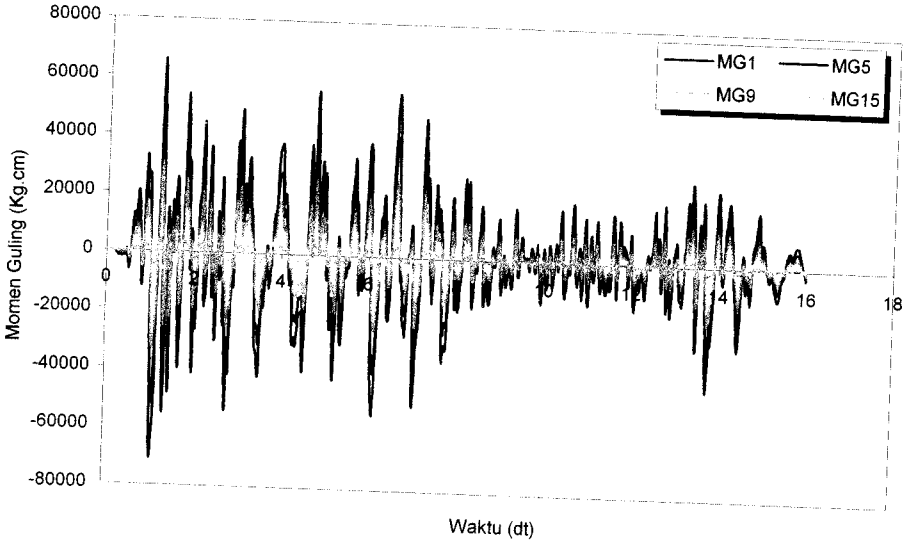
Gambar 5.142 Perbandingan Momen Guling Struktur Tingkat 15 Akibat Gempa Bucharest



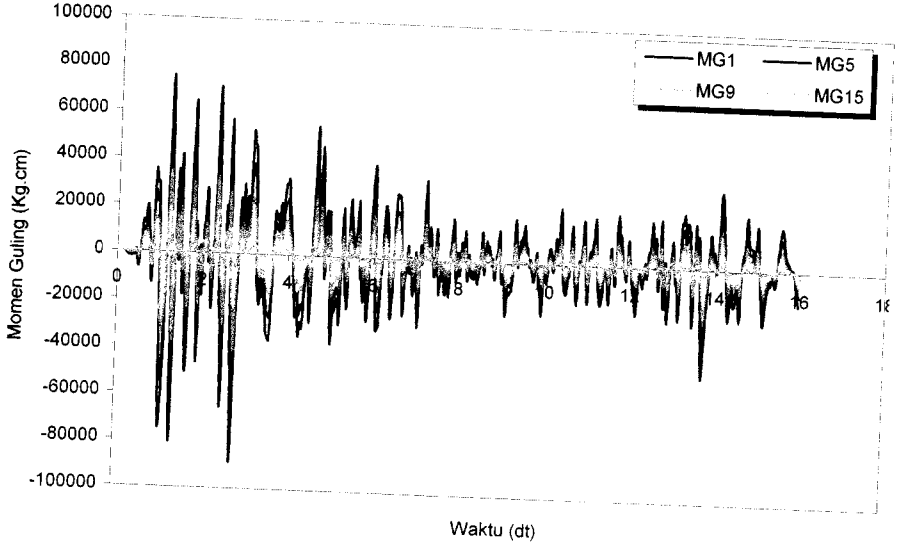
Tipikal



Setback 1

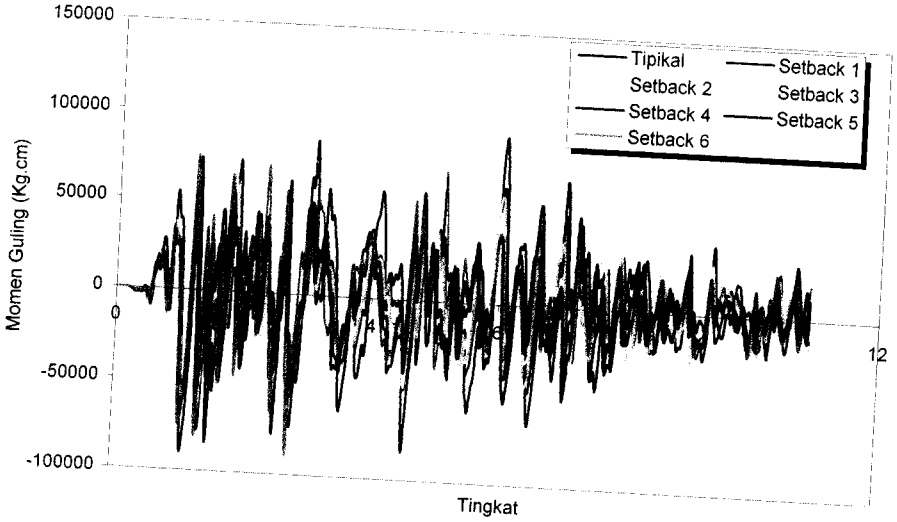


Setback 4

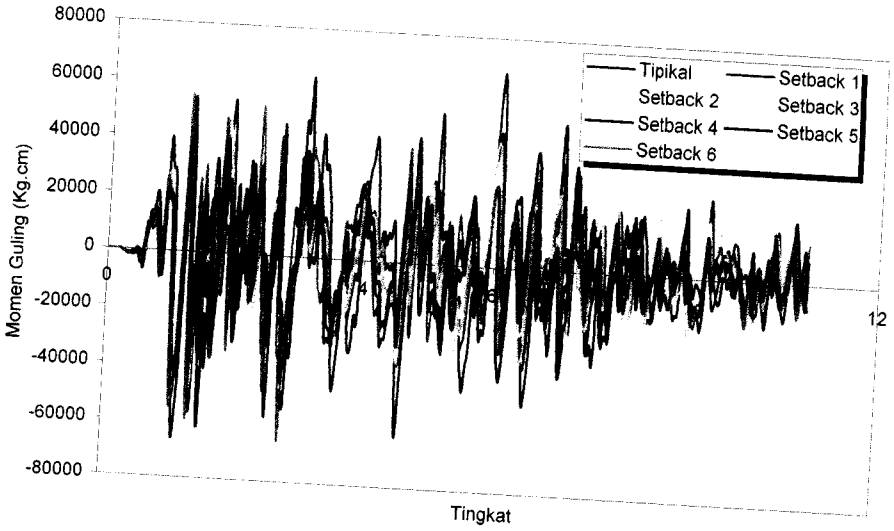


Setback 6

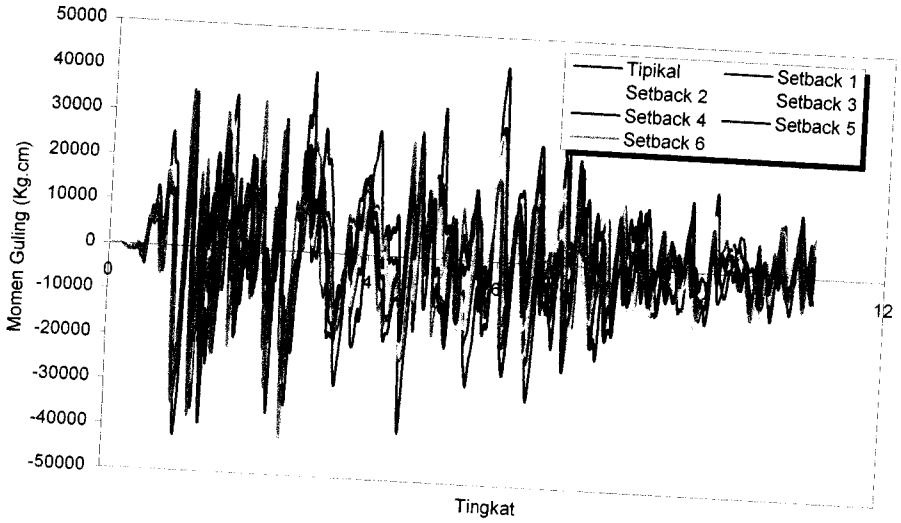
Gambar 5.143 Momen Guling Struktur Tingkat 15 Akibat Gempa El Centro



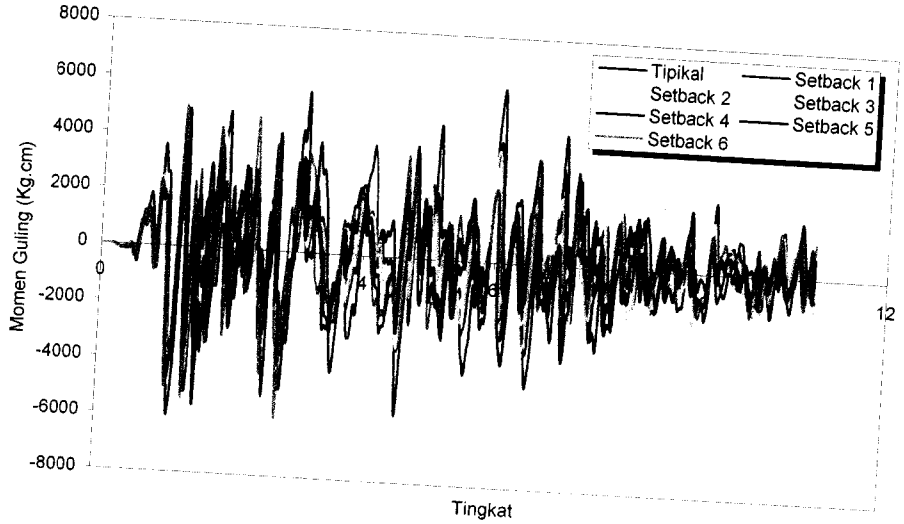
Tingkat 1



Tingkat 5

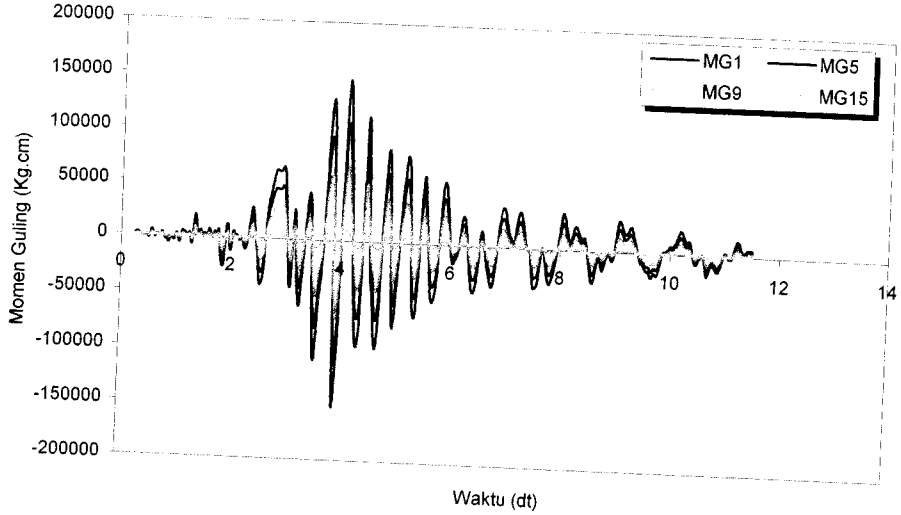


Tingkat 9

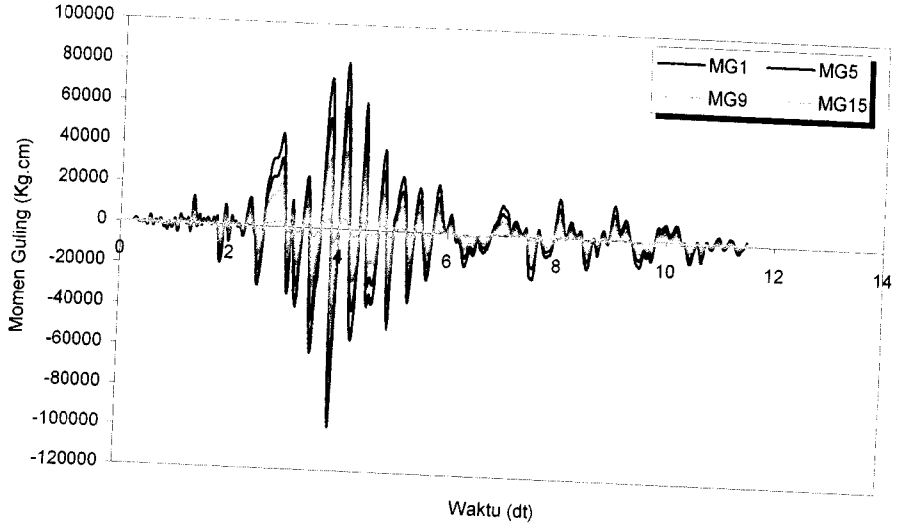


Tingkat 15

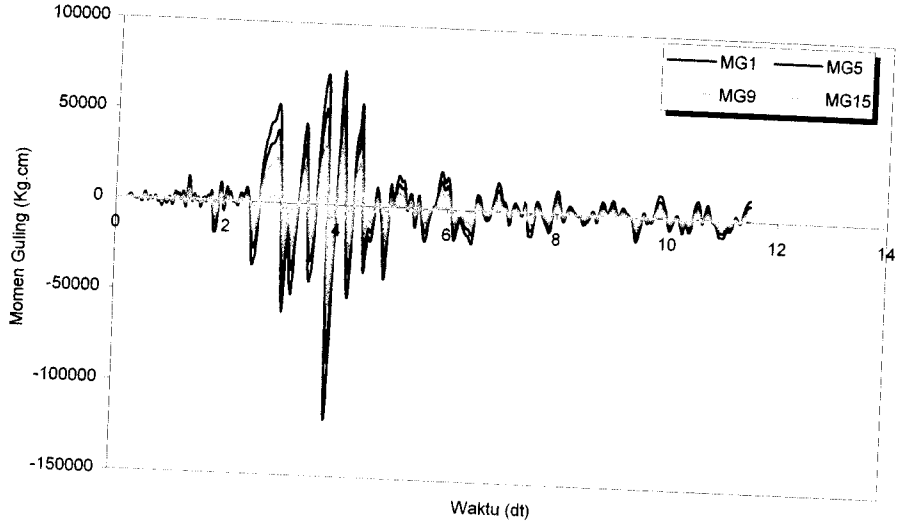
Gambar 5.144 Perbandingan Momen Guling Struktur Tingkat 15 Akibat Gempa El Centro



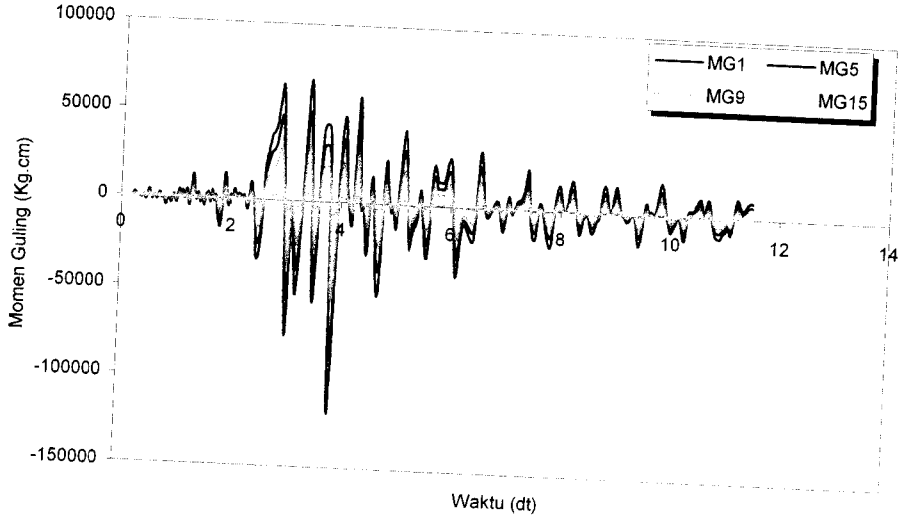
Tipikal



Setback 1

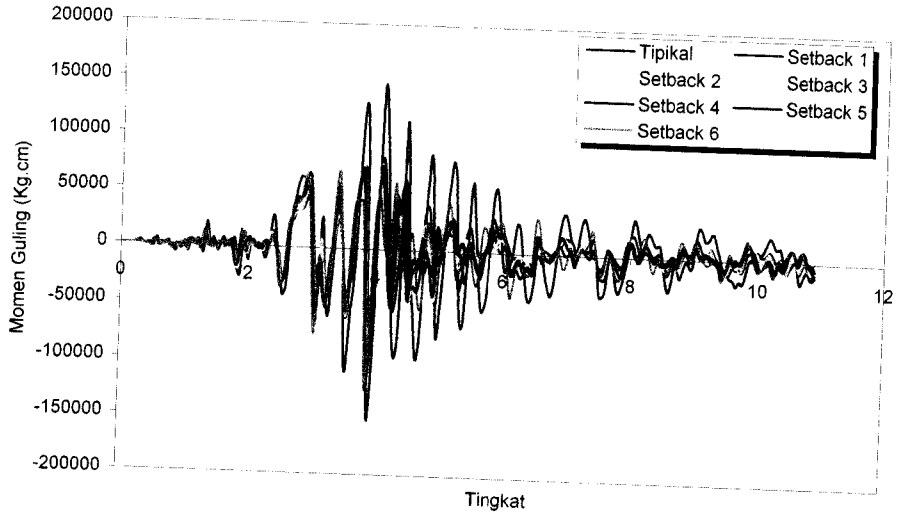


Setback 4

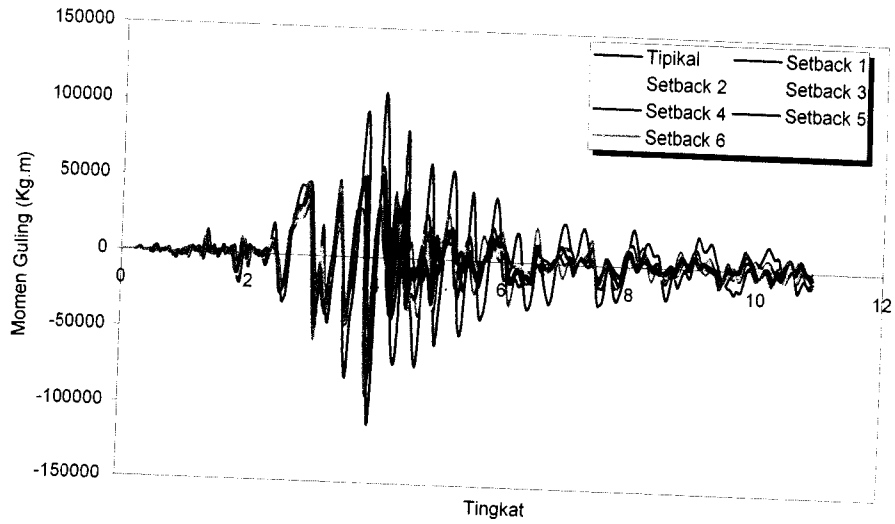


Setback 6

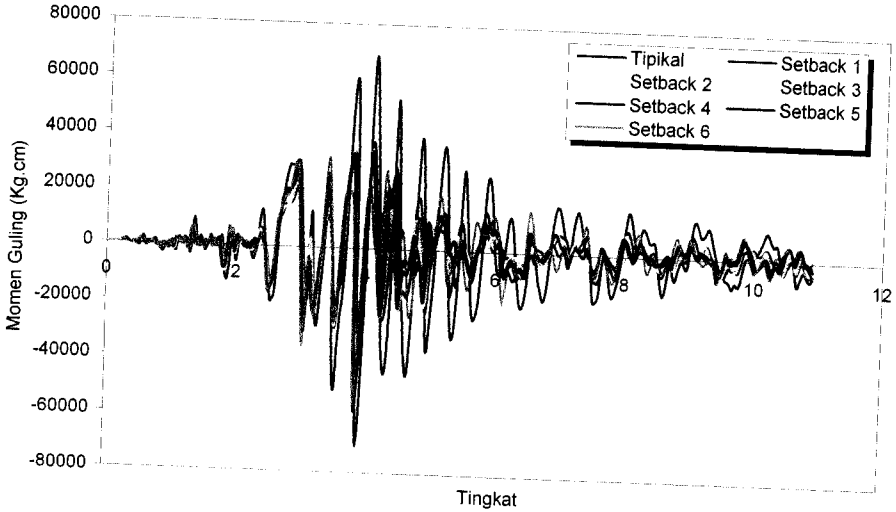
Gambar 5.145 Momen Guling Struktur Tingkat 15 Akibat Gempa Gilroy



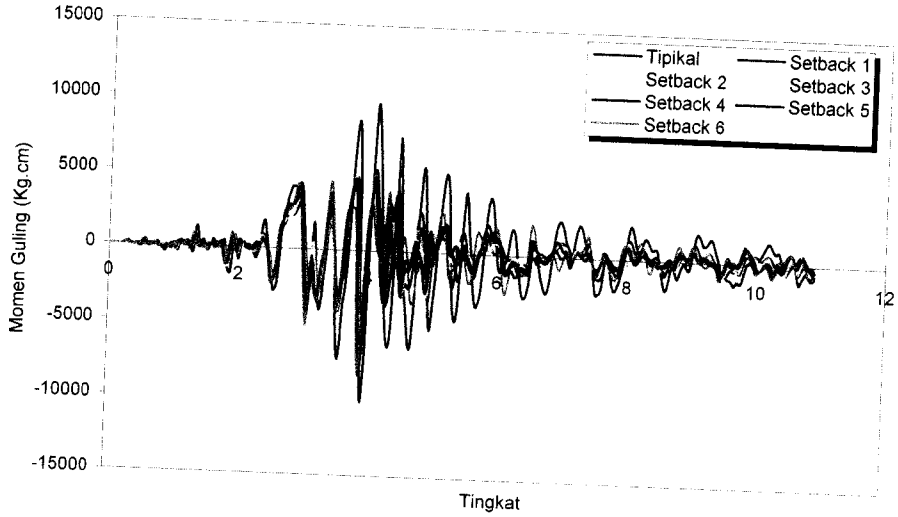
Tingkat 1



Tingkat 5

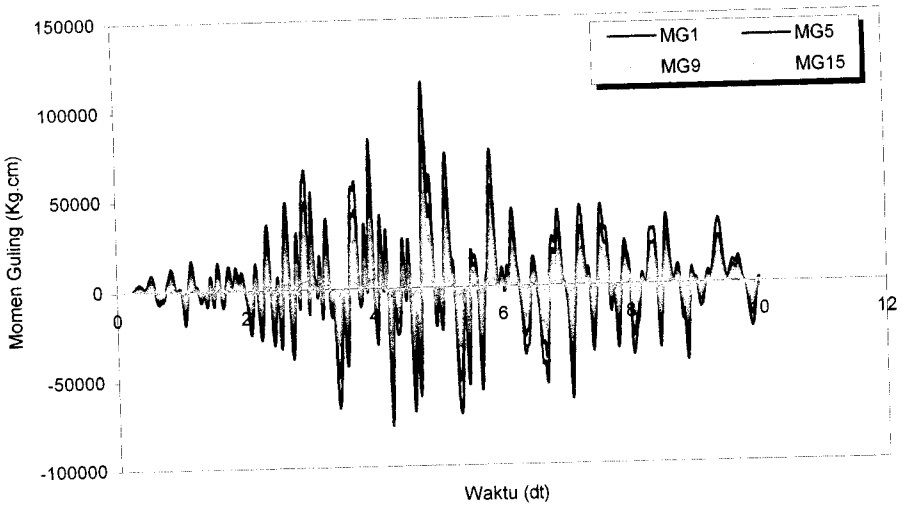


Tingkat 9

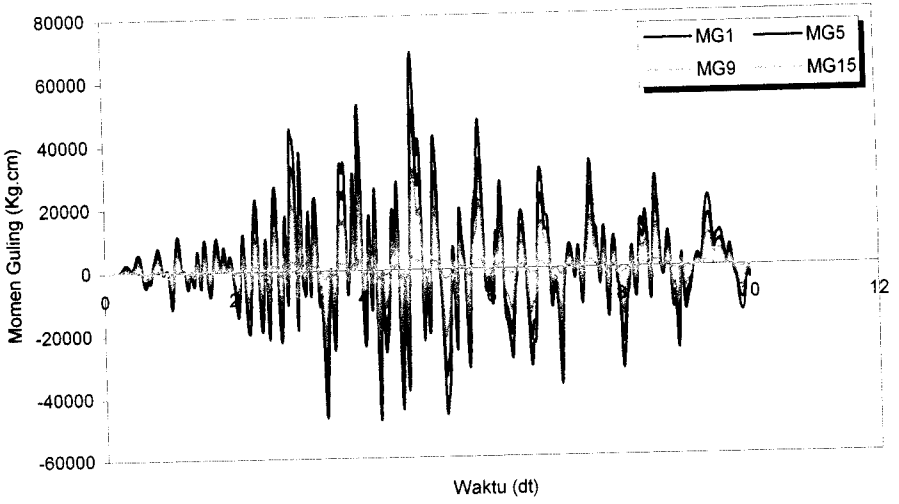


Tingkat 15

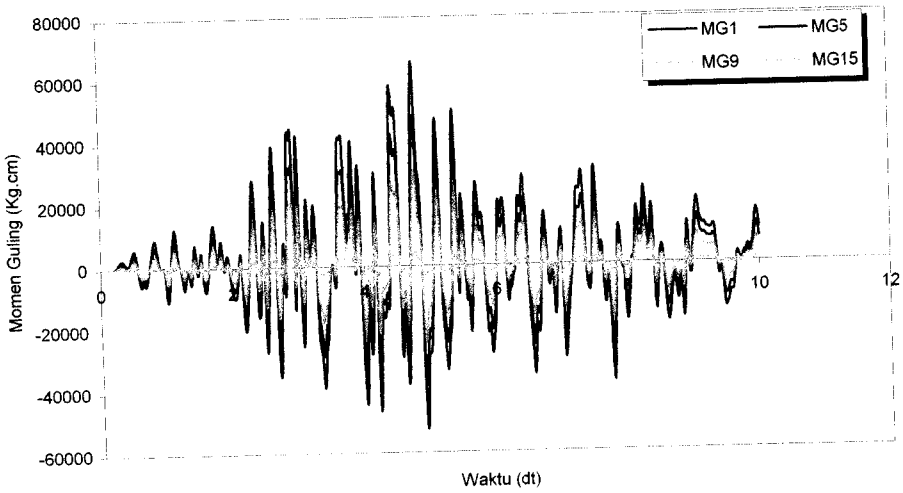
Gambar 5.146 Perbandingan Momen Guling Struktur Tingkat 15 Akibat Gempa Gilroy



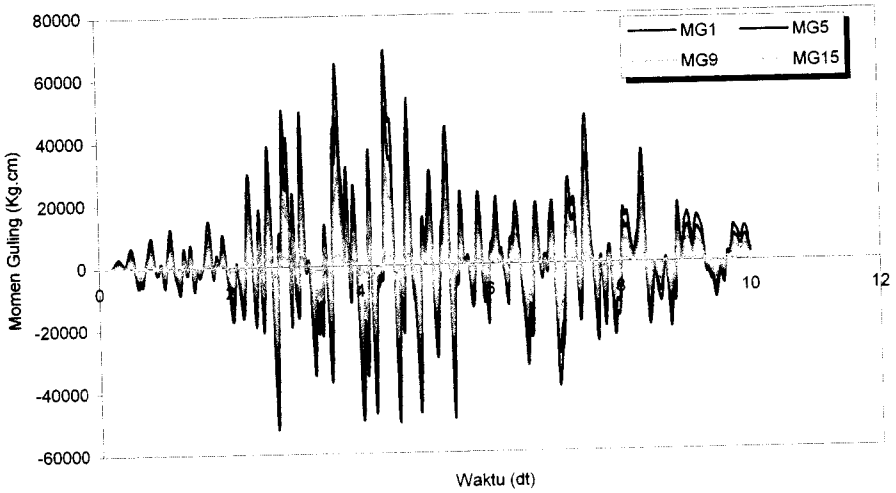
Tipikal



Setback 1

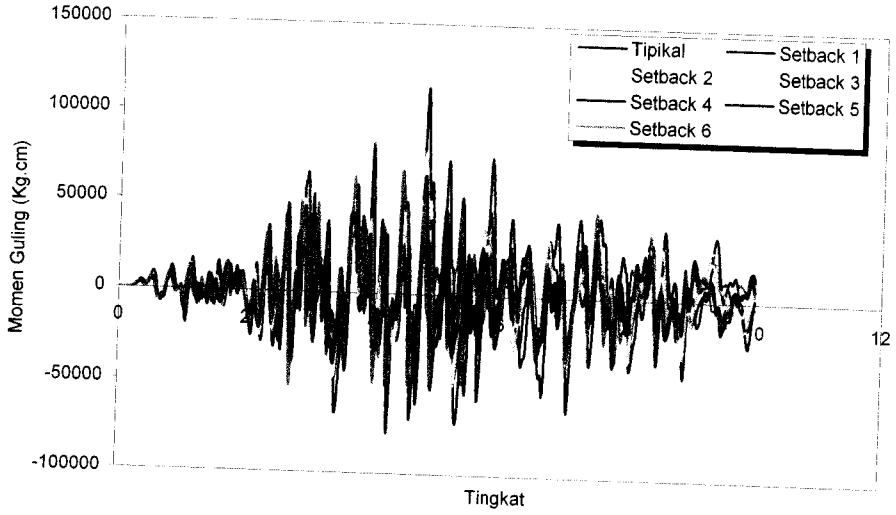


Setback 4

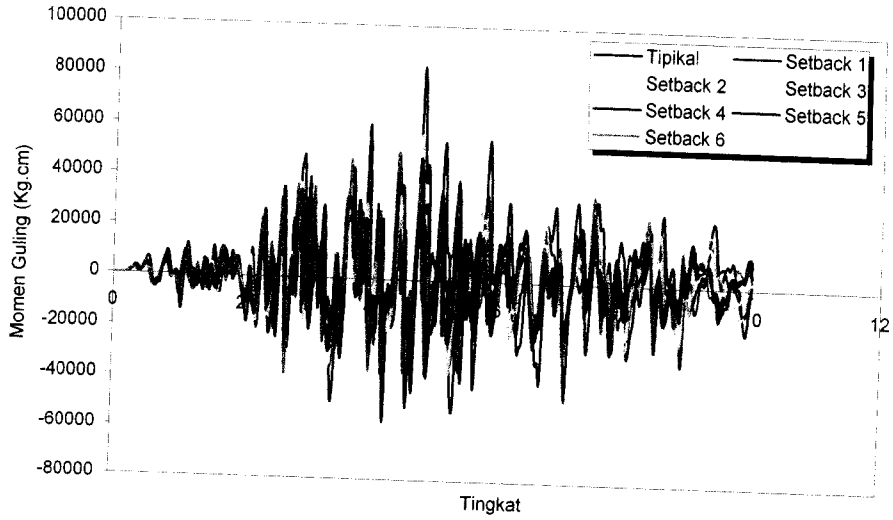


Setback 6

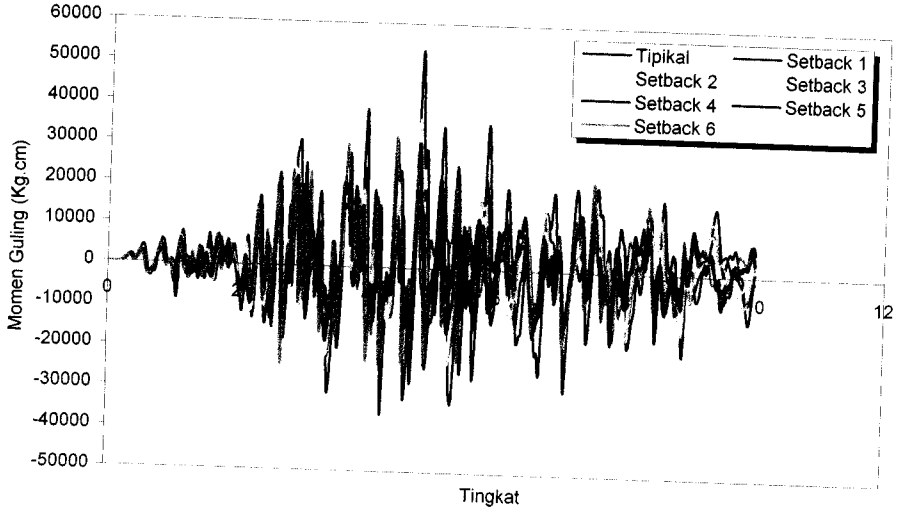
Gambar 5.147 Momen Guling Struktur Tingkat 15 Akibat Gempa Koyna



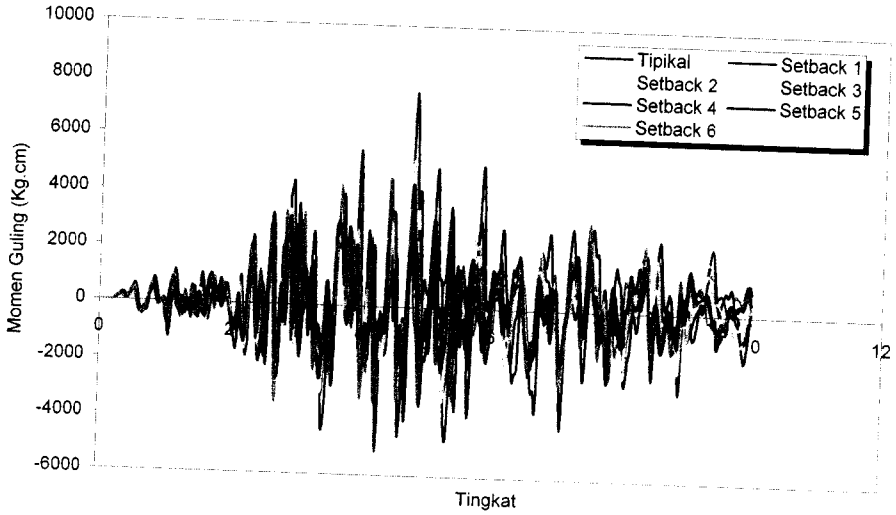
Tingkat 1



Tingkat 5

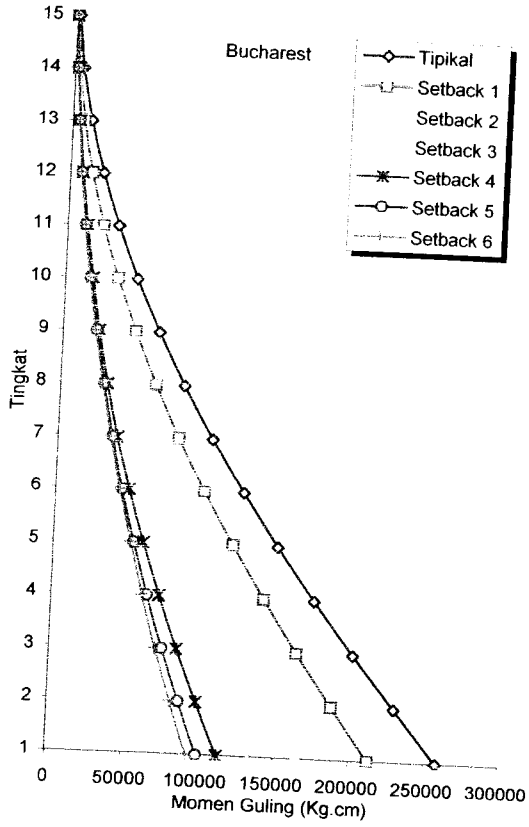


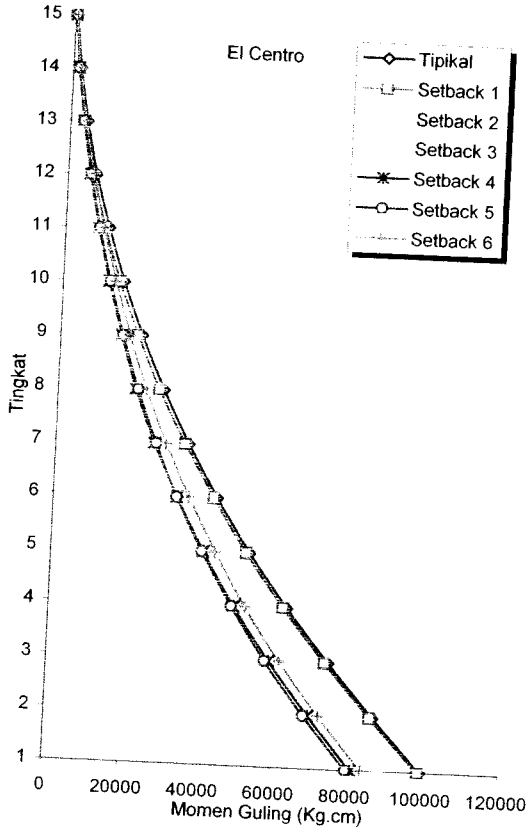
Tingkat 9

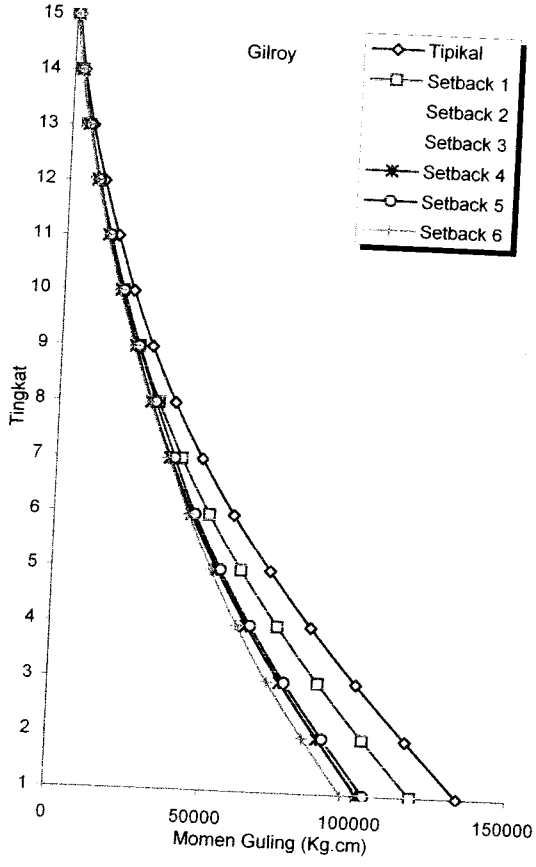


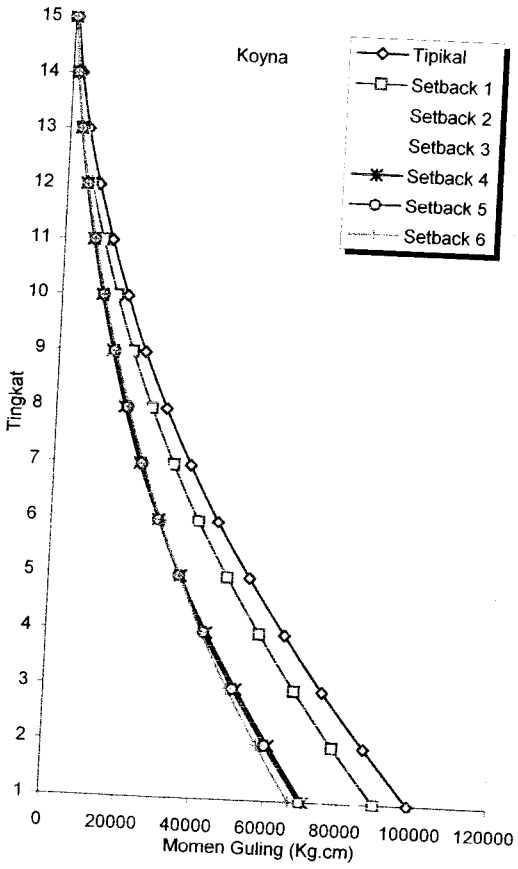
Tingkat 15

Gambar 5.148 Perbandingan Momen Guling Struktur Tingkat 15 Akibat Gempa Koyna

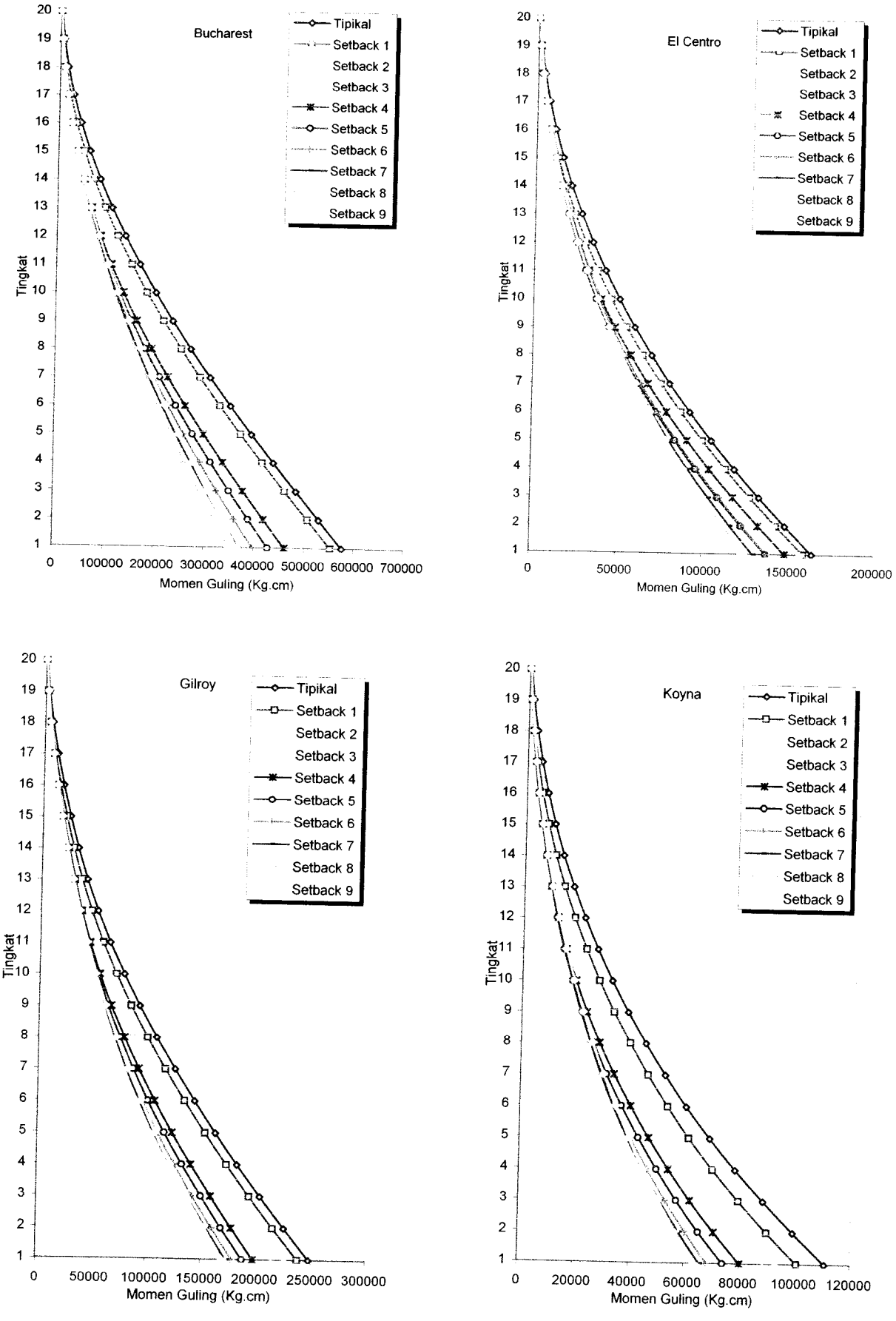








Gambar 5.149 Momen Guling Maksimum Struktur Tingkat 15 Akibat 4 Gempa



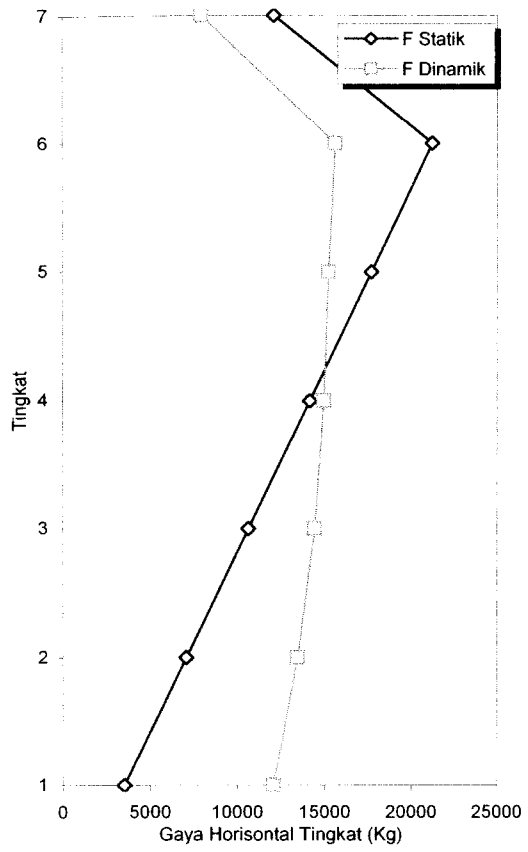
Gambar 5.150 Momen Guling Maksimum Struktur Tingkat 20 Akibat 4 Gempa

5.4.7 Hasil Perbandingan Dinamik dengan Statik Ekivalen

Dari program ini dapat disajikan nilai-nilai *respon dinamik* untuk struktur bangunan tingkat 7, 10, 15 dan 20. Untuk memperkuat hasil dinamik maka dibandingkan dengan statik ekivalen yang disajikan pada Gambar 5.151 sampai dengan Gambar 5.198.

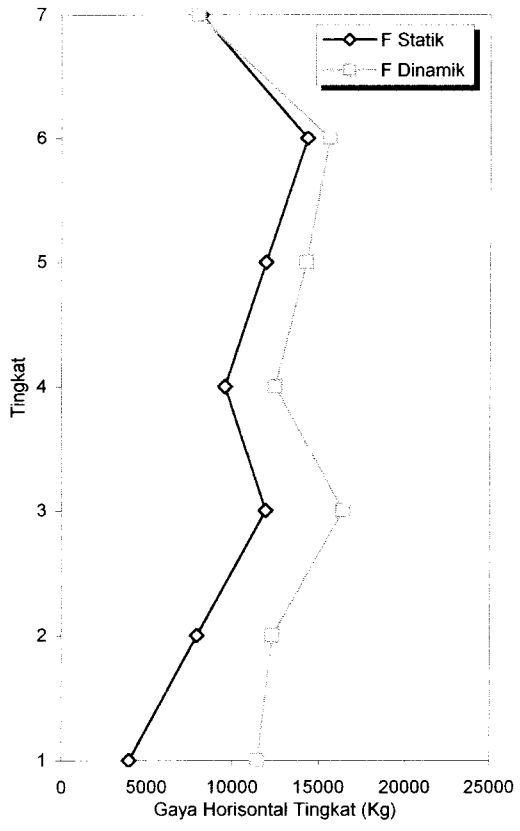
Dengan memperhatikan Gambar 5.151 sampai dengan Gambar 5.198 tersebut, maka dapat dilihat nilai perbandingan respon dinamik dan statik pada bangunan tingkat 7 akibat gempa Bucharest menunjukkan gaya horisontal tingkat respon dinamik lebih besar dari statik pada tingkat paling bawah tetapi jika ditinjau dari momen guling respon dinamik jauh lebih kecil dari dari statik. Hal ini disebabkan karena struktur bangunan tingkat 7 merupakan bangunan yang relatif kaku (frekuensi tinggi) jika dibebani gempa berfrekuensi rendah (Bucharest) maka responnya kecil. Berbeda dengan gempa Koyna yang mempunyai frekuensi tinggi sehingga pada struktur bangunan kaku akan mempunyai nilai respon dinamik yang cukup besar.

Bangunan tingkat 10, 15 dan 20 merupakan bangunan yang fleksibel (frekuensi rendah) jika ditinjau dari momen guling perhitungan secara statik ekivalen cenderung tidak aman karena jauh lebih besar dari perhitungan secara dinamik. Sehingga pengaruh dinamik lebih dominan pada bangunan tinggi. Sebaliknya, pada bangunan tingkat rendah perhitungan secara statik akan lebih besar dari dinamik.

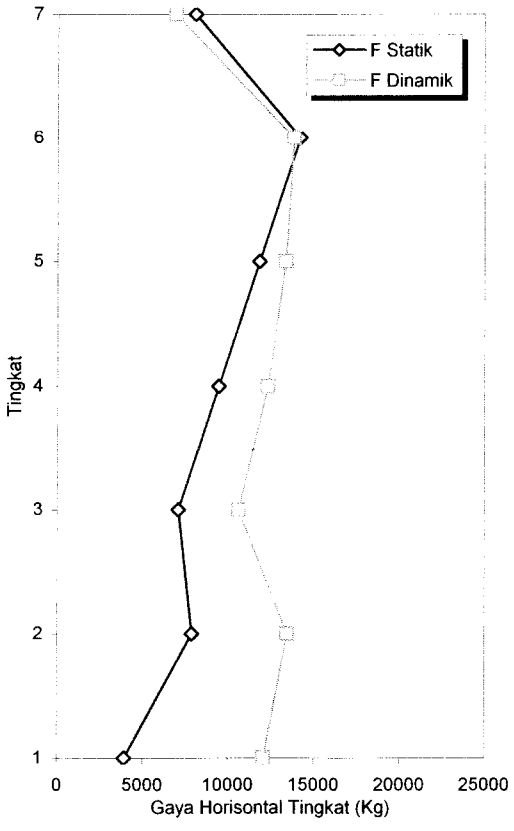


Tipikal

Setback 1

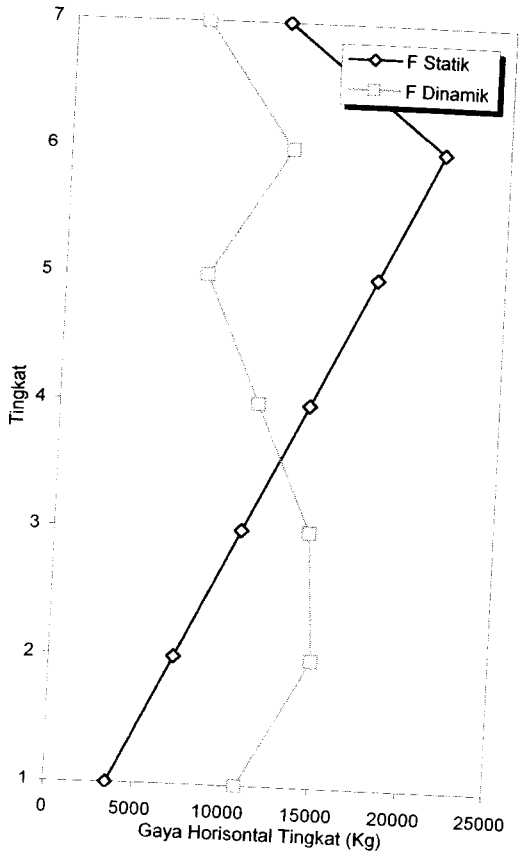


Setback 2

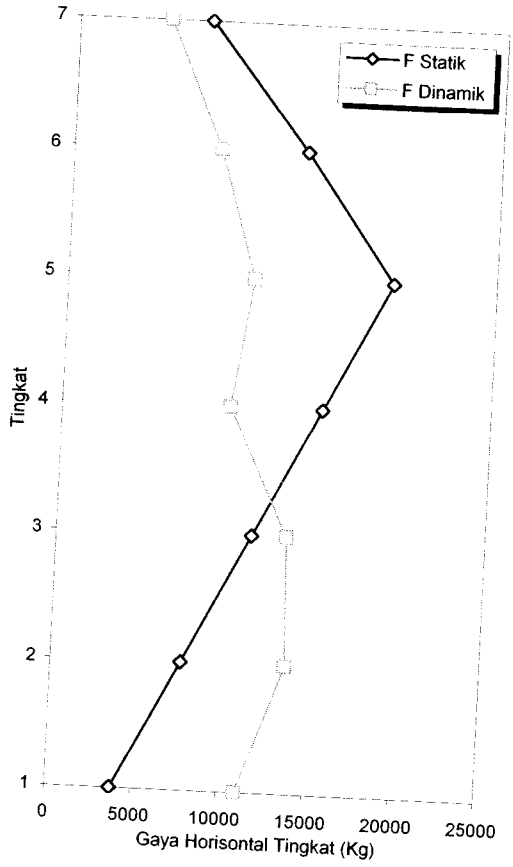


Setback 3

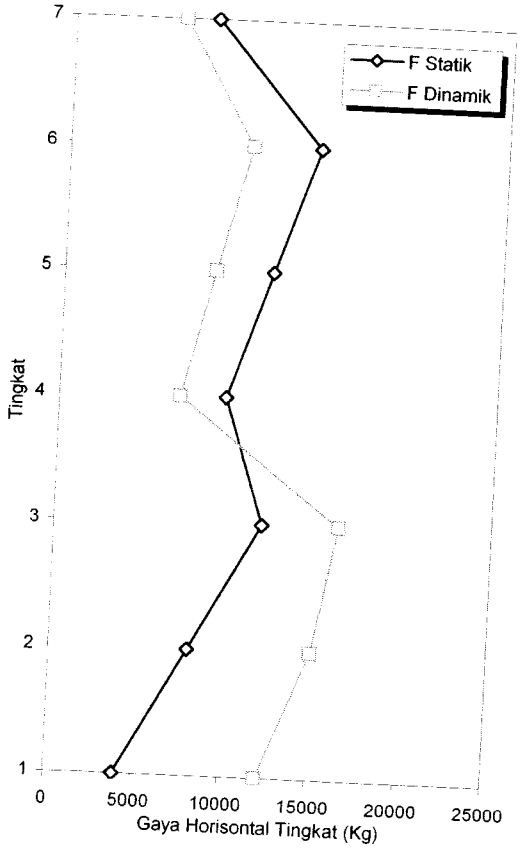
Gambar 5.151 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Bucharest



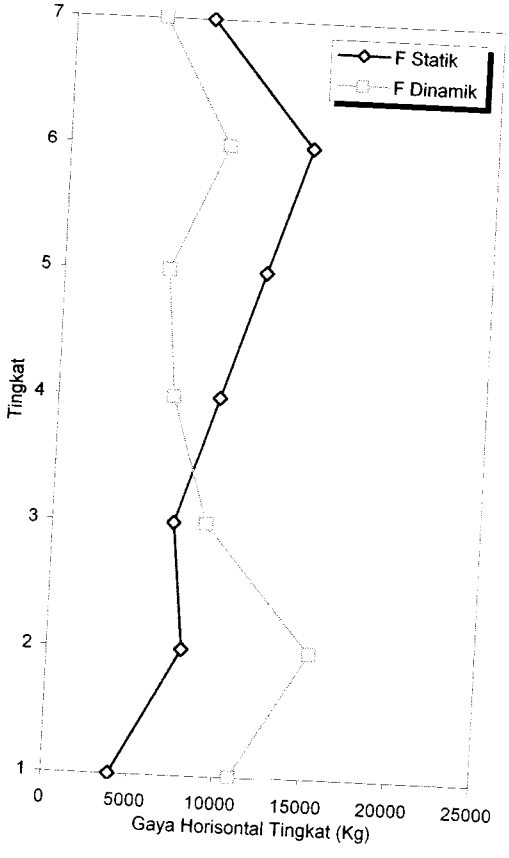
Tipikal



Setback 1

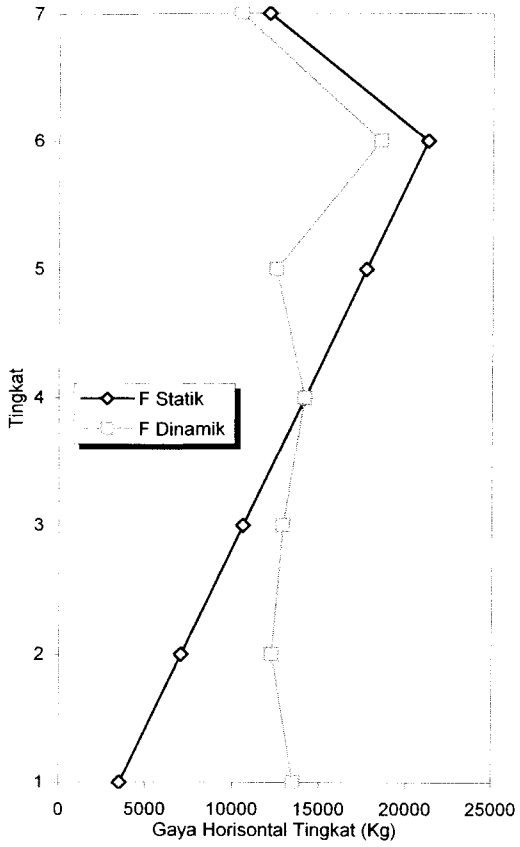


Setback 2

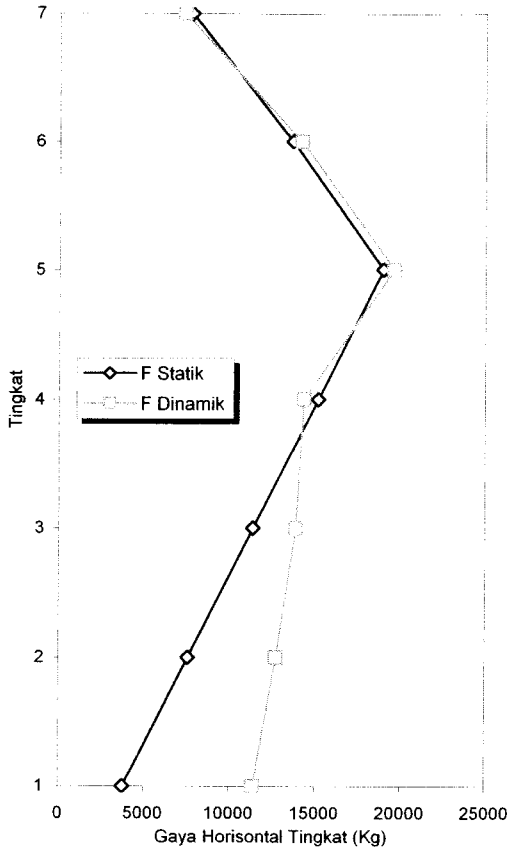


Setback 3

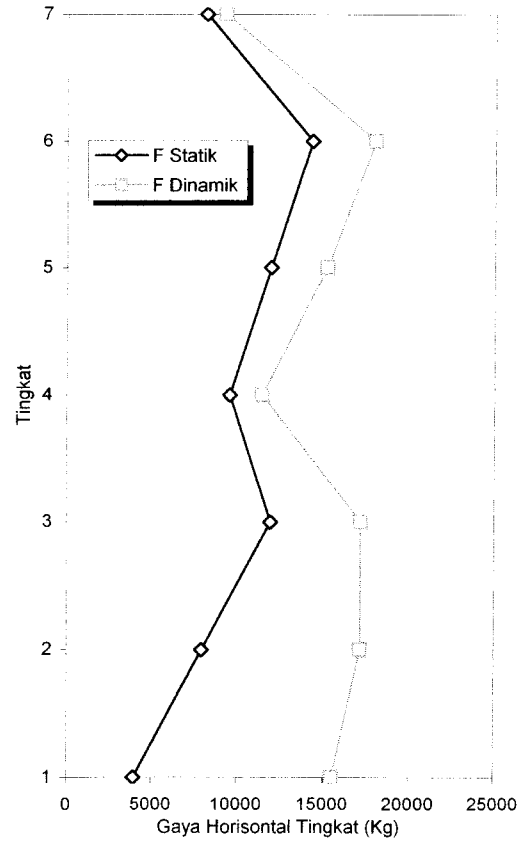
Gambar 5.152 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa El Centro



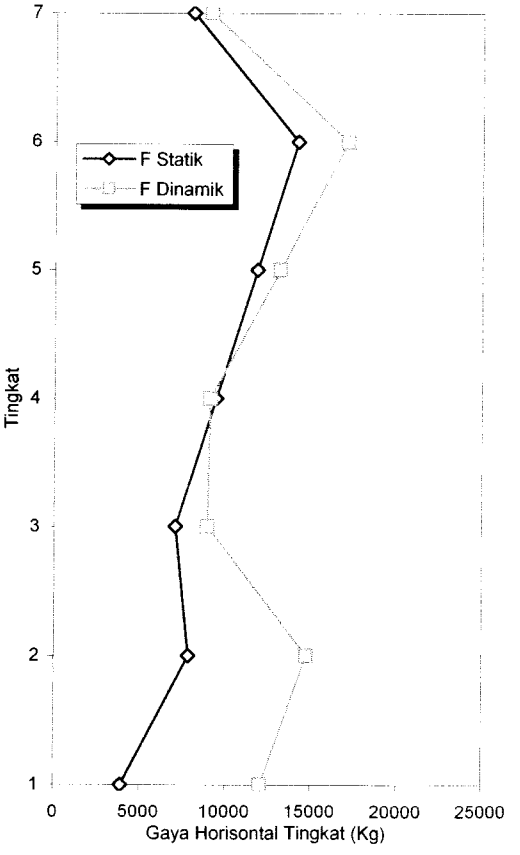
Tipikal



Setback 1

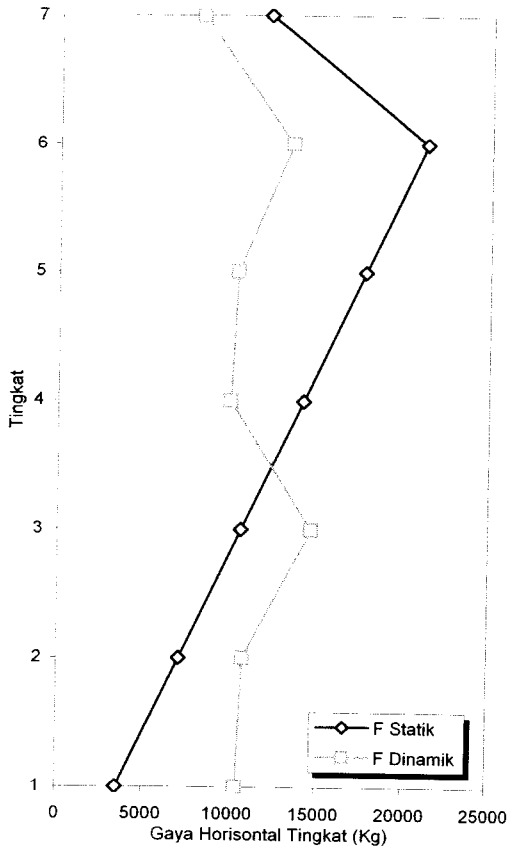


Setback 2

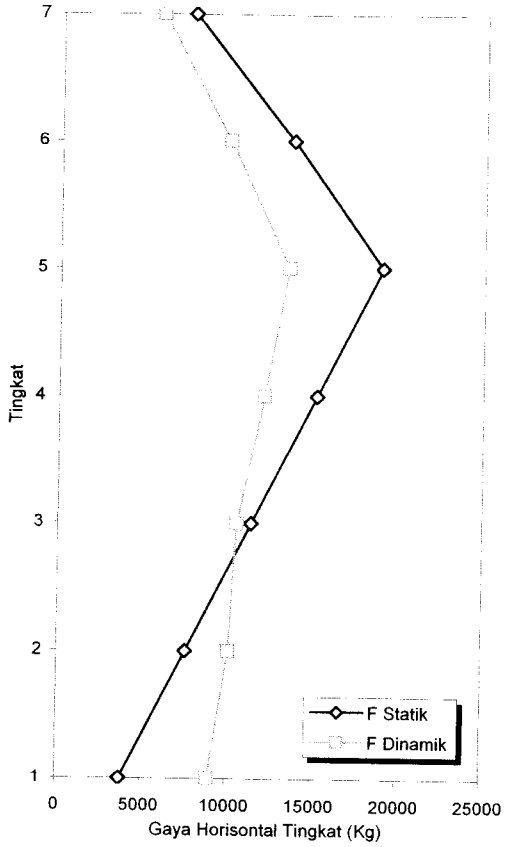


Setback 3

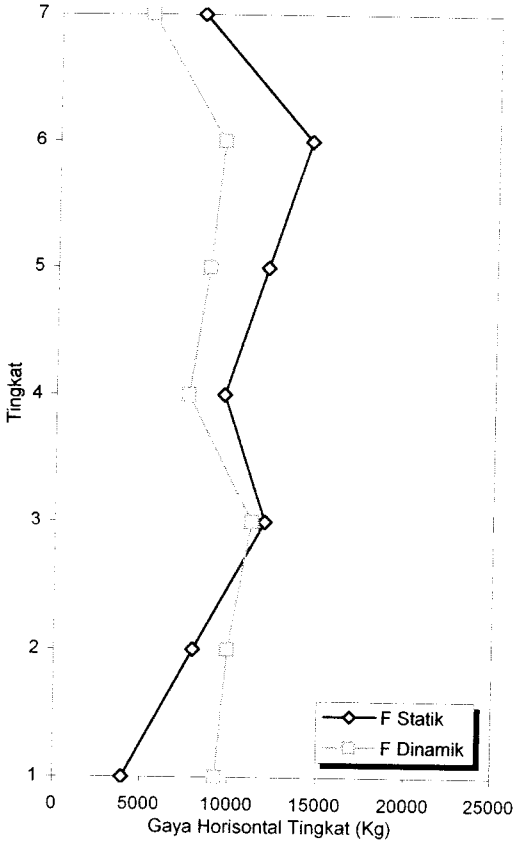
Gambar 5.153 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Gilroy



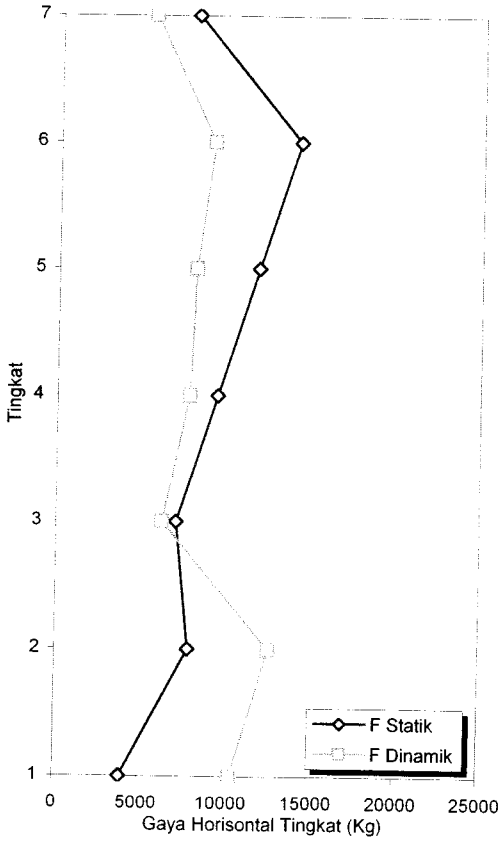
Tipikal



Setback 1

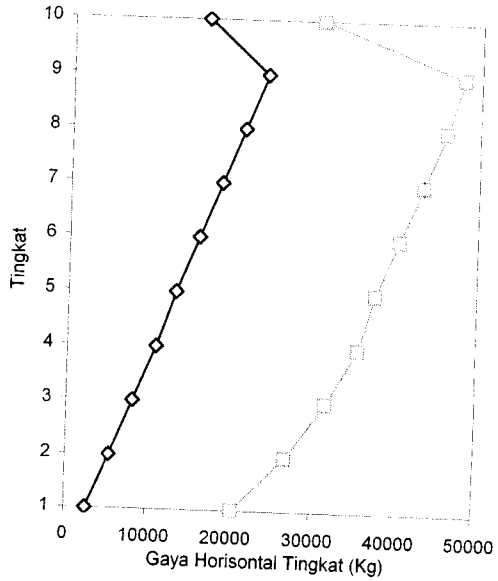


Setback 2

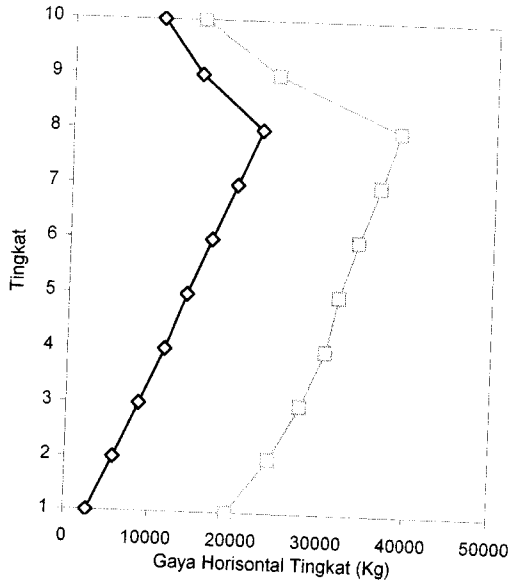


Setback 3

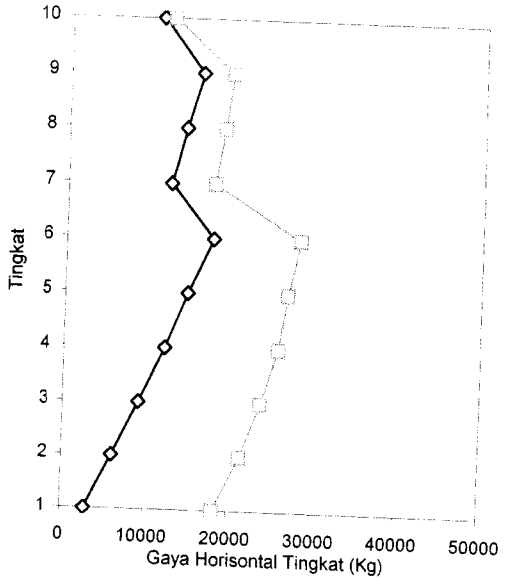
Gambar 5.154 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Koyna



Tipikal



Setback 1



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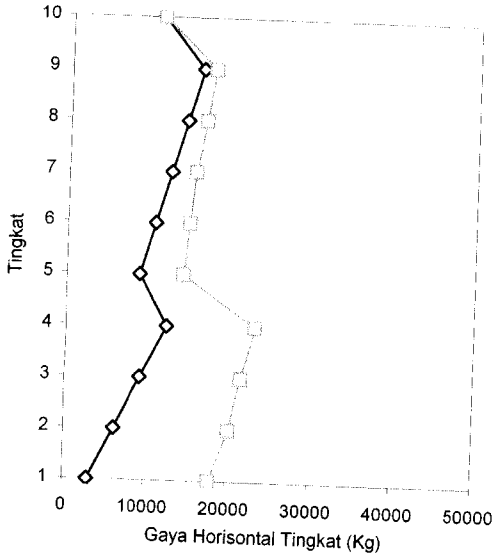

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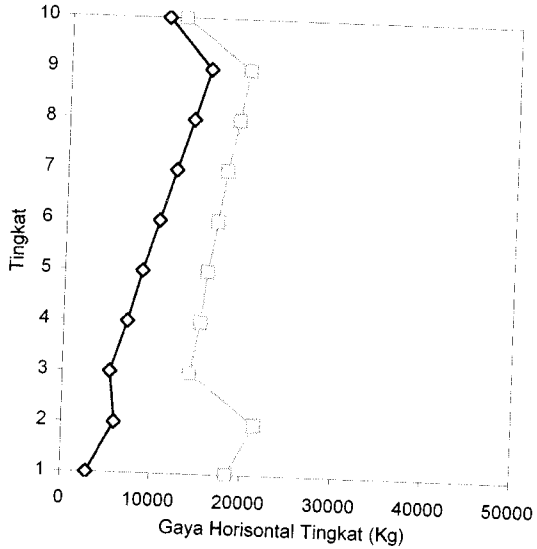
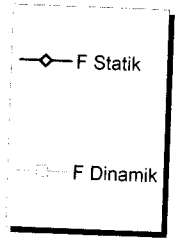
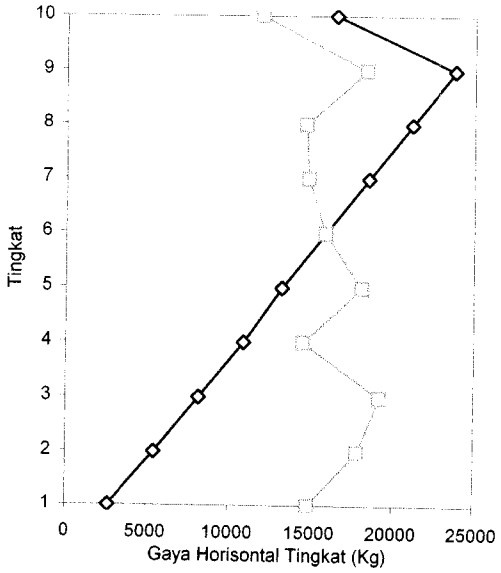


Setback 4



Gambar 5.155 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Bucharest



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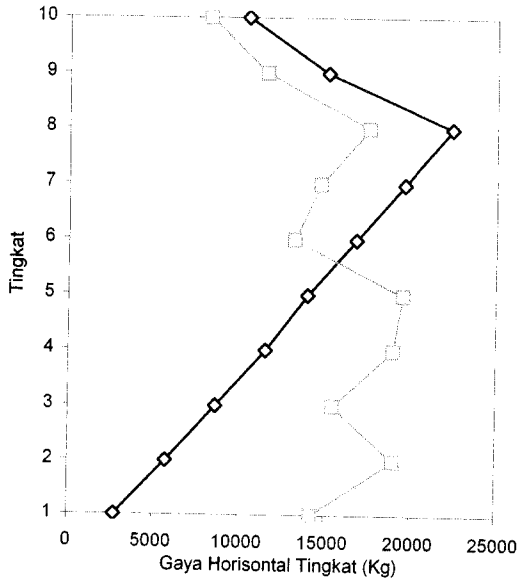

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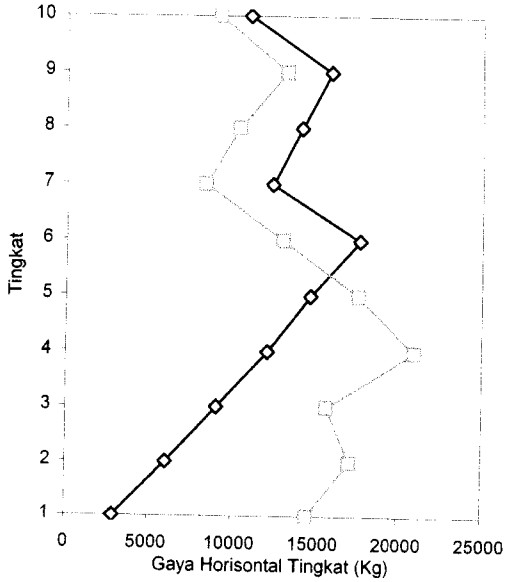
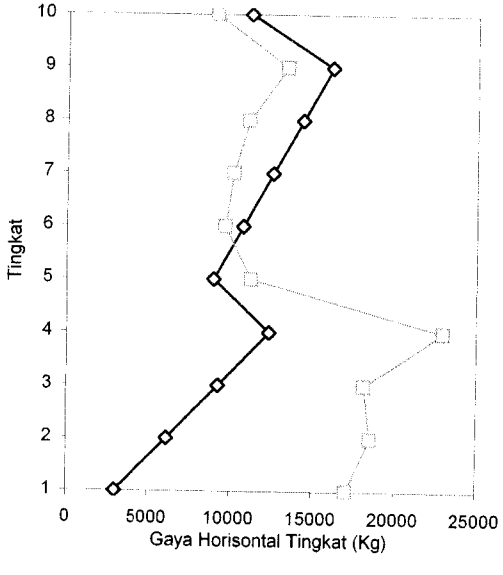
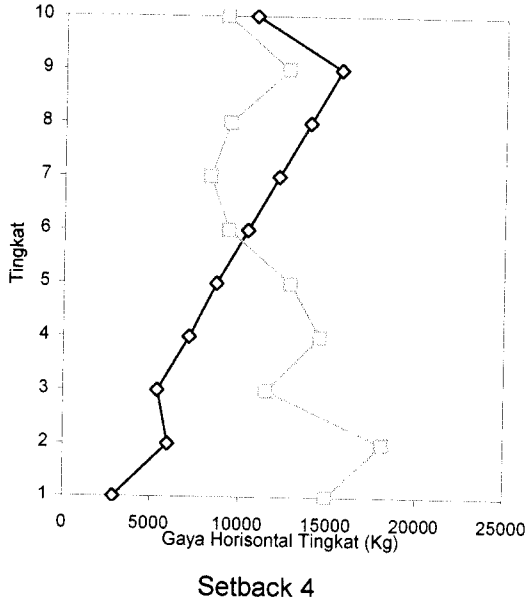


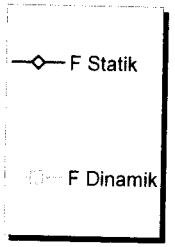
Setback 2



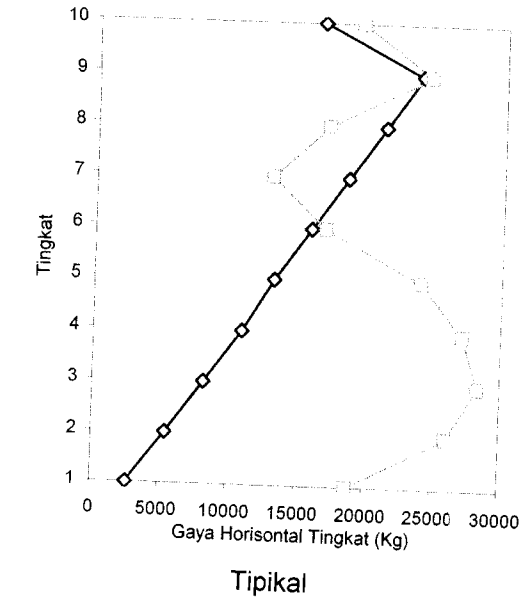
Setback 3



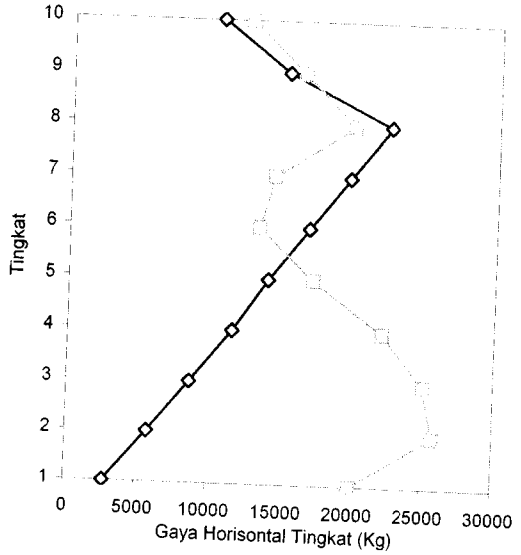
Setback 4



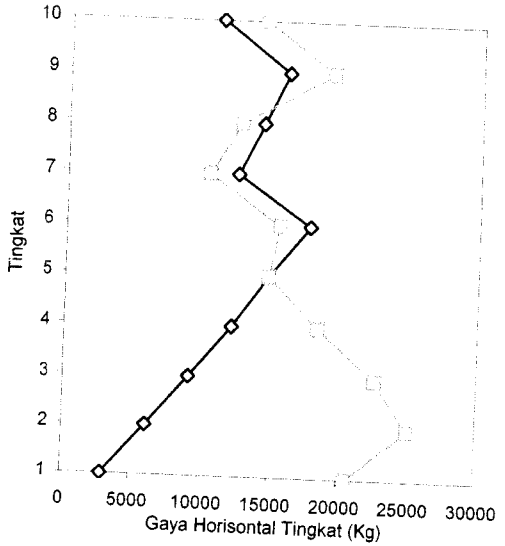
Gambar 5.156 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa El Centro



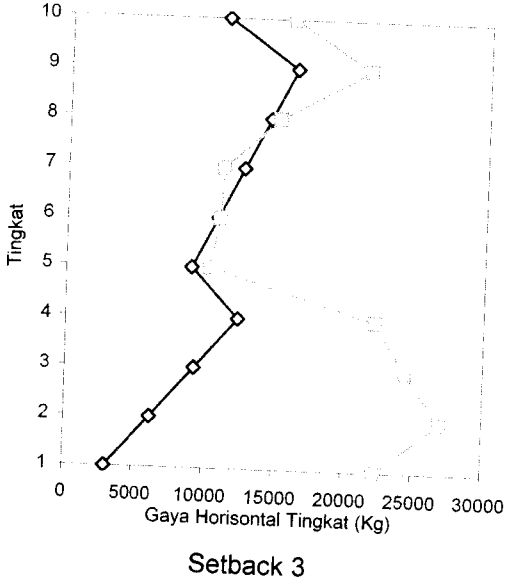
Tipikal



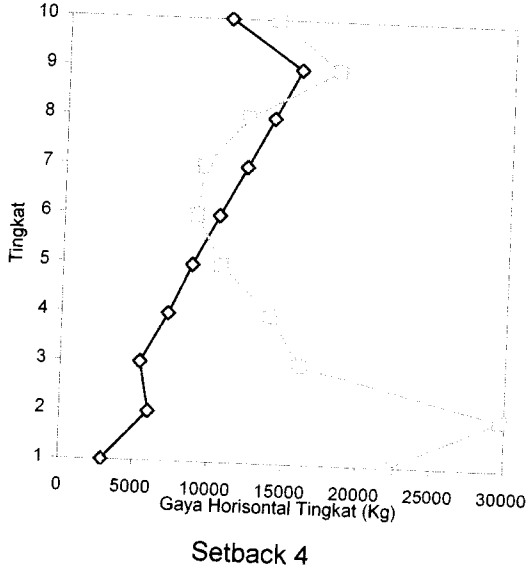
Setback 1



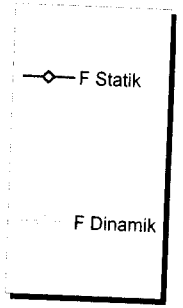
Setback 2



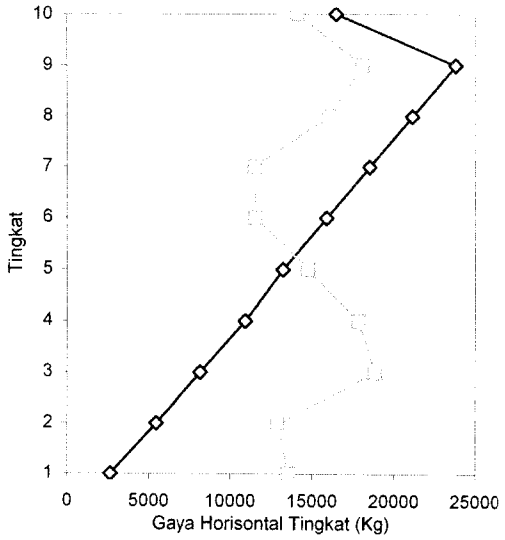
Setback 3



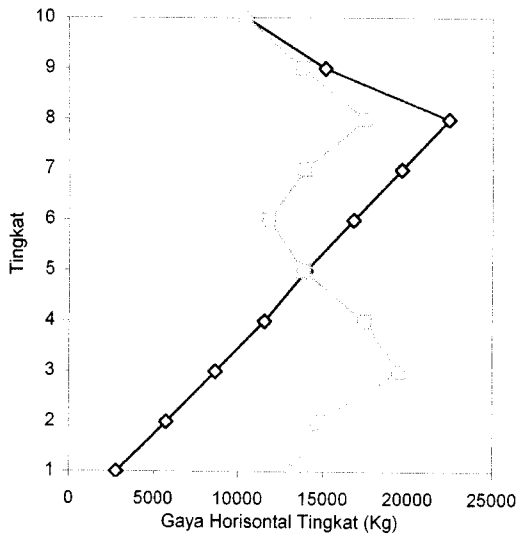
Setback 4



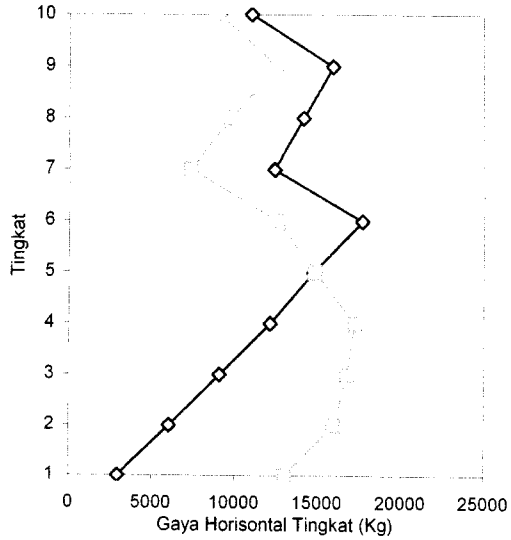
Gambar 5.157 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Gilroy



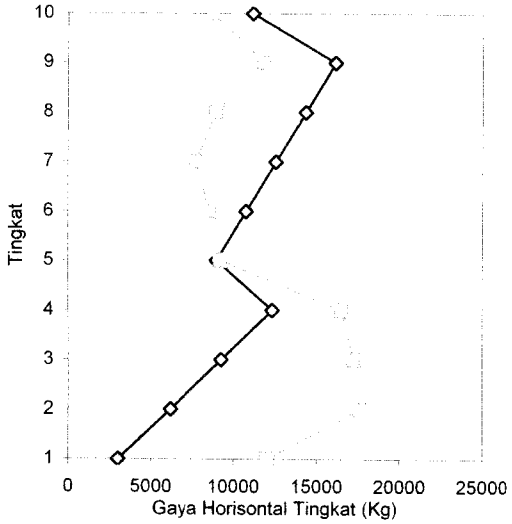
Tipikal



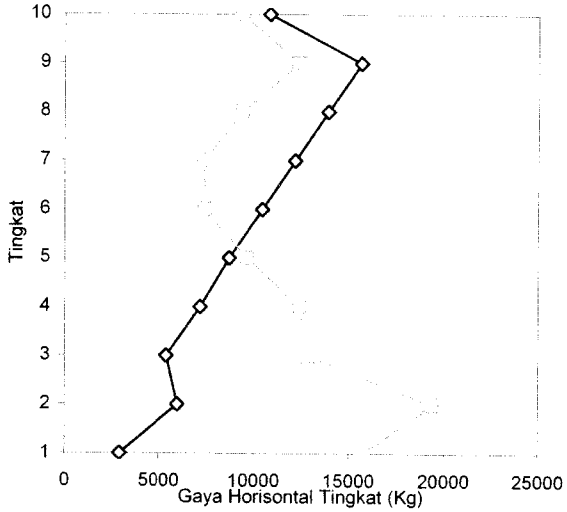
Setback 1



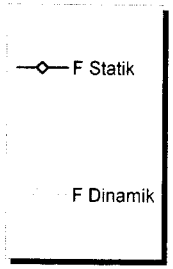
Setback 2



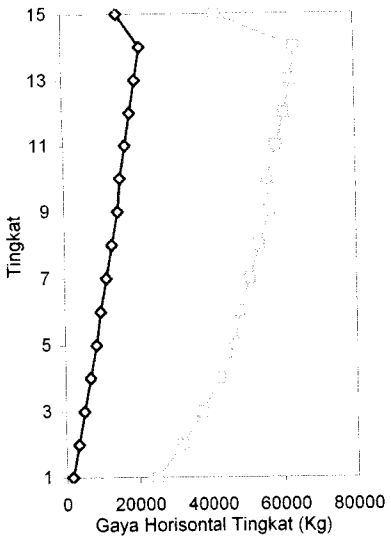
Setback 3



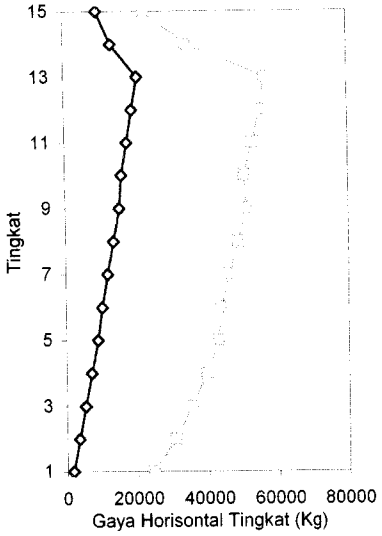
Setback 4



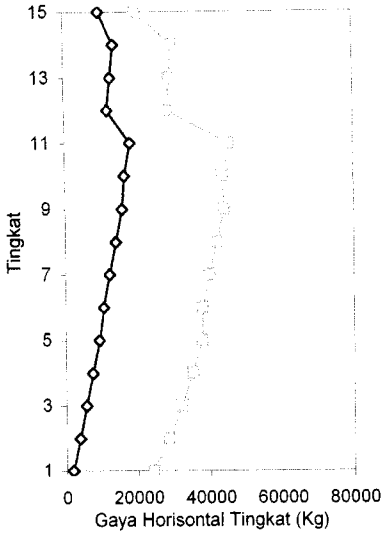
Gambar 5.158 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Koyna



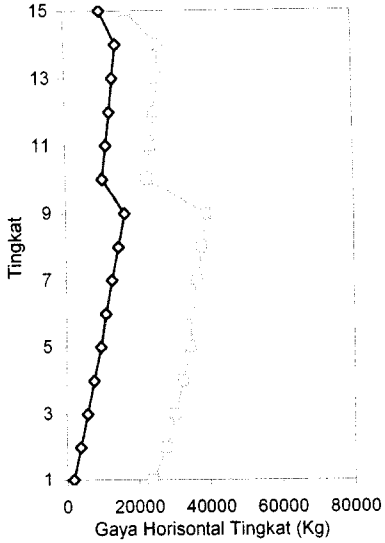
Tipikal



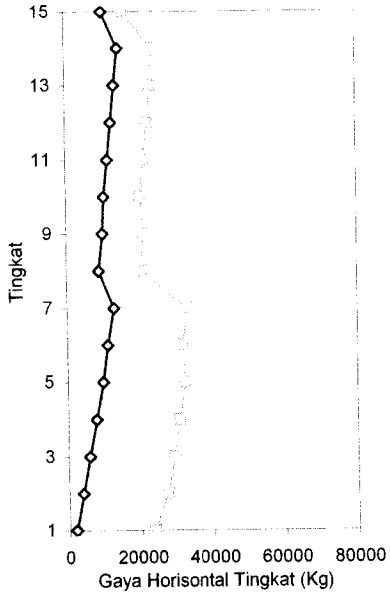
Setback 1



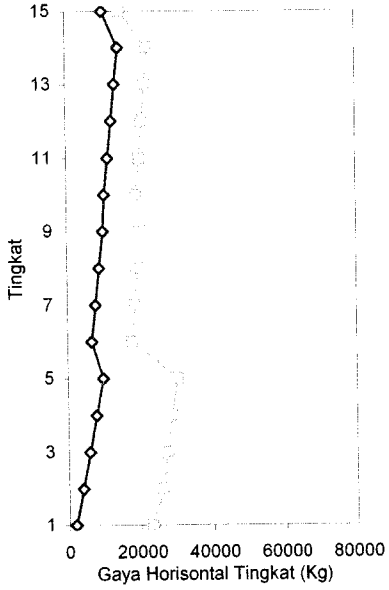
Setback 2



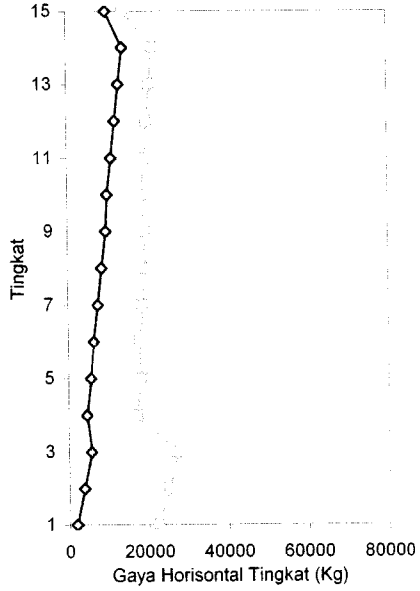
Setback 3



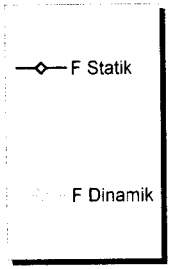
Setback 4



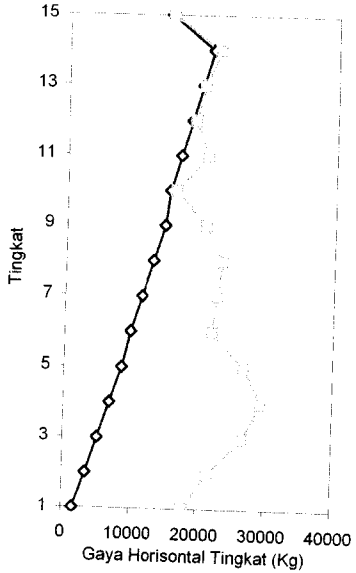
Setback 5



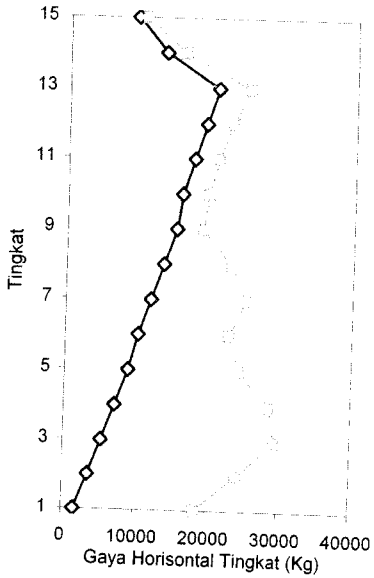
Setback 6



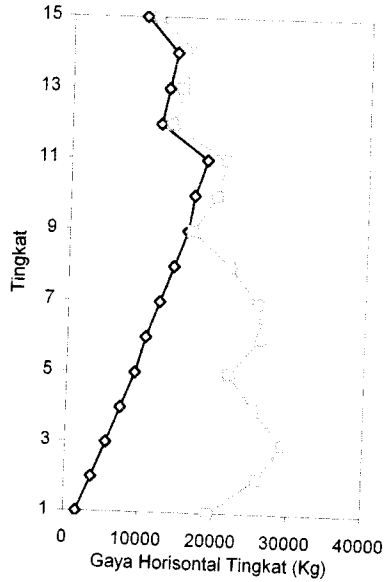
Gambar 5.159 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest



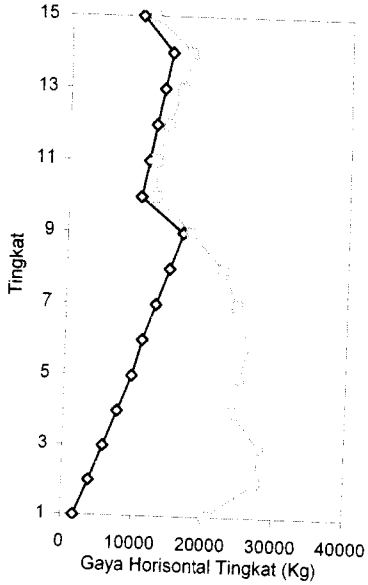
Tipikal



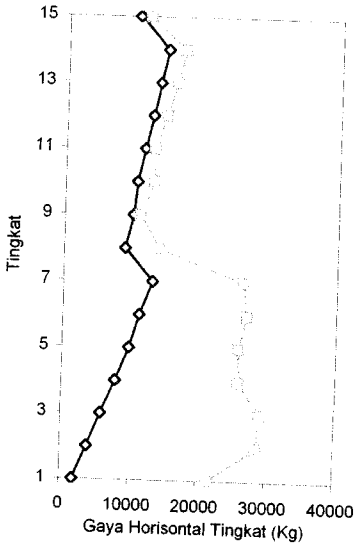
Setback 1



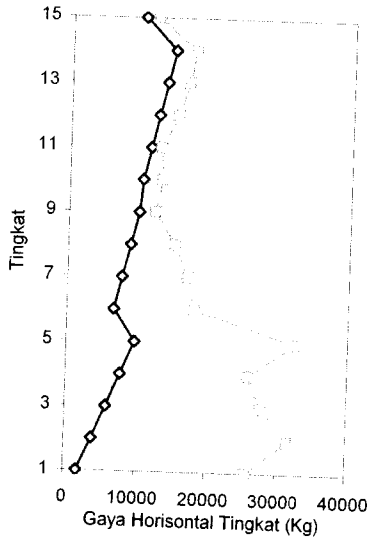
Setback 2



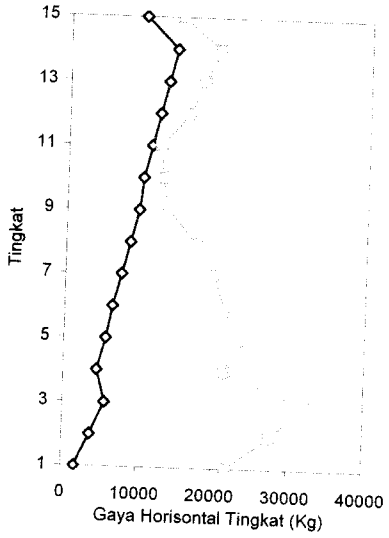
Setback 3



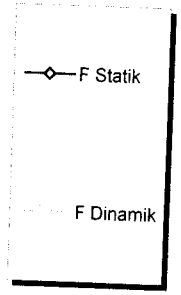
Setback 4



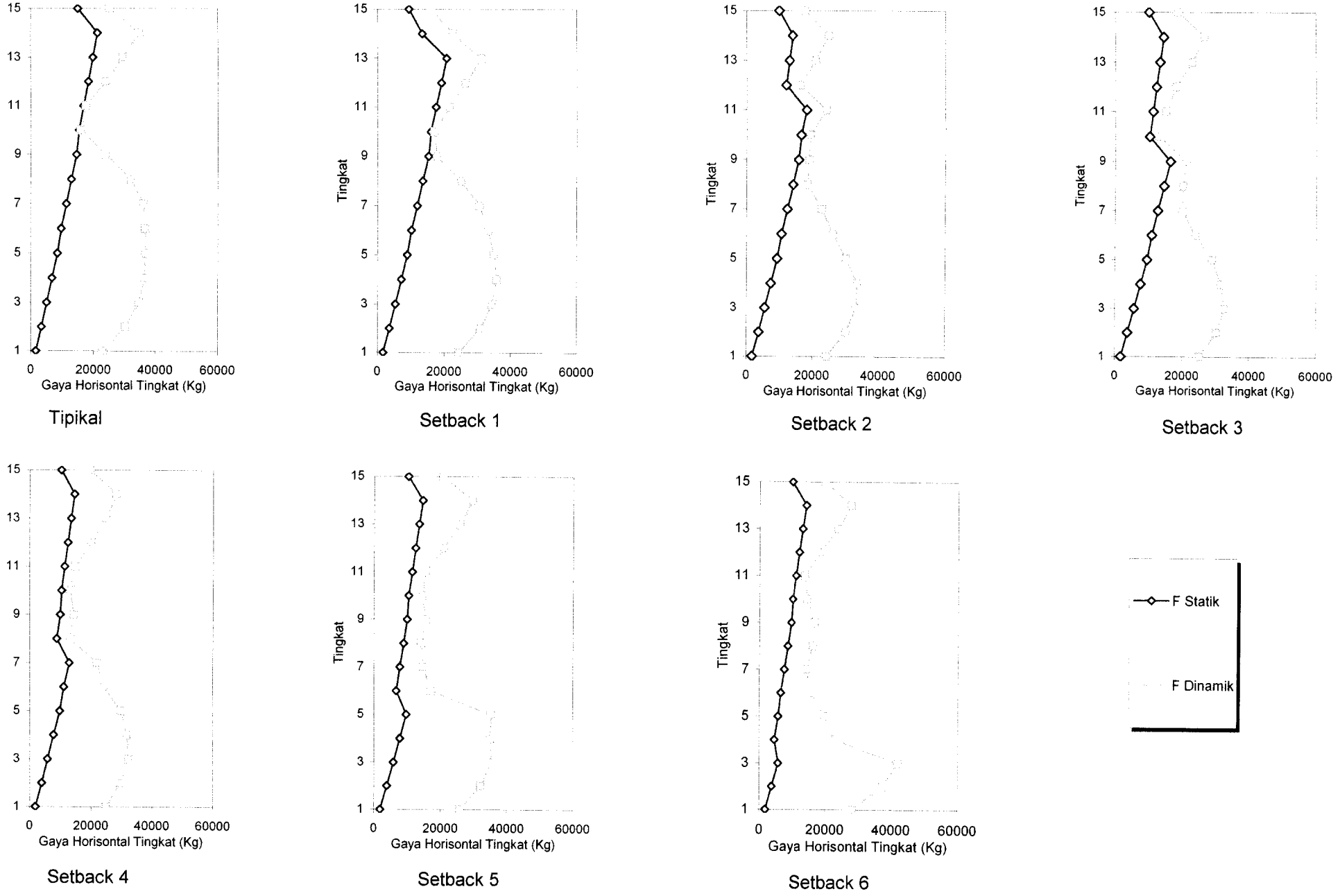
Setback 5



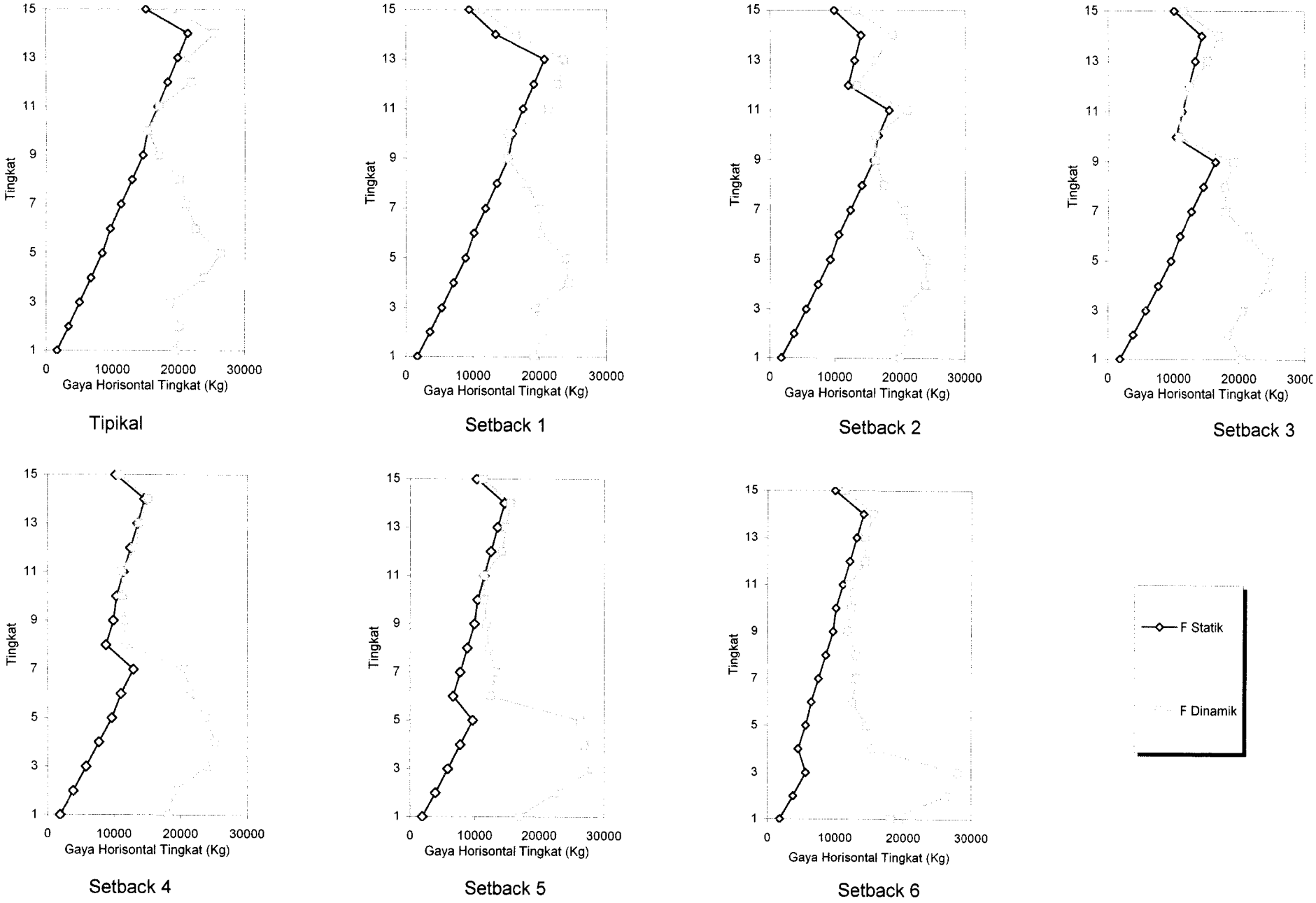
Setback 6



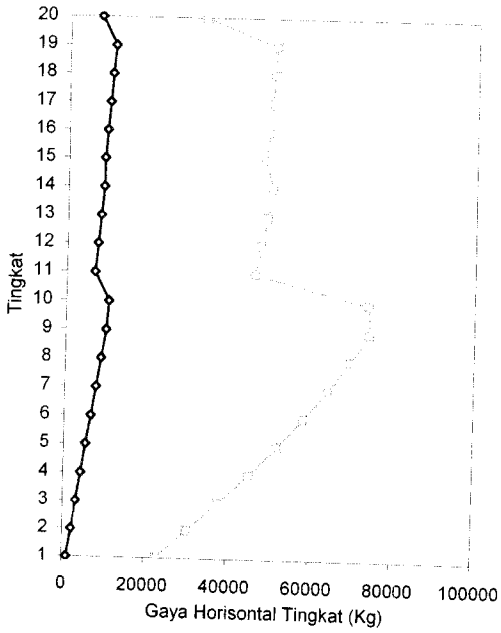
Gambar 5.160 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro



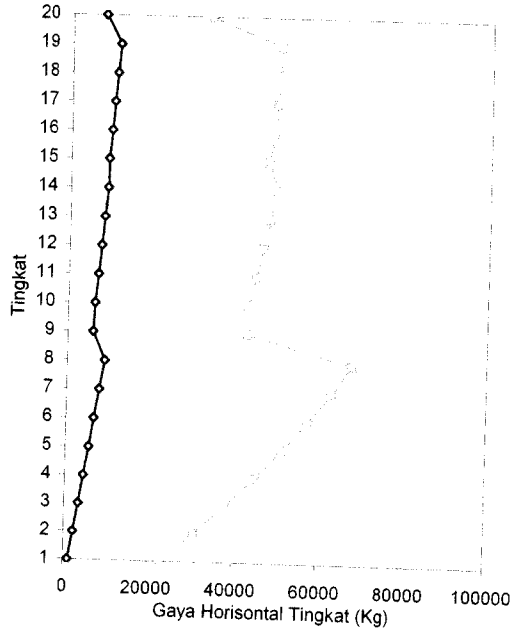
Gambar 5.161 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy



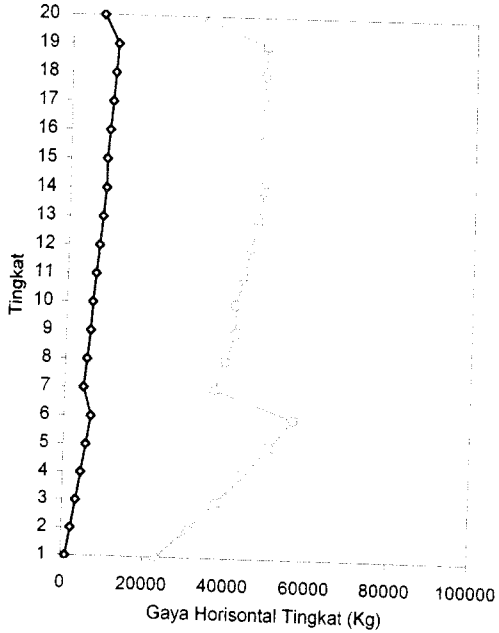
Gambar 5.162 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna



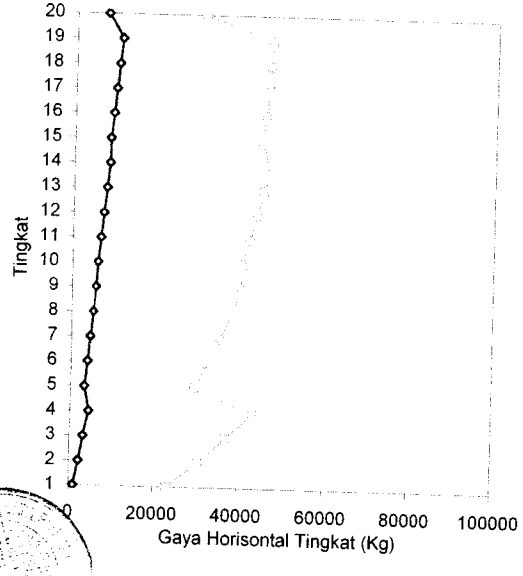
Setback 5



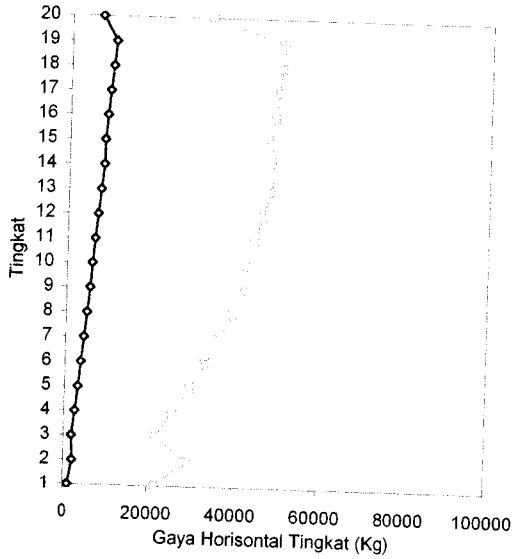
Setback 6



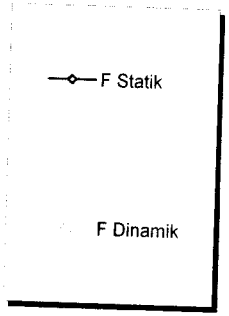
Setback 7



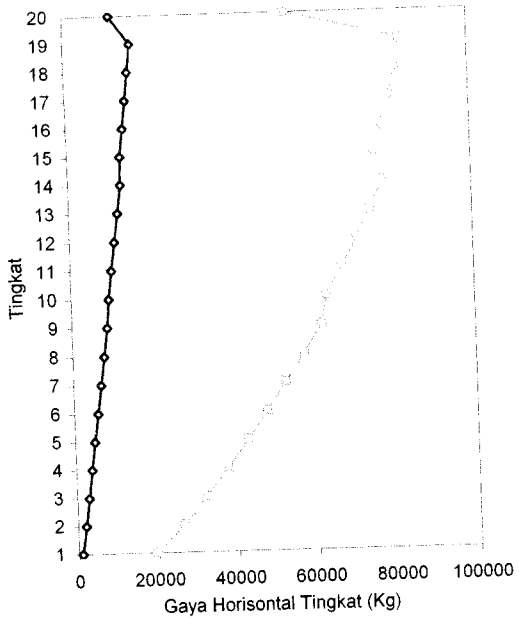
Setback 8



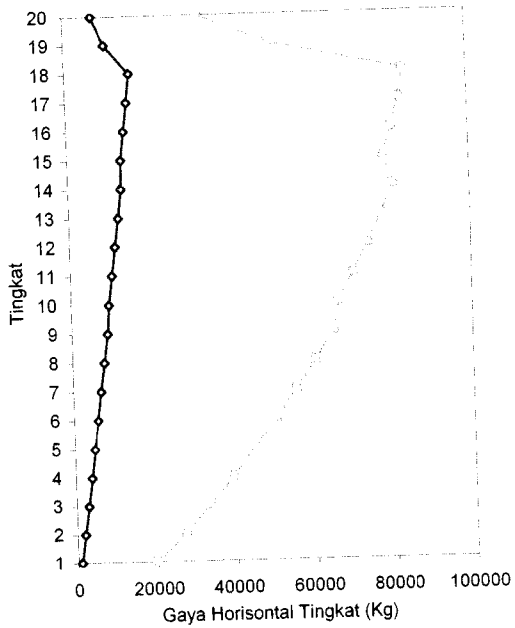
Setback 9



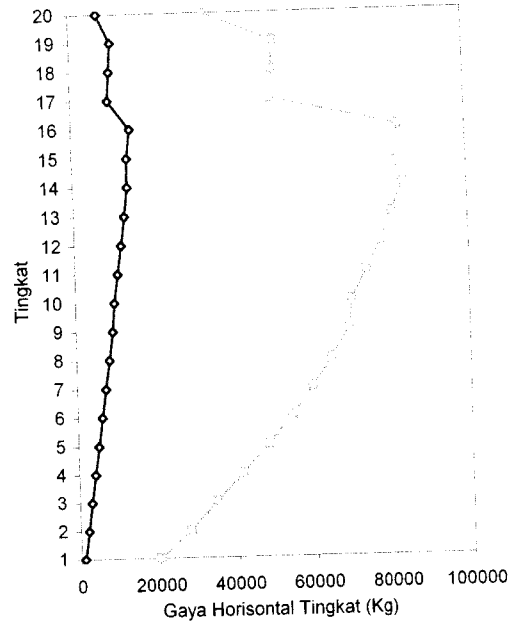
Gambar 5.163 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest



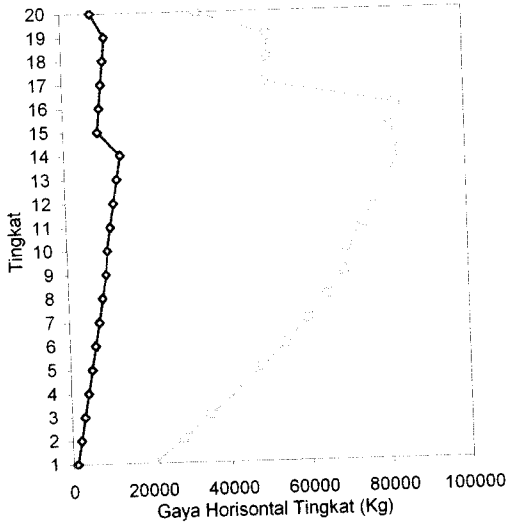
Tipikal



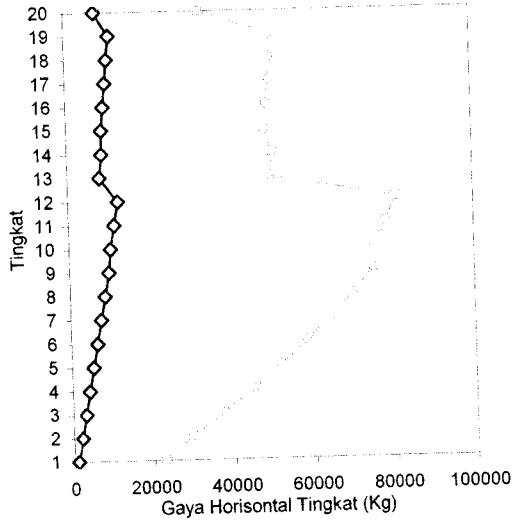
Setback 1



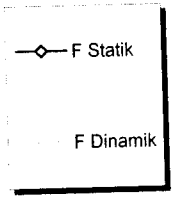
Setback 2



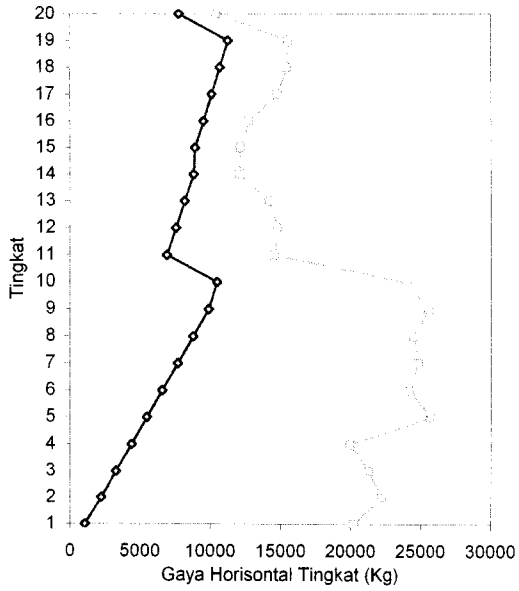
Setback 3



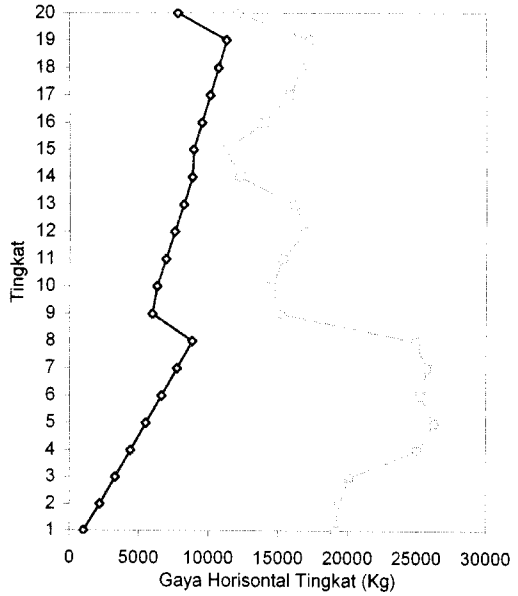
Setback 4



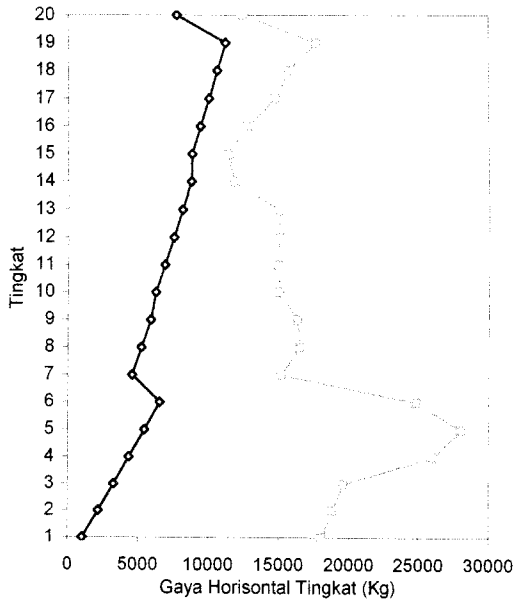
Gambar 5.163 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest



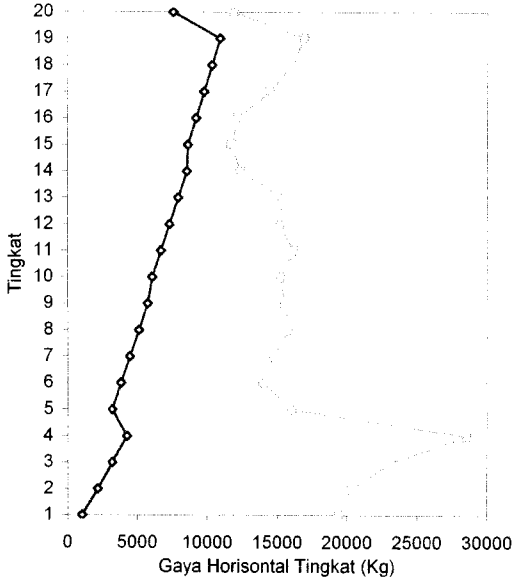
Setback 5



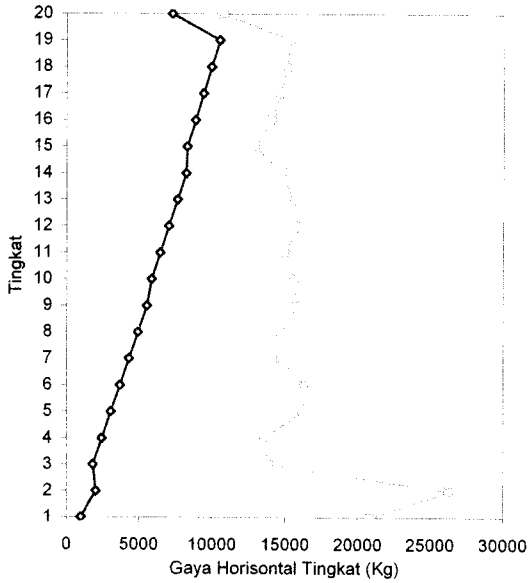
Setback 6



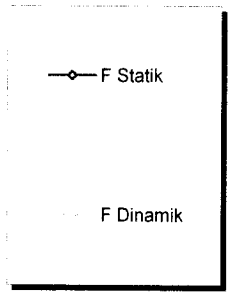
Setback 7



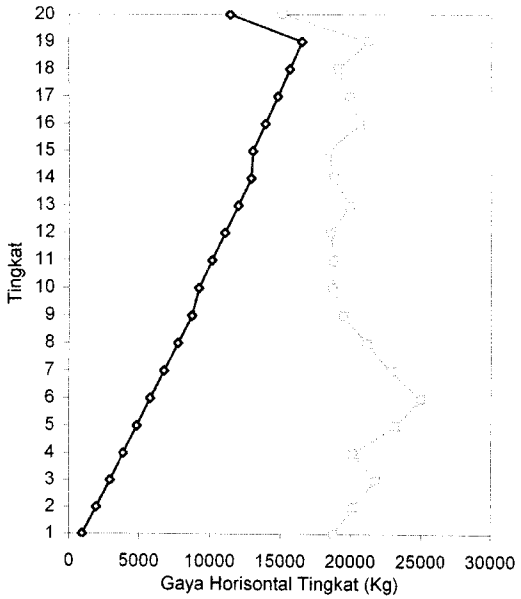
Setback 8



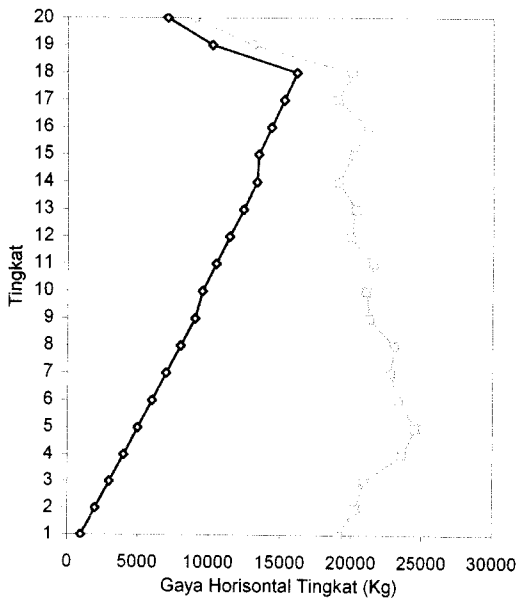
Setback 9



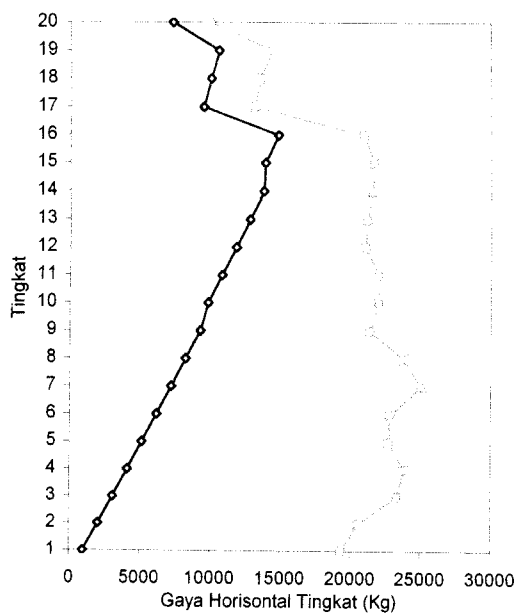
Gambar 5.164 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro



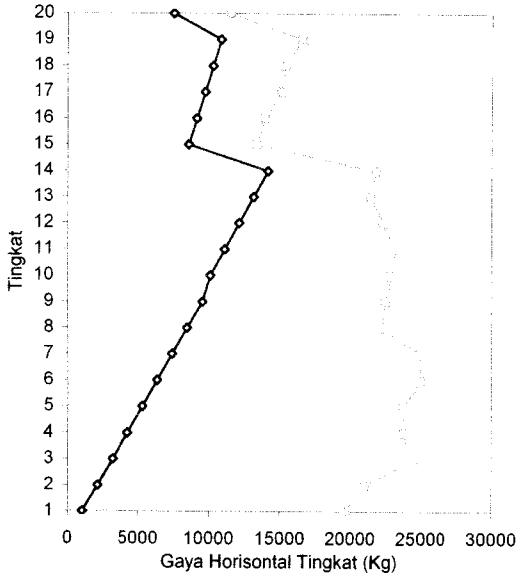
Tipikal



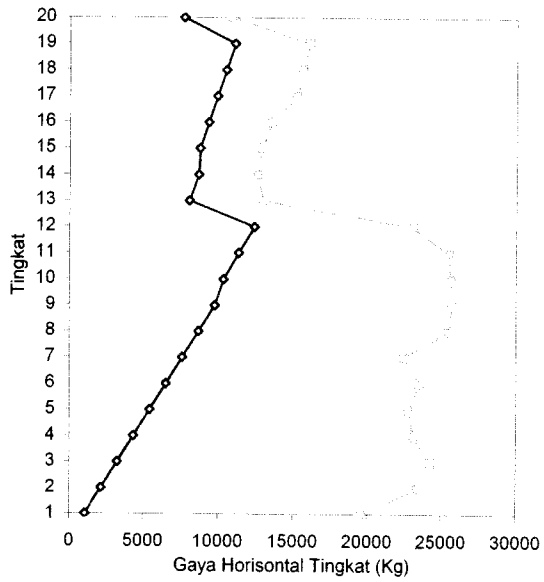
Setback 1



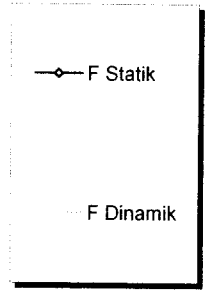
Setback 2



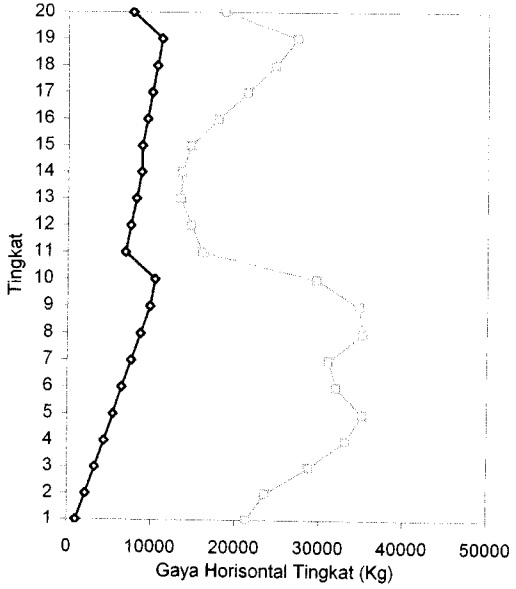
Setback 3



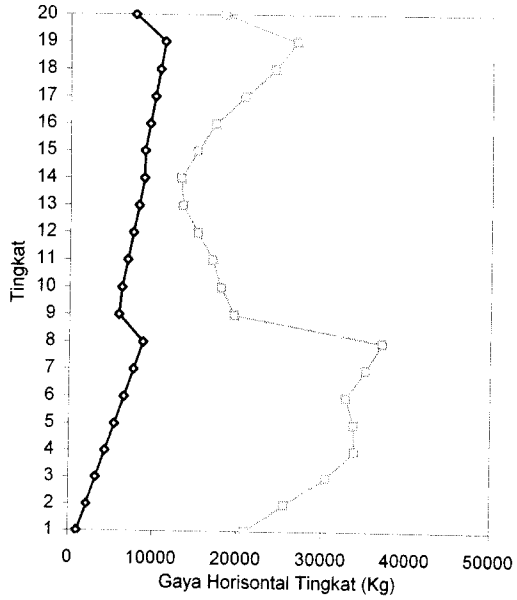
Setback 4



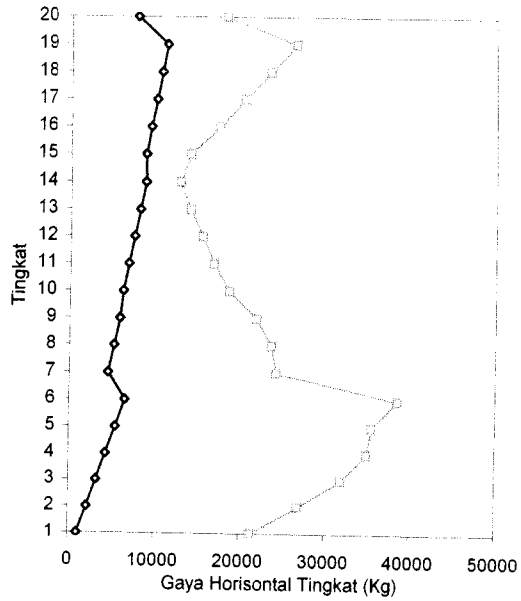
Gambar 5.164 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro



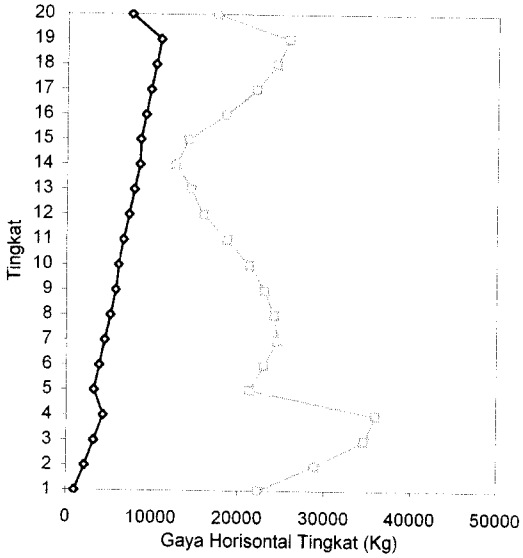
Setback 5



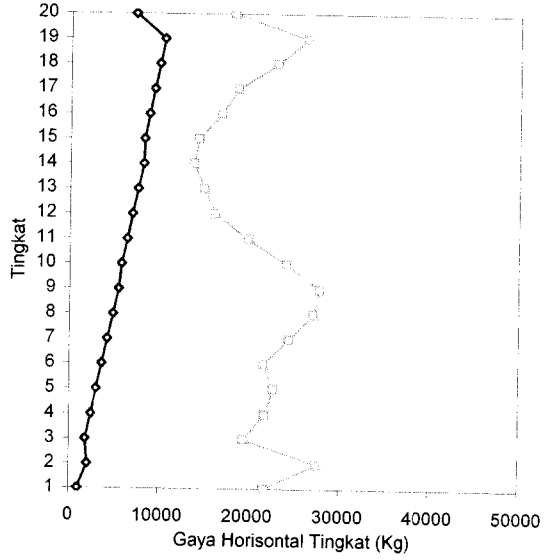
Setback 6



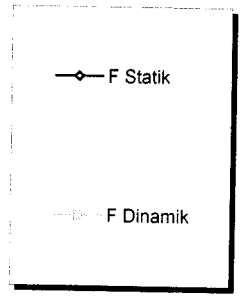
Setback 7



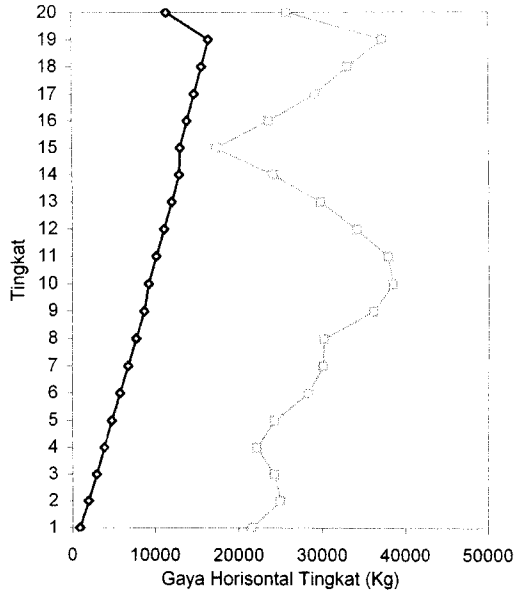
Setback 8



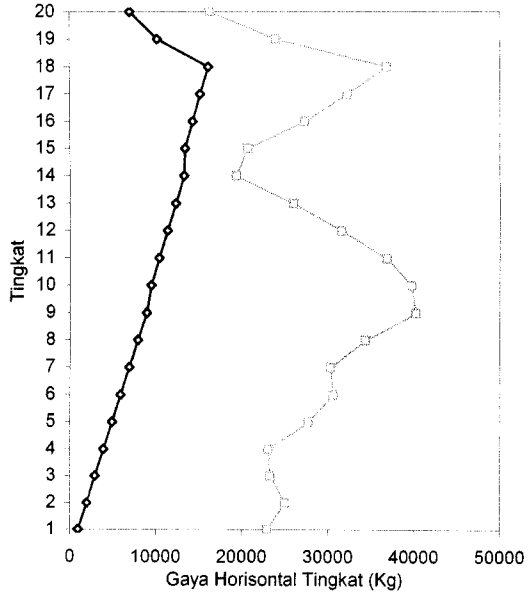
Setback 9



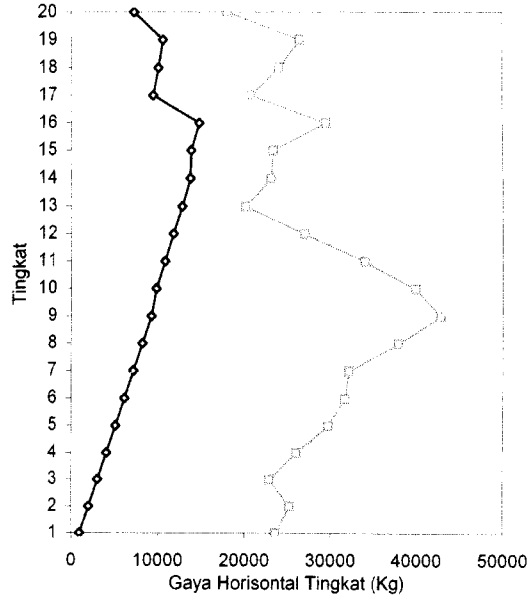
Gambar 5.165 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy



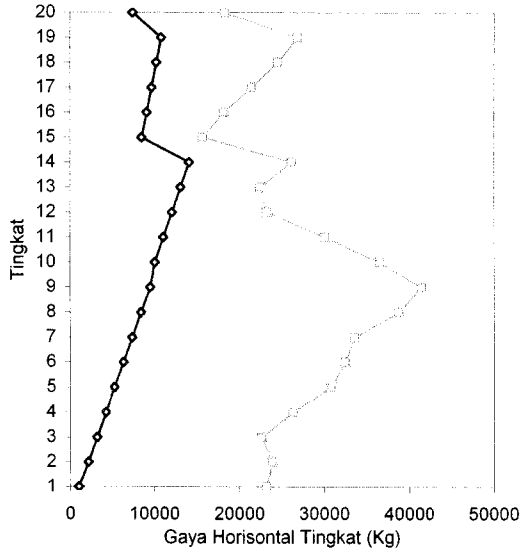
Tipikal



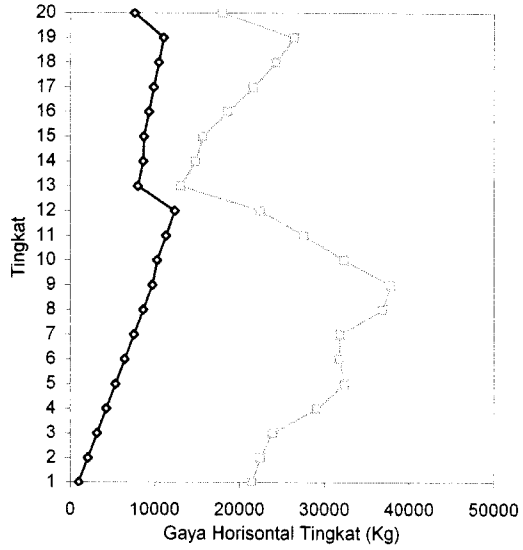
Setback 1



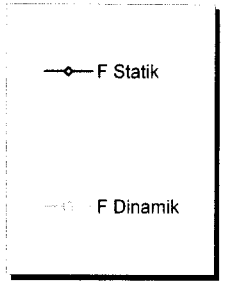
Setback 2



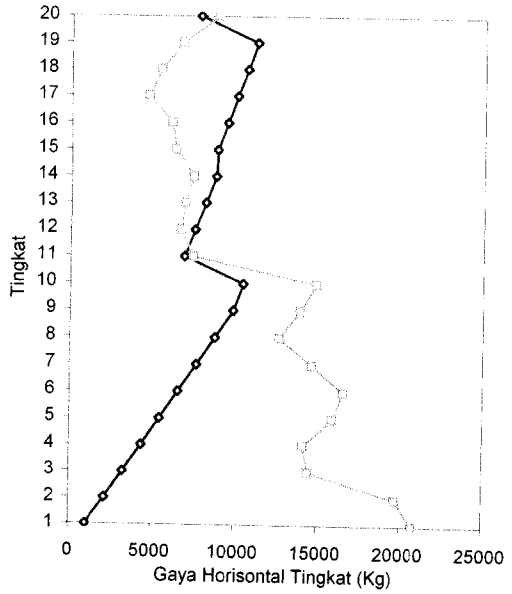
Setback 3



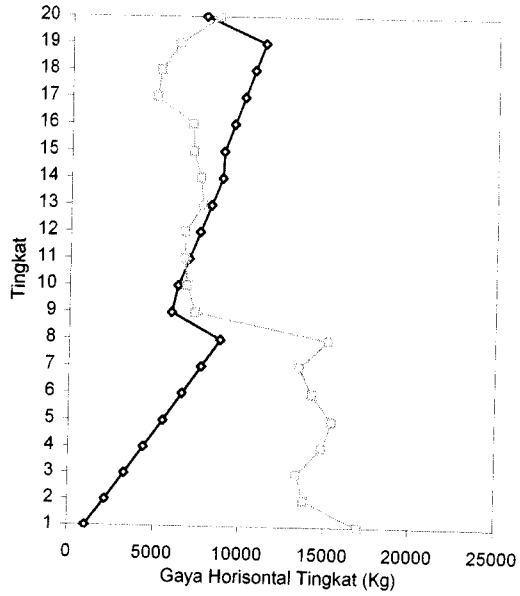
Setback 4



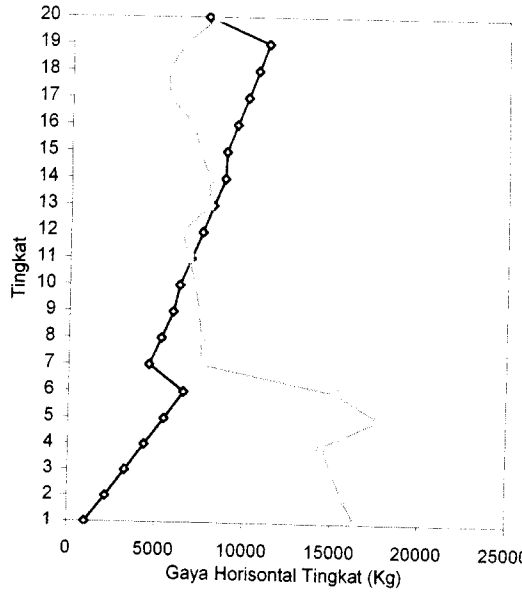
Gambar 5.165 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy



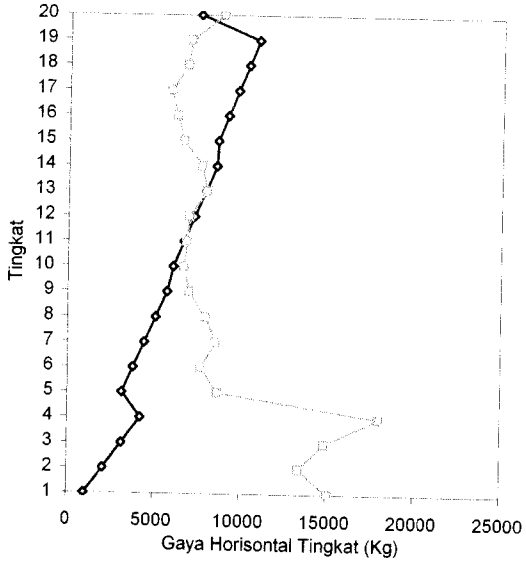
Setback 5



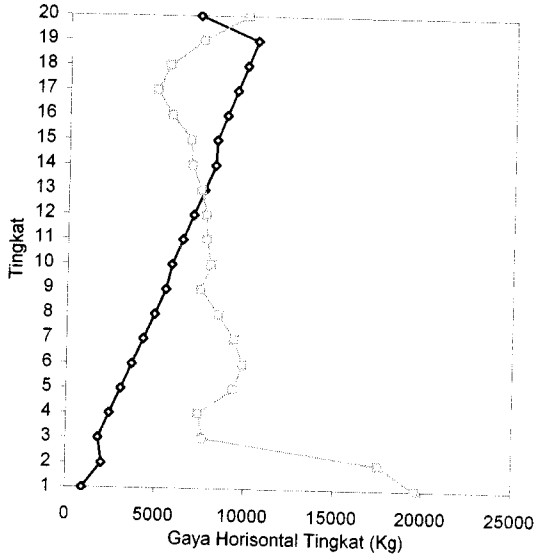
Setback 6



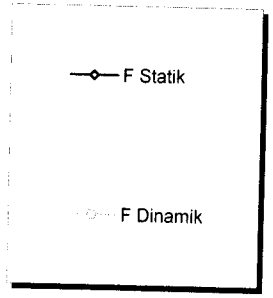
Setback 7



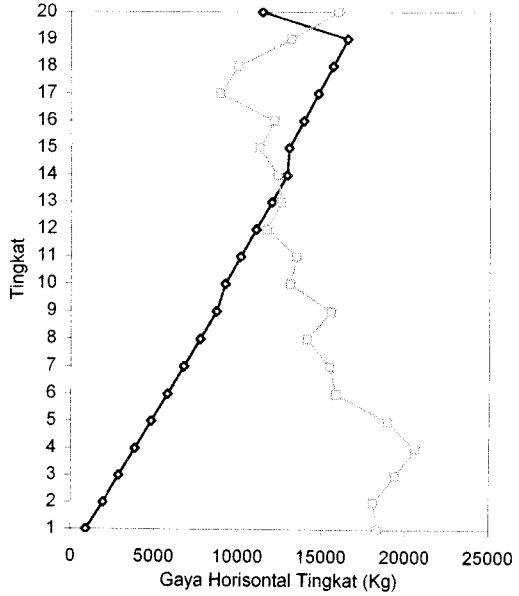
Setback 8



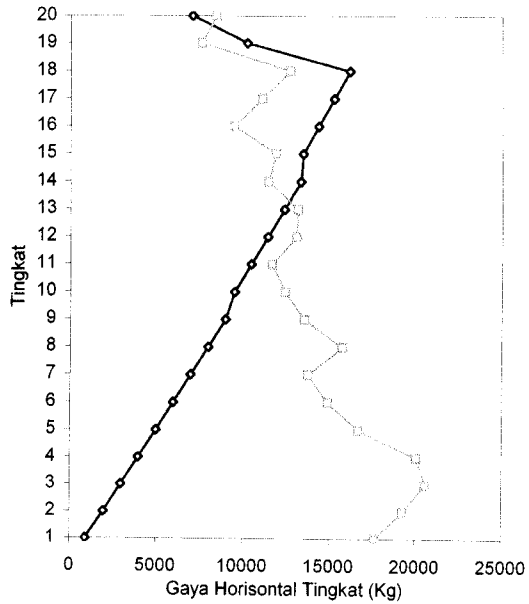
Setback 9



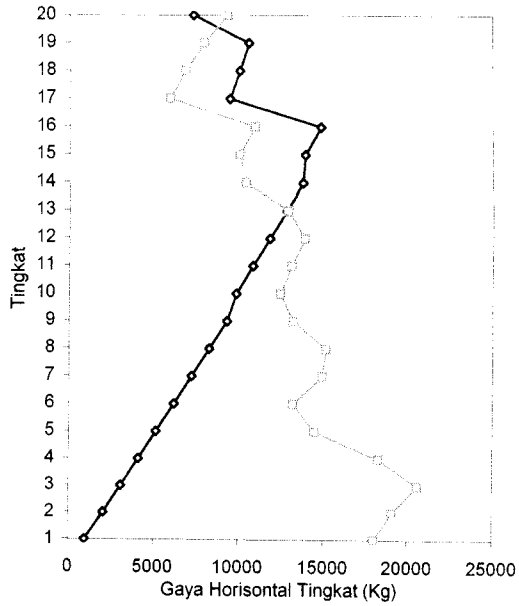
Gambar 5.166 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna



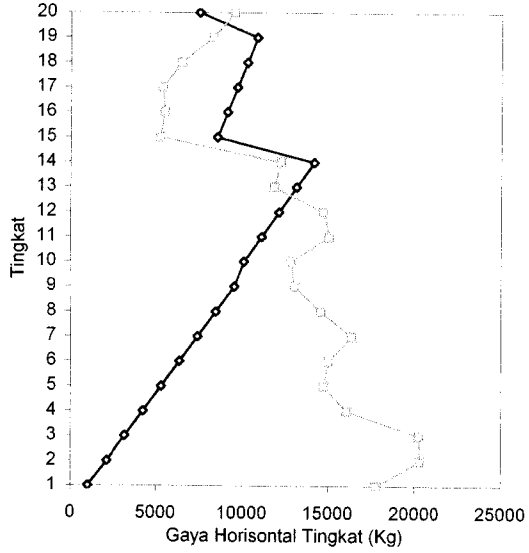
Tipikal



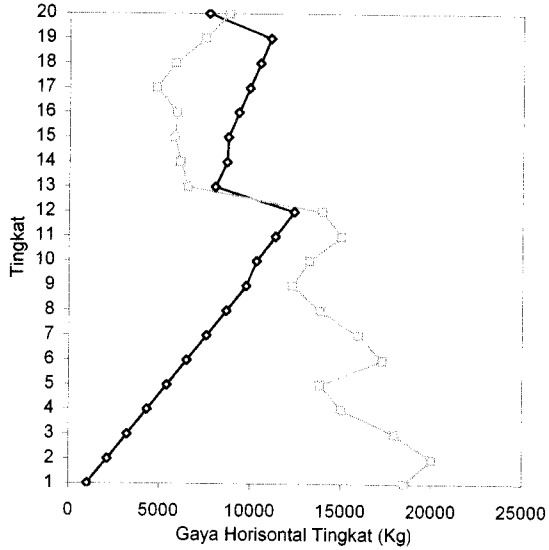
Setback 1



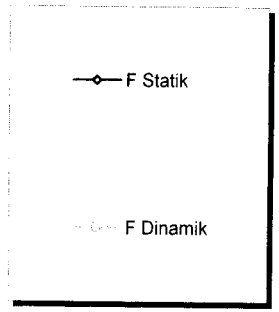
Setback 2



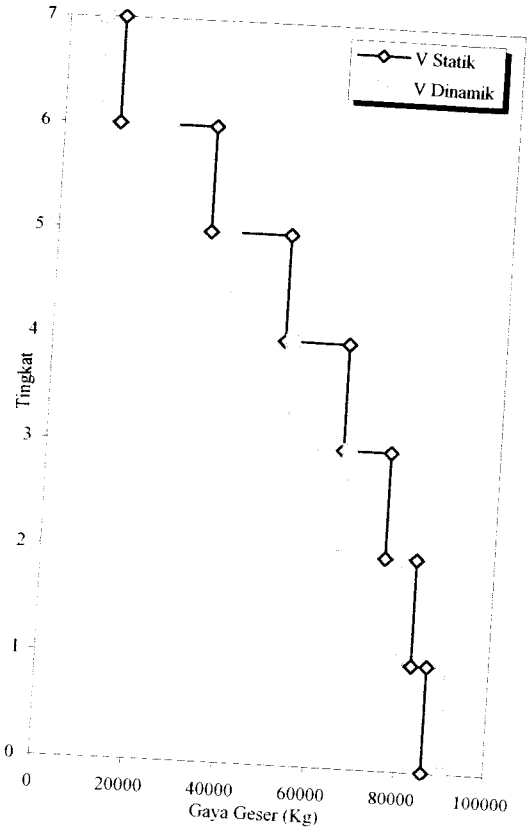
Setback 3



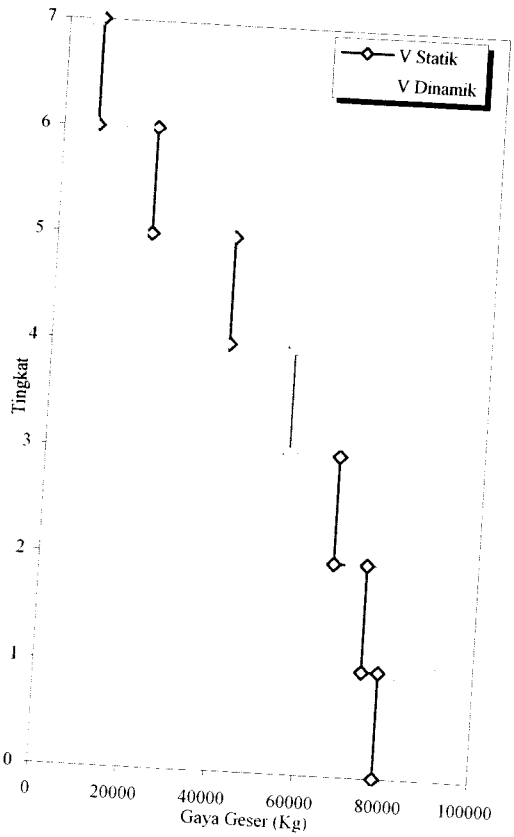
Setback 4



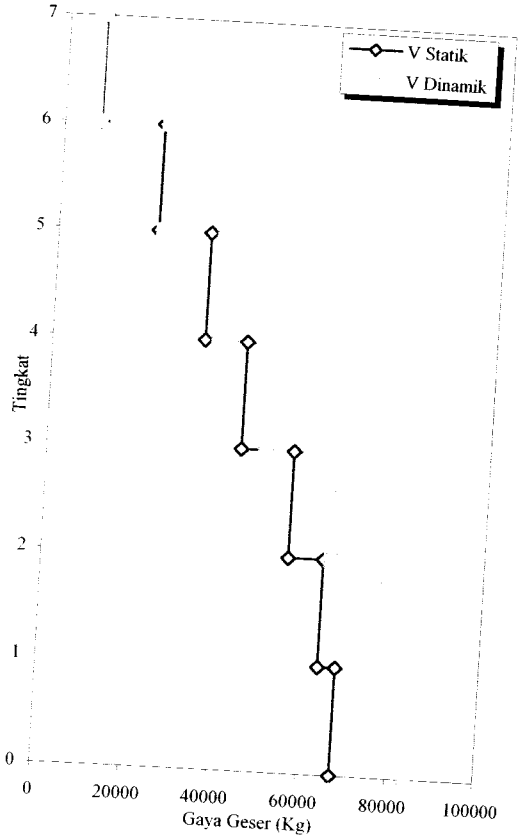
Gambar 5.166 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna



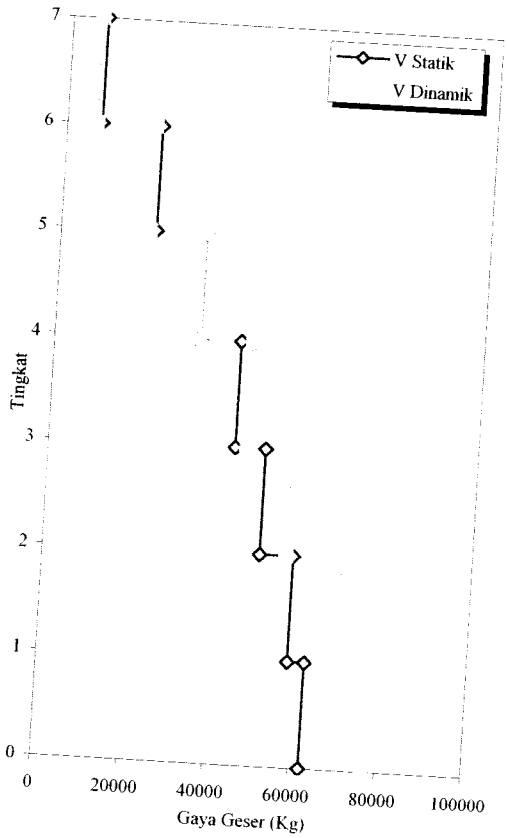
Tipikal



Setback 1

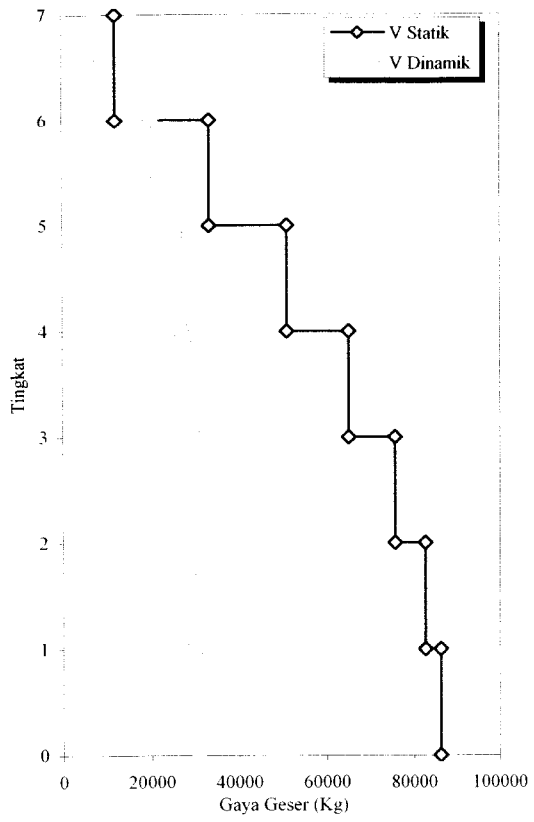


Setback 2

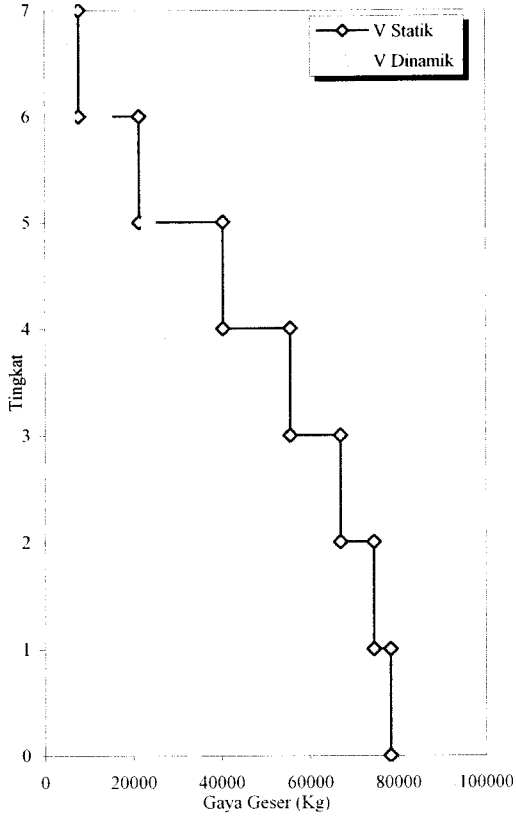


Setback 3

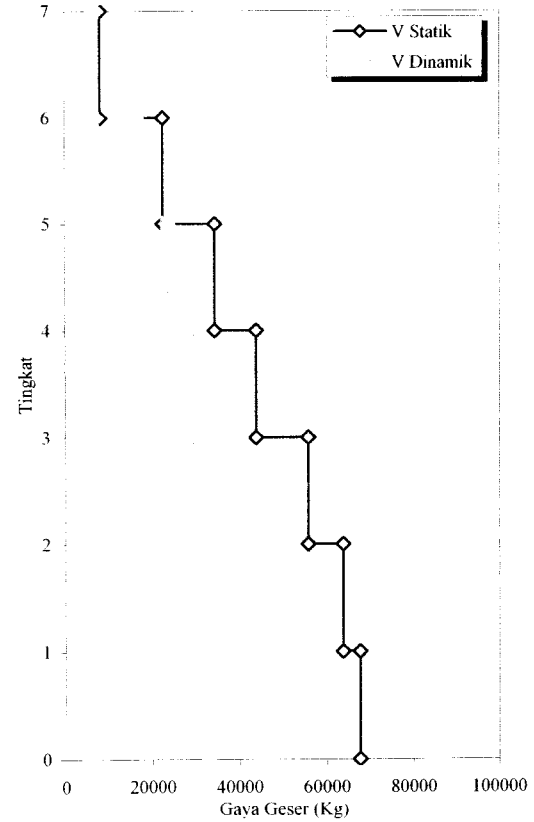
Gambar 5.167 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Bucharest



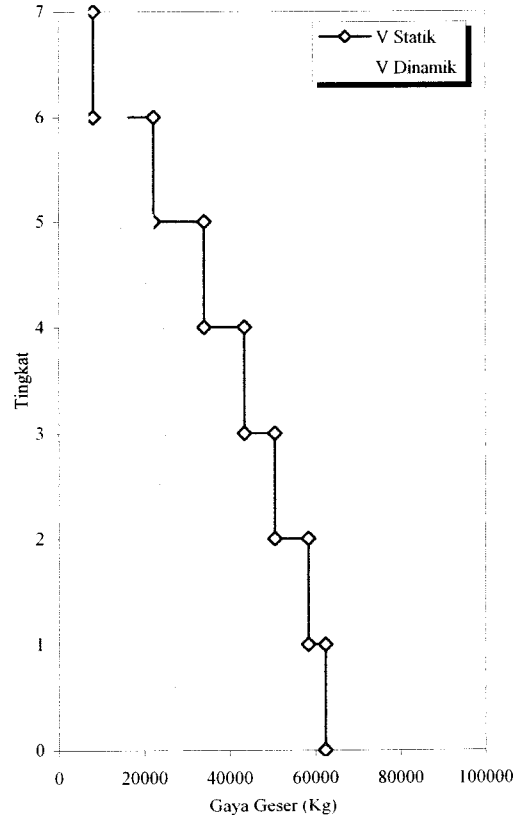
Tipikal



Setback 1

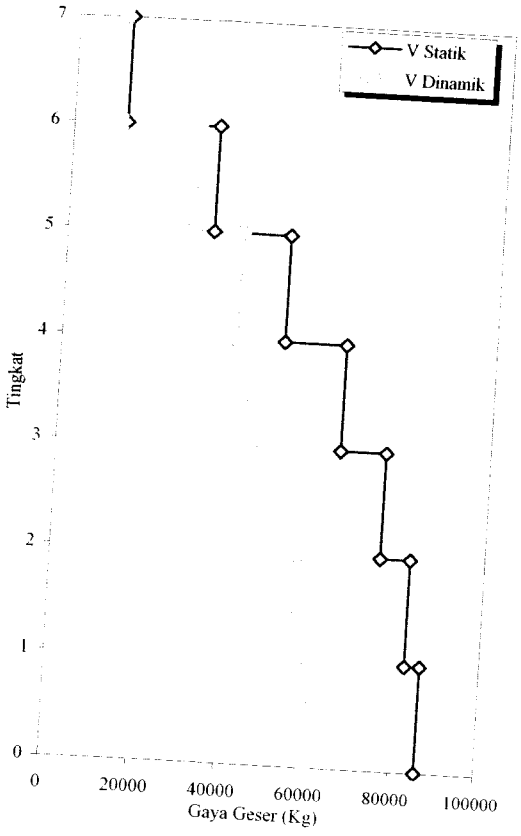


Setback 2

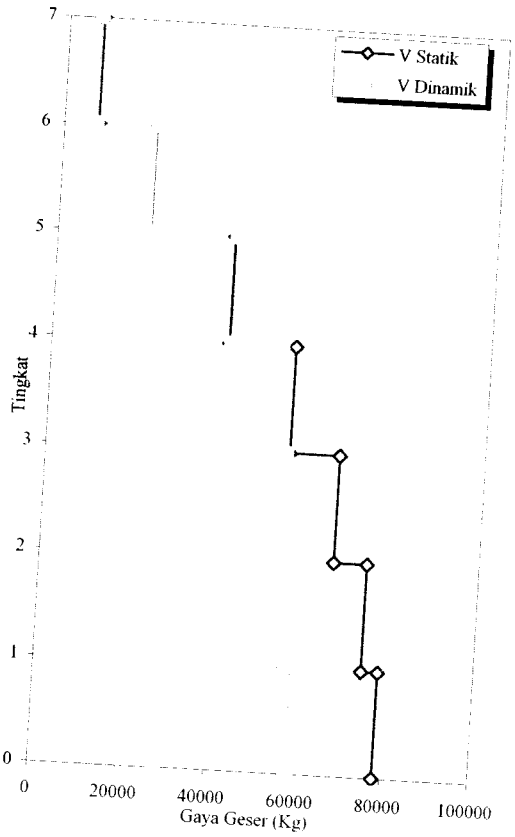


Setback 3

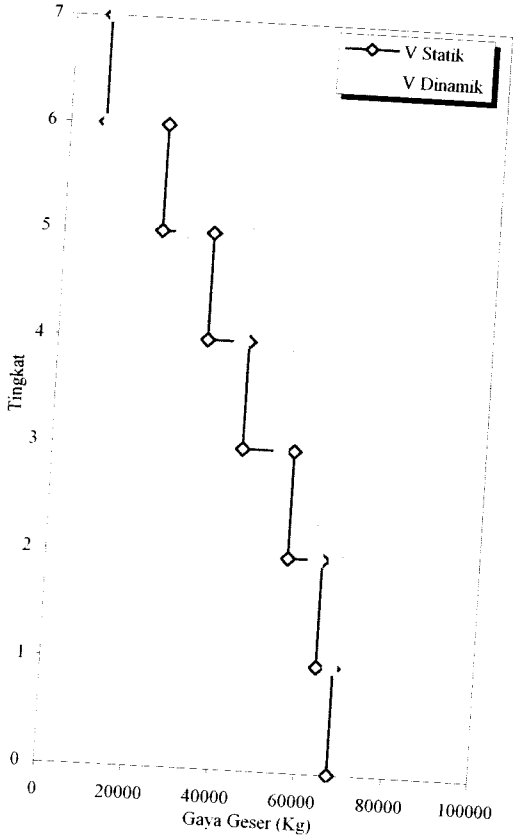
Gambar 5.168 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa El Centro



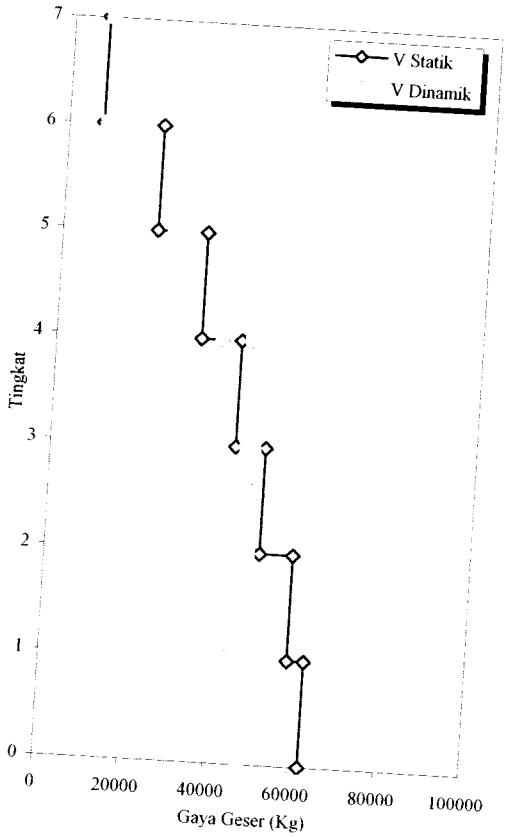
Tipikal



Setback 1

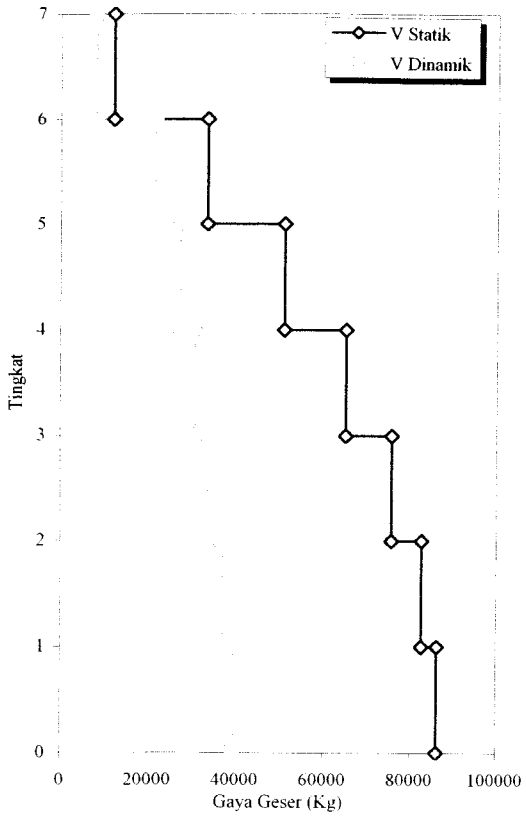


Setback 2

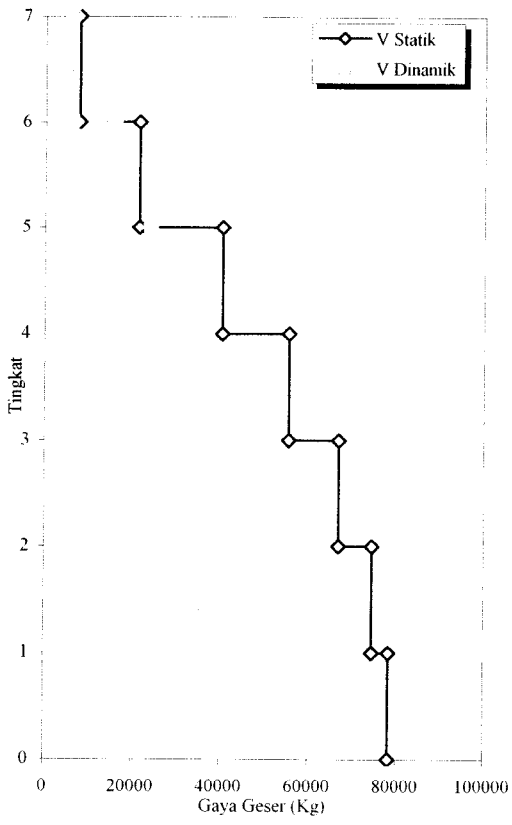


Setback 3

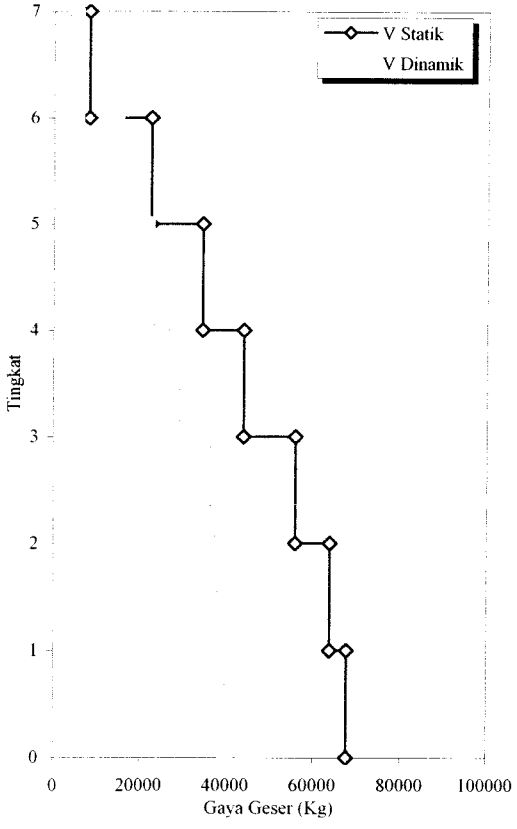
Gambar 5.169 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Gilroy



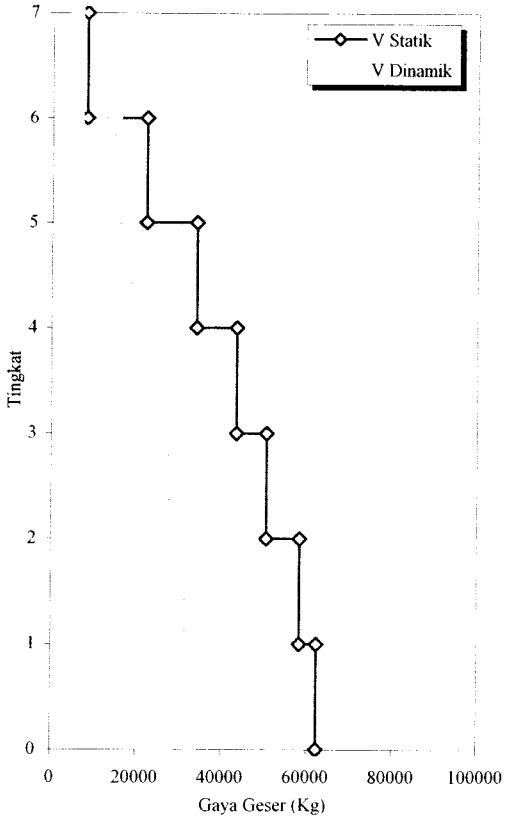
Tipikal



Setback 1

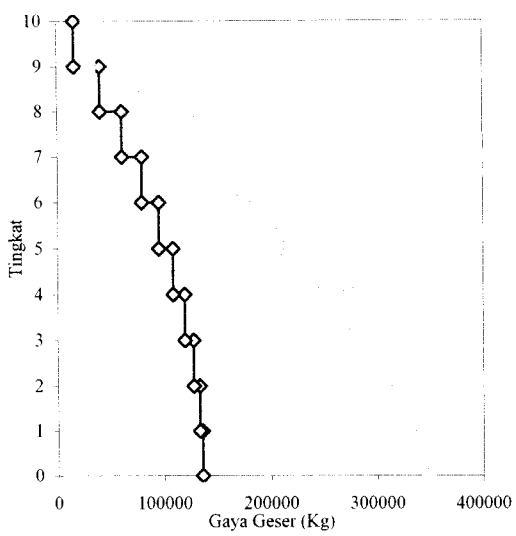


Setback 2

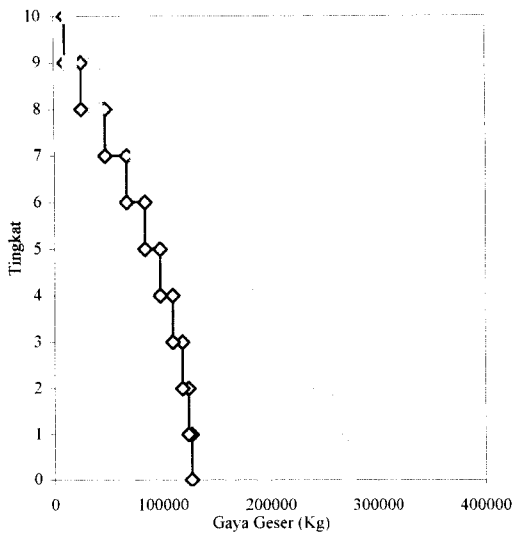


Setback 3

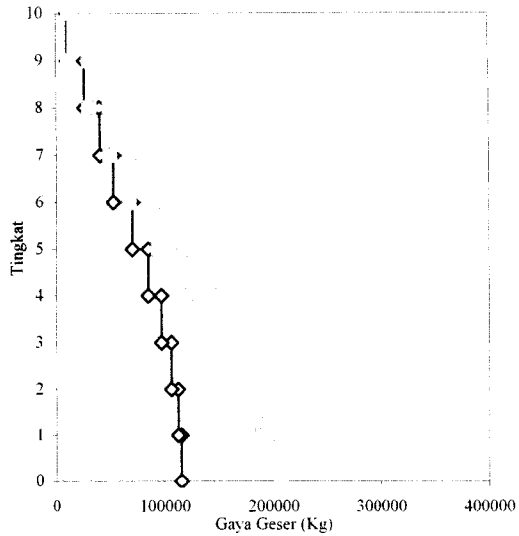
Gambar 5.170 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Koyna



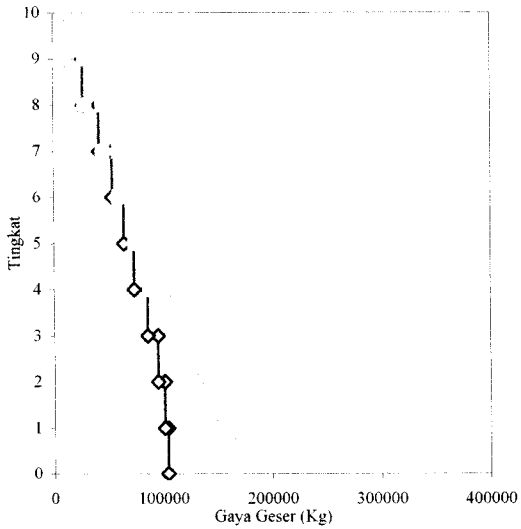
Tipikal



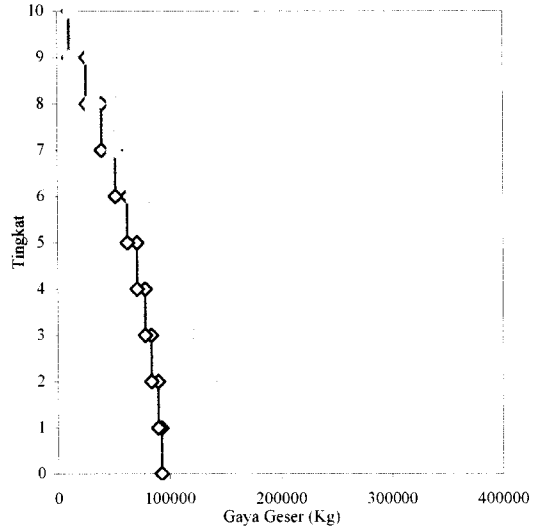
Setback 1



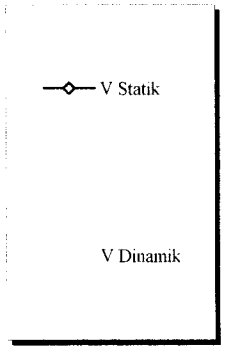
Setback 2



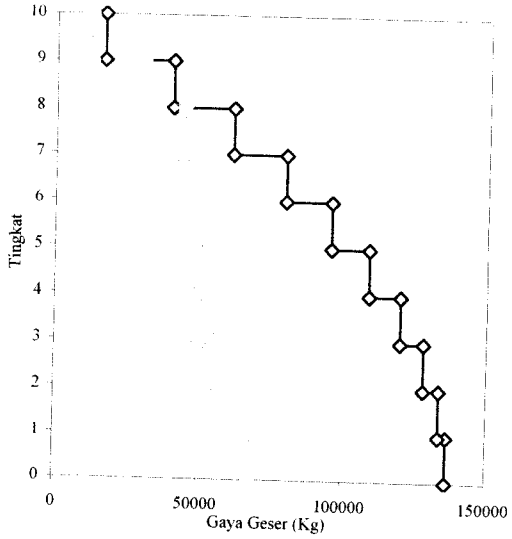
Setback 3



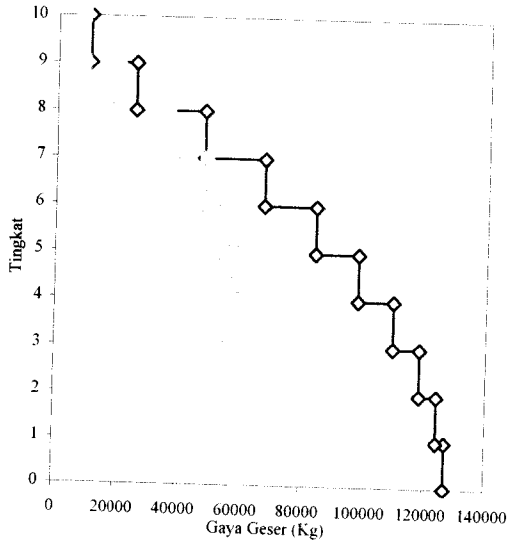
Setback 4



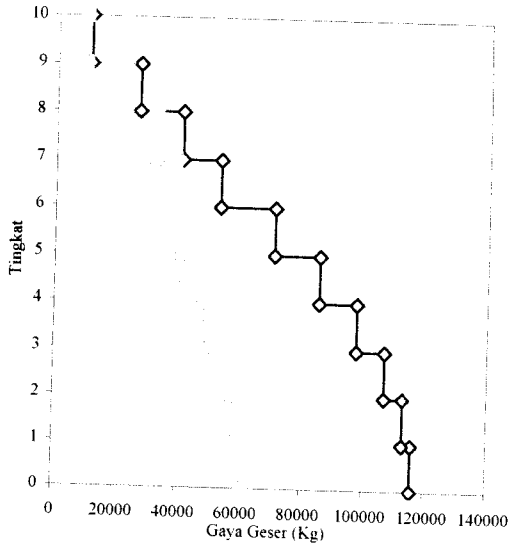
Gambar 5.171 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Bucharest



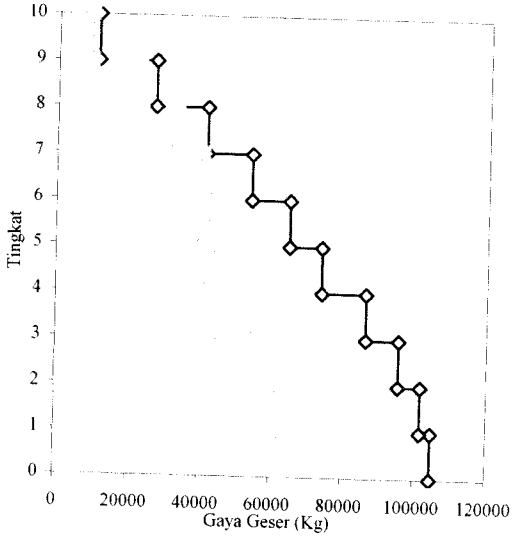
Tipikal



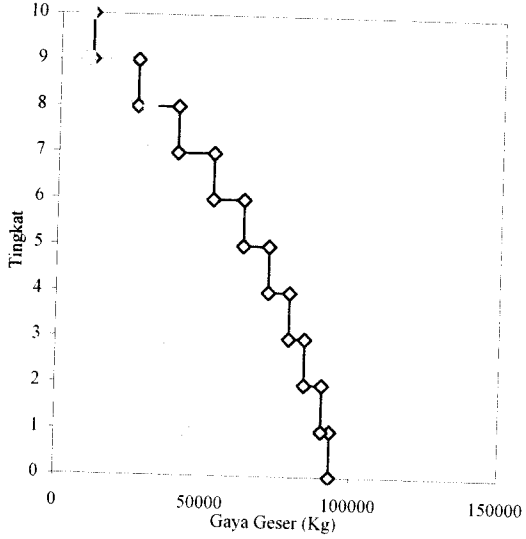
Setback 1



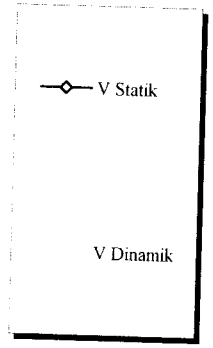
Setback 2



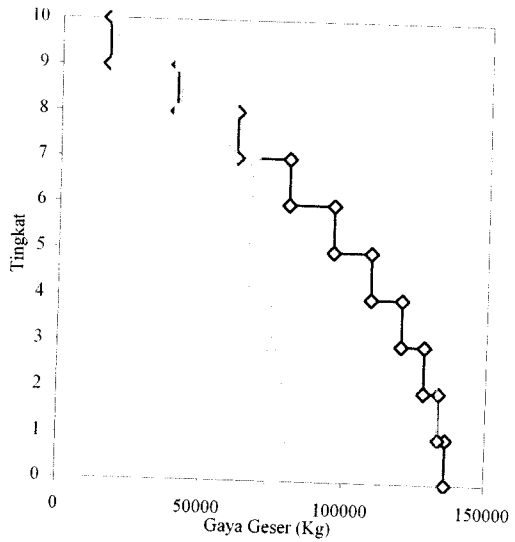
Setback 3



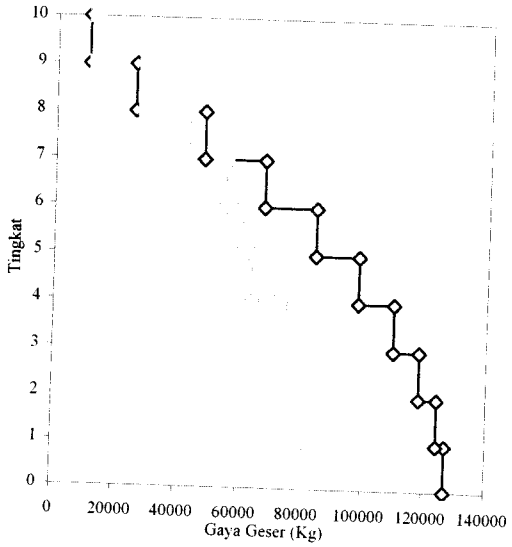
Setback 4



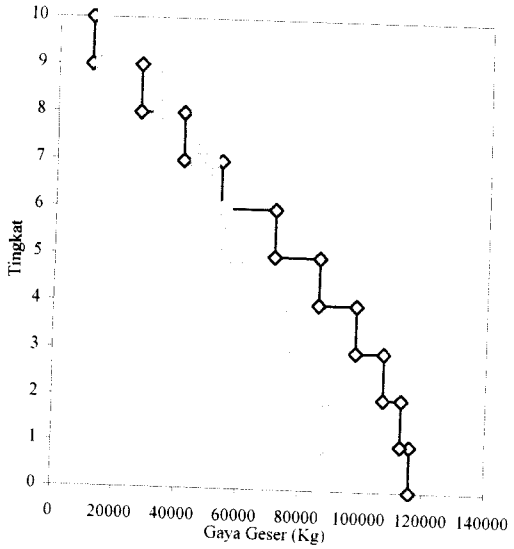
Gambar 5.172 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa El Centro



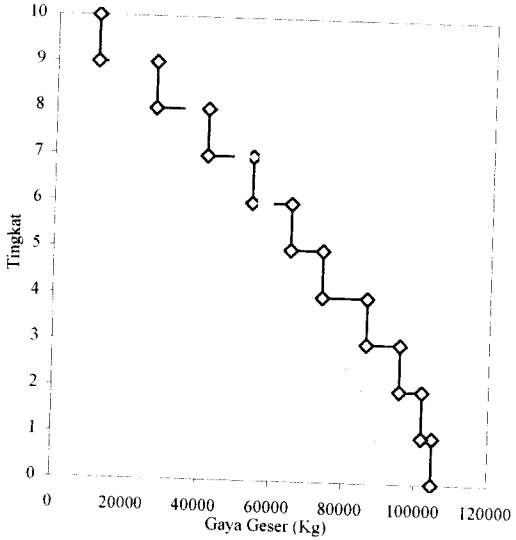
Tipikal



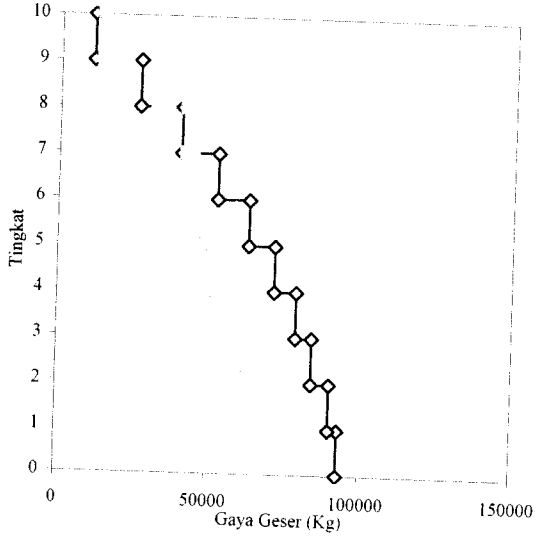
Setback 1



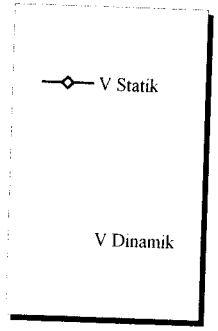
Setback 2



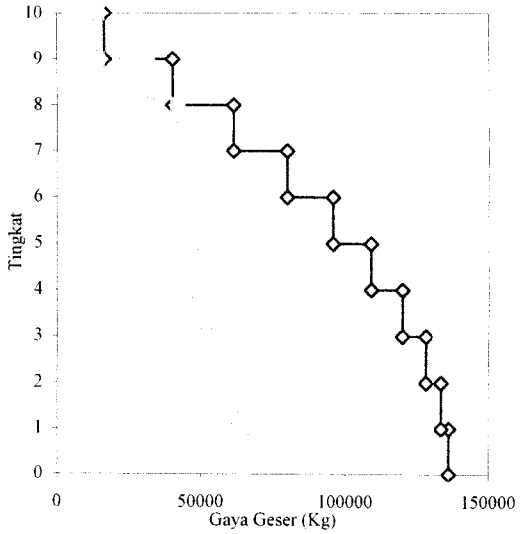
Setback 3



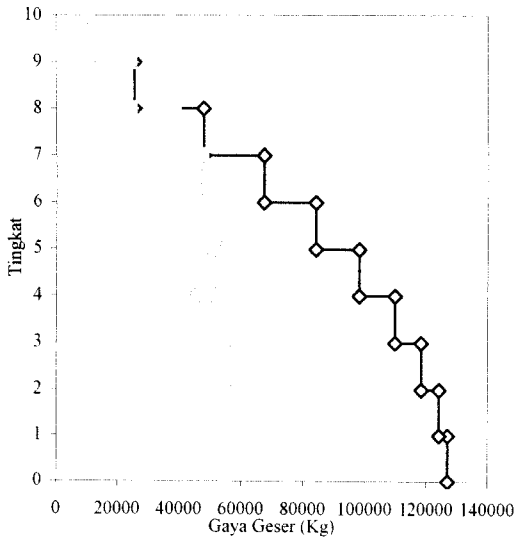
Setback 4



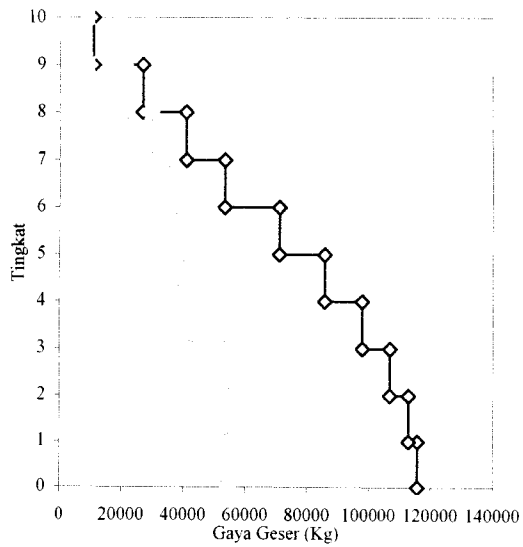
Gambar 5.173 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Gilroy



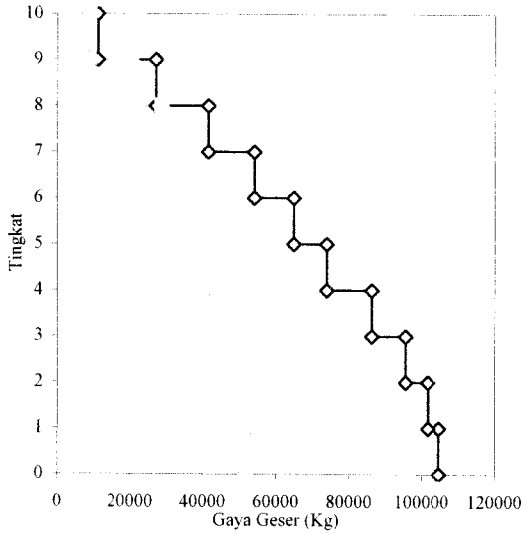
Tipikal



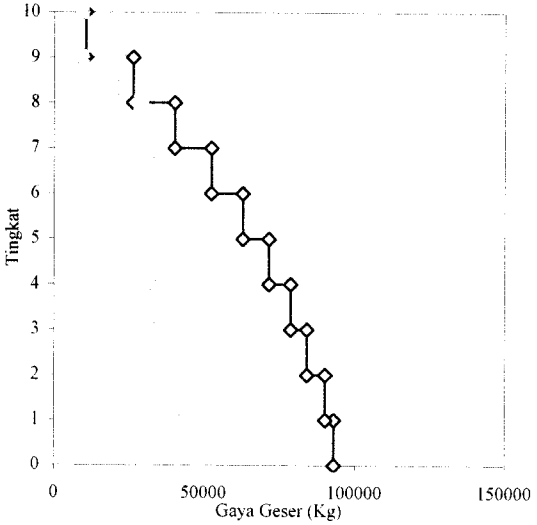
Setback 1



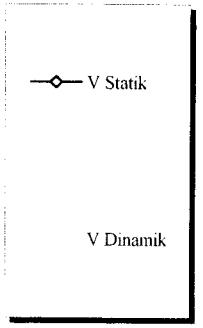
Setback 2



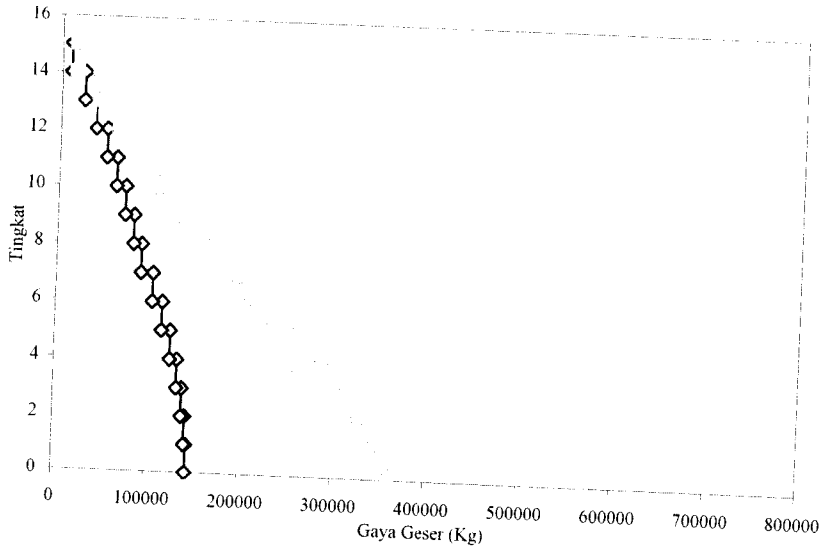
Setback 3



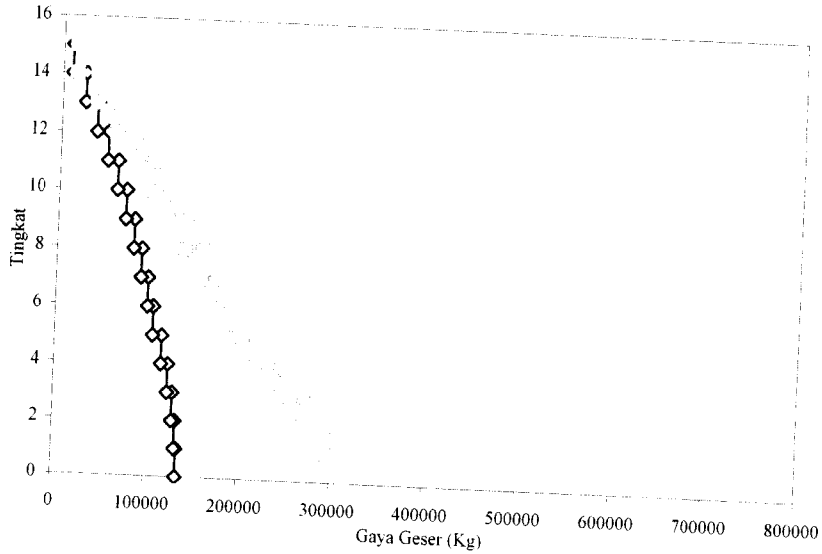
Setback 4



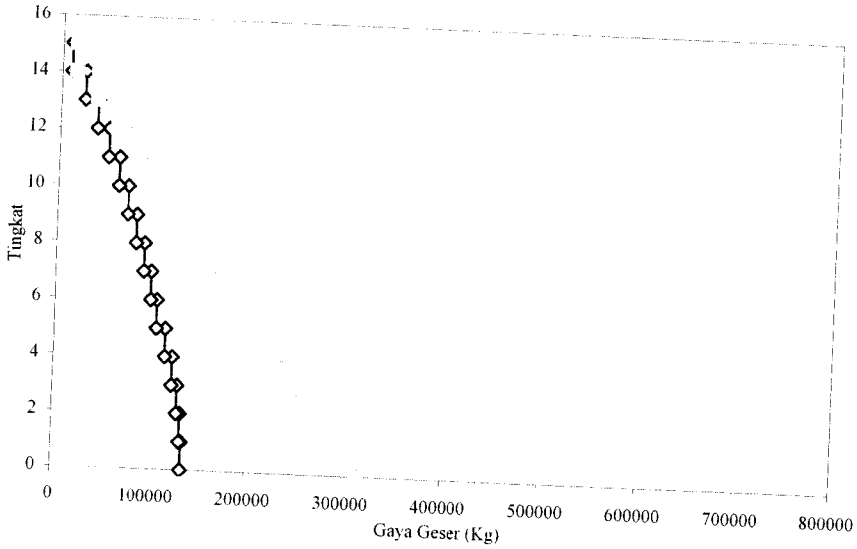
Gambar 5.174 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Koyna



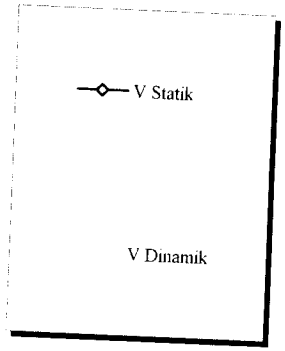
Setback 4



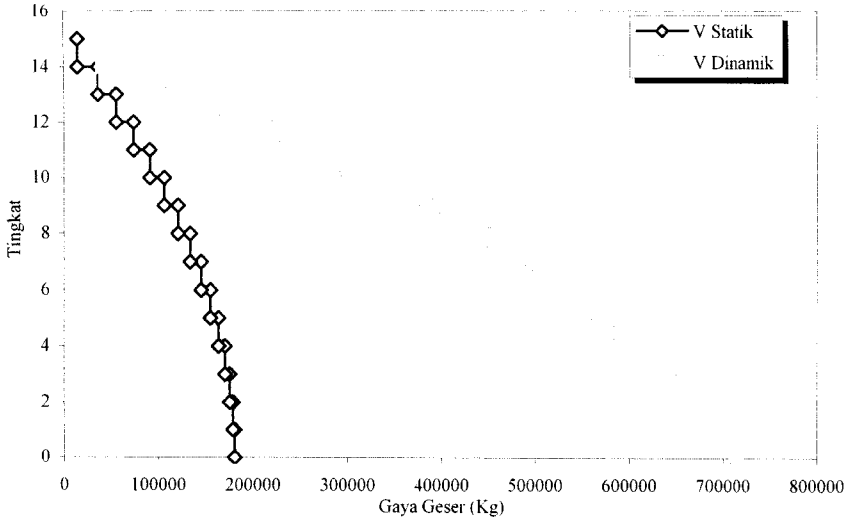
Setback 5



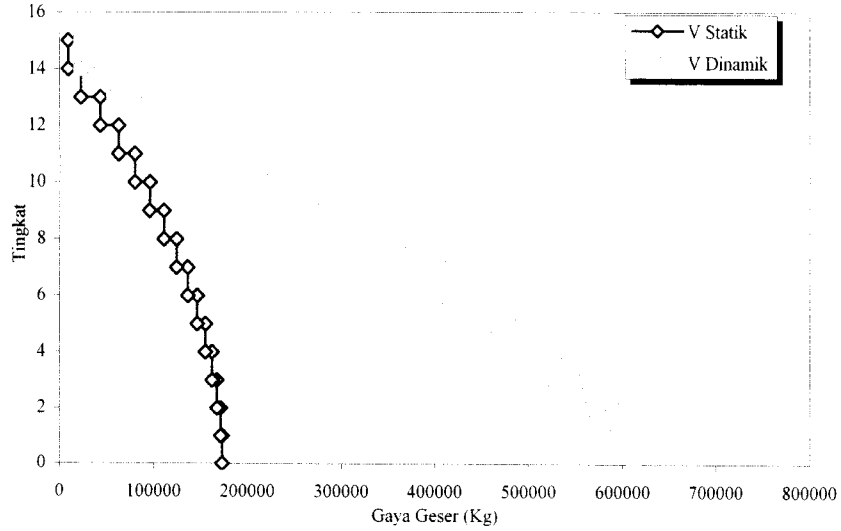
Setback 6



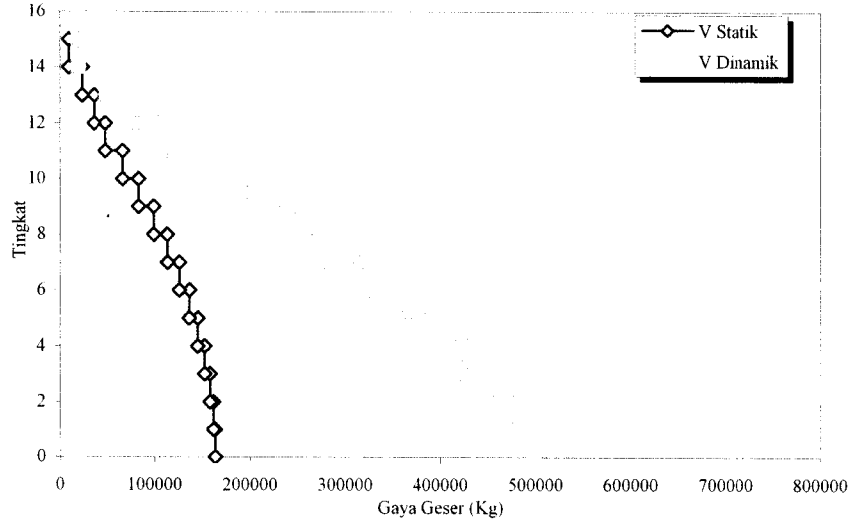
Gambar 5.175 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest



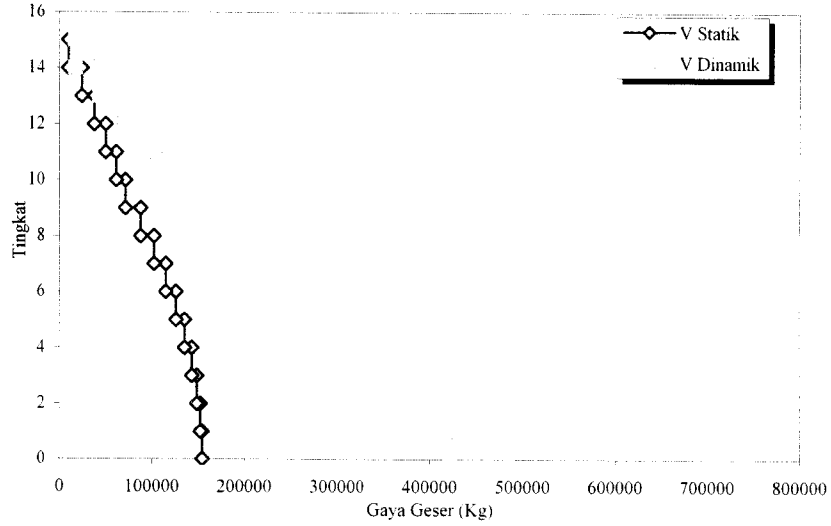
Tipikal



Setback 1

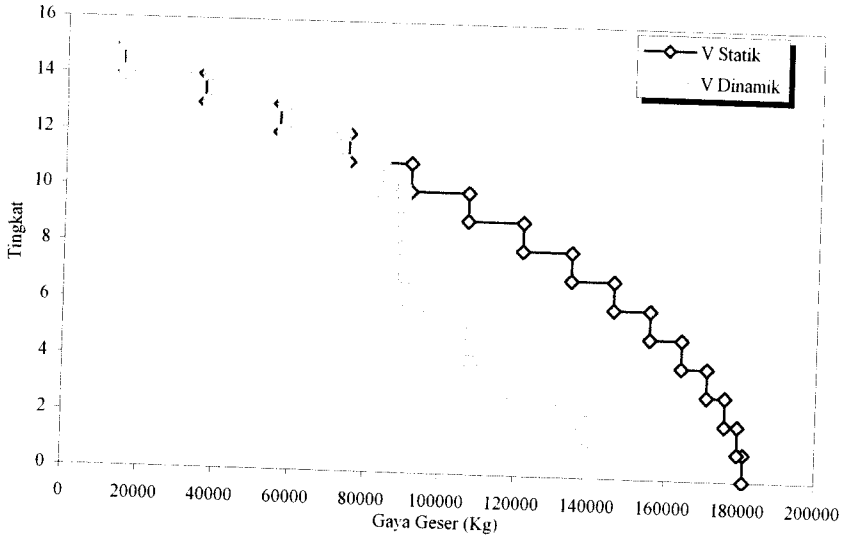


Setback 2

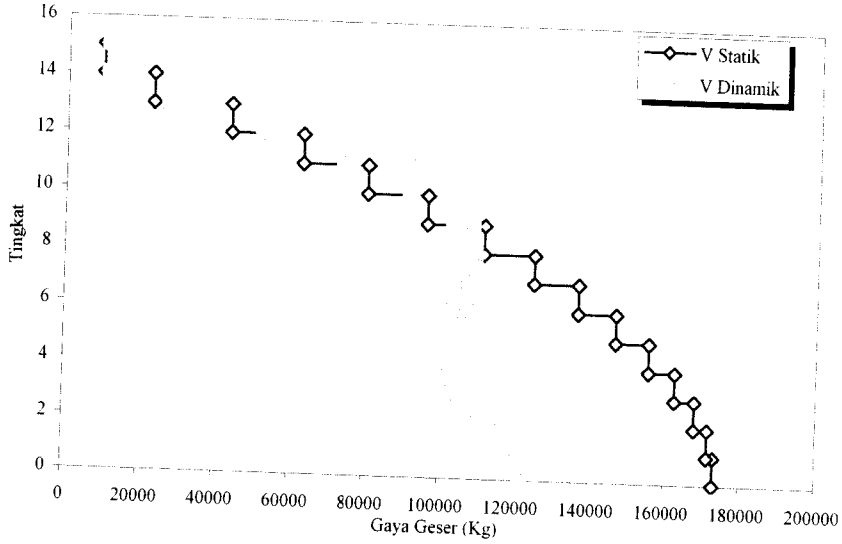


Setback 3

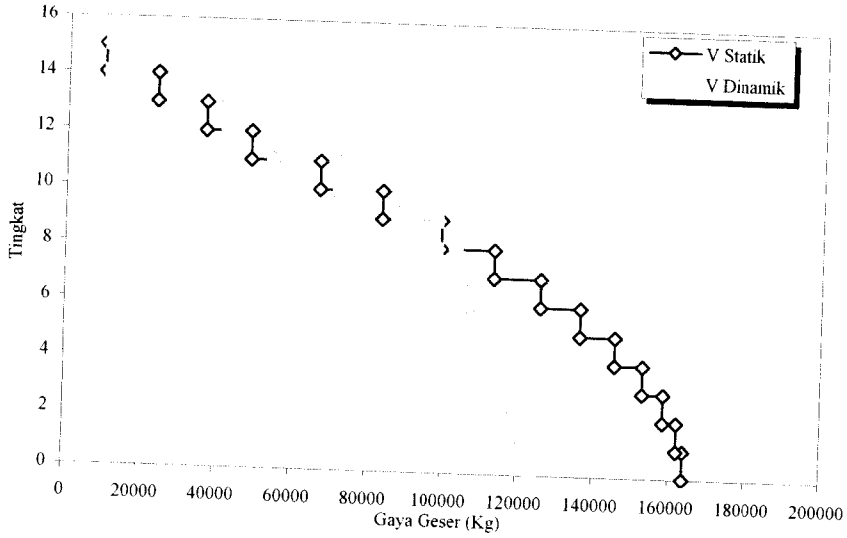
Gambar 5.175 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest



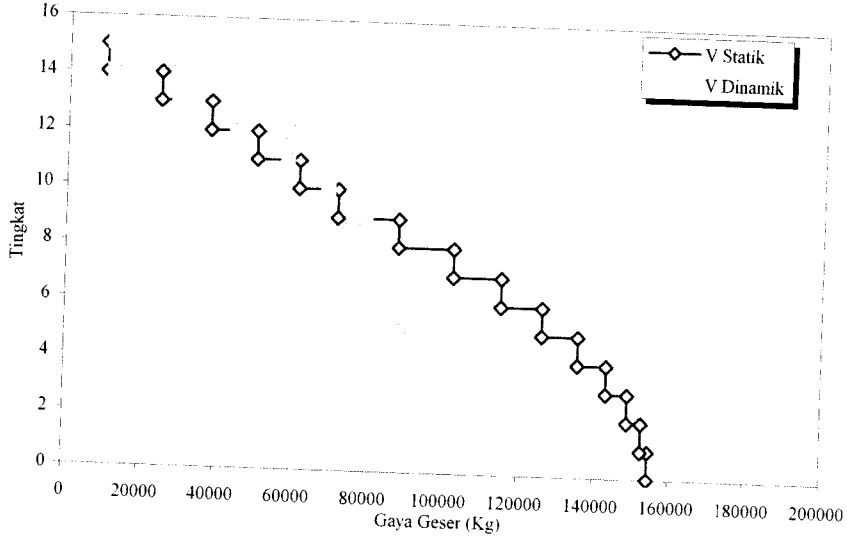
Tipikal



Setback 1

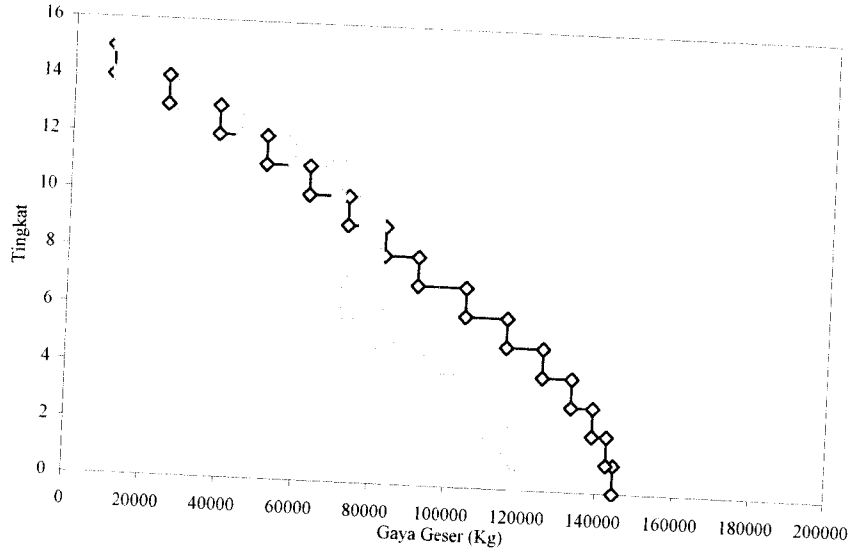


Setback 2

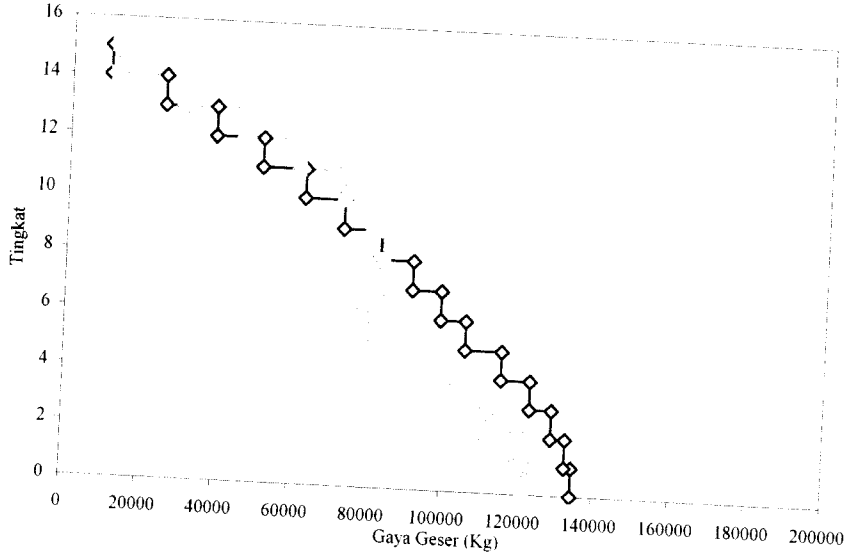


Setback 3

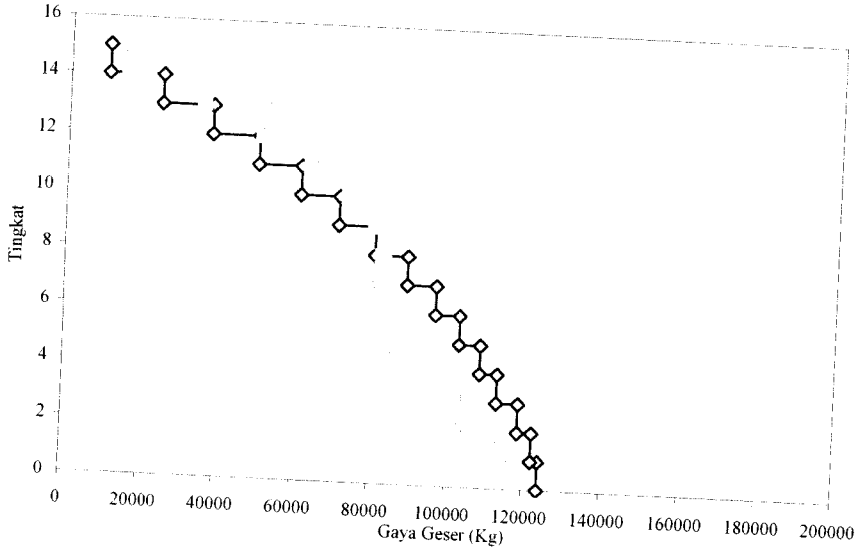
Gambar 5.176 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

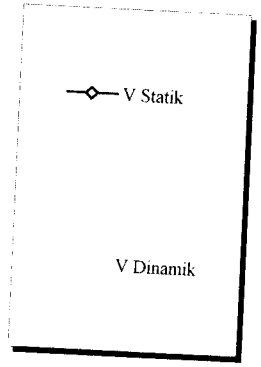


Setback 4

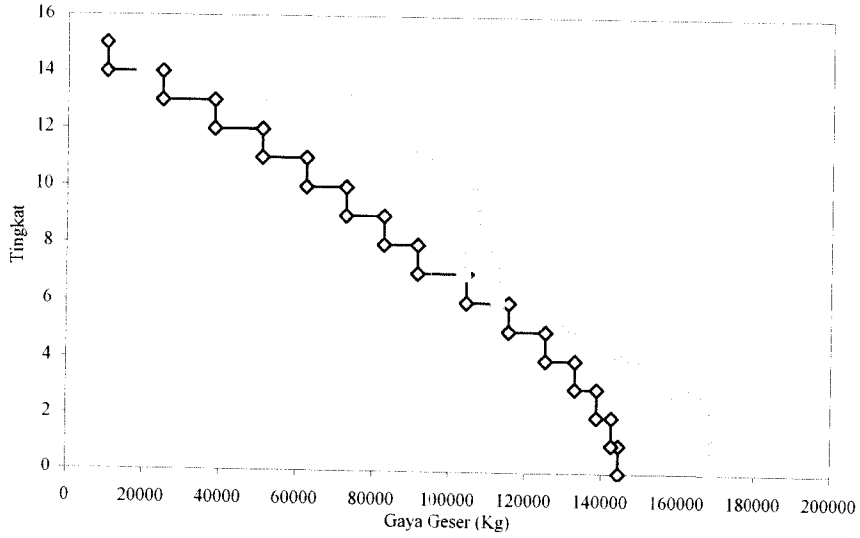


Setback 5

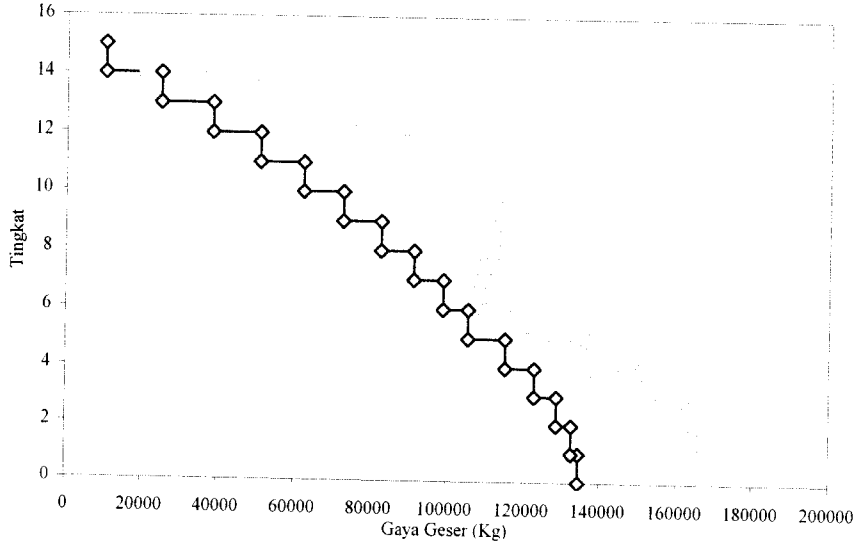




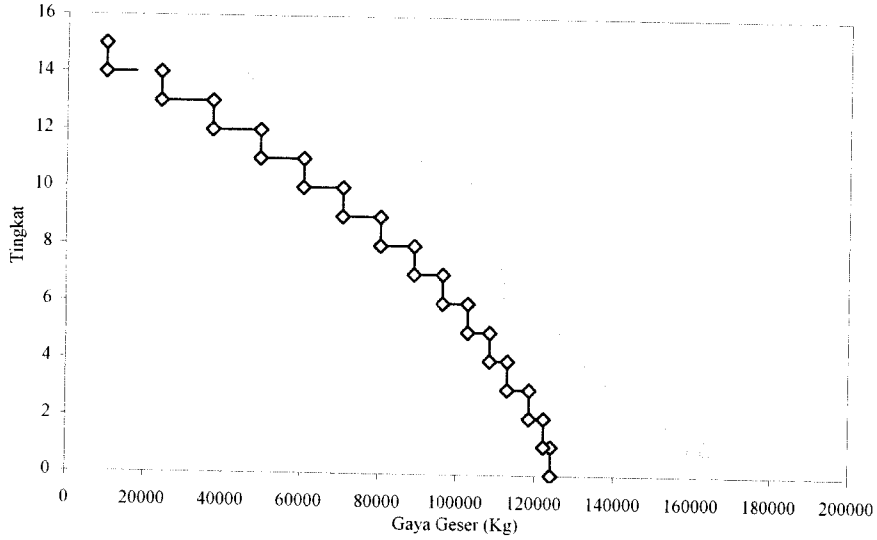
Gambar 5.176 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

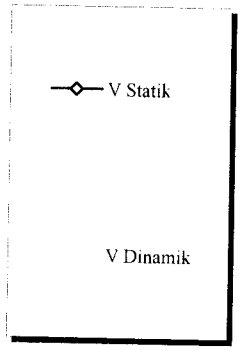


Setback 4

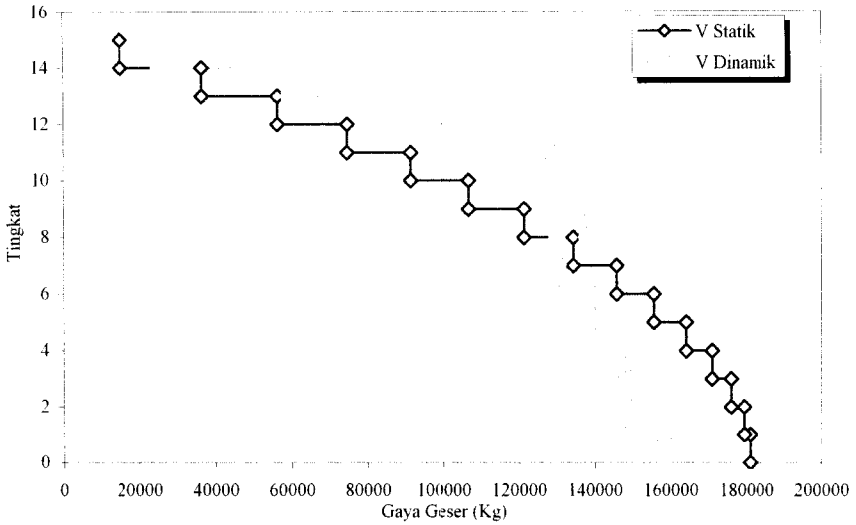


Setback 5

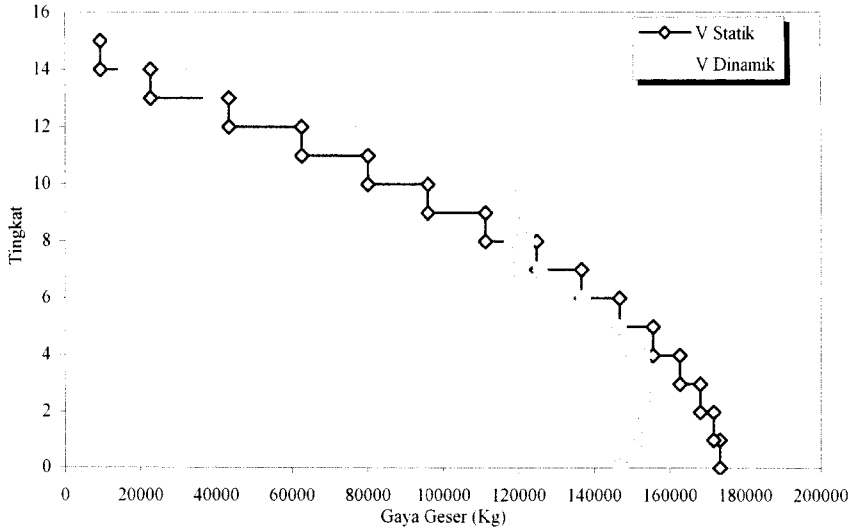




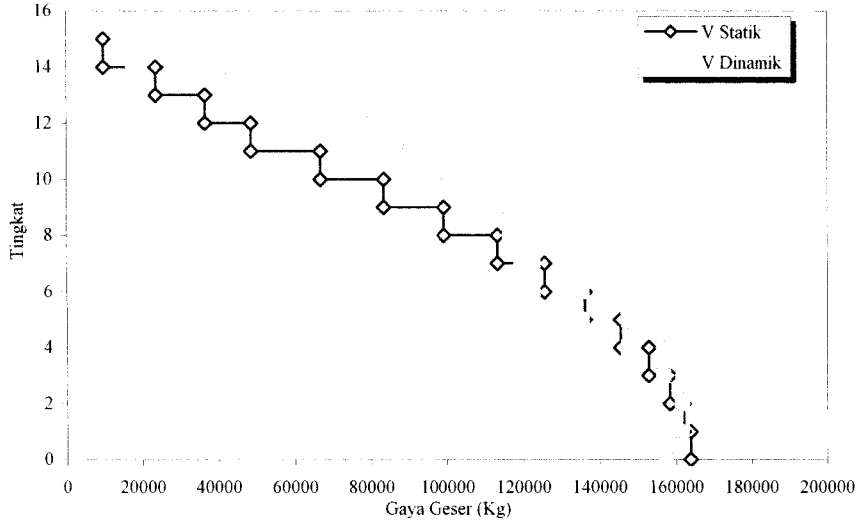
Gambar 5.177 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy



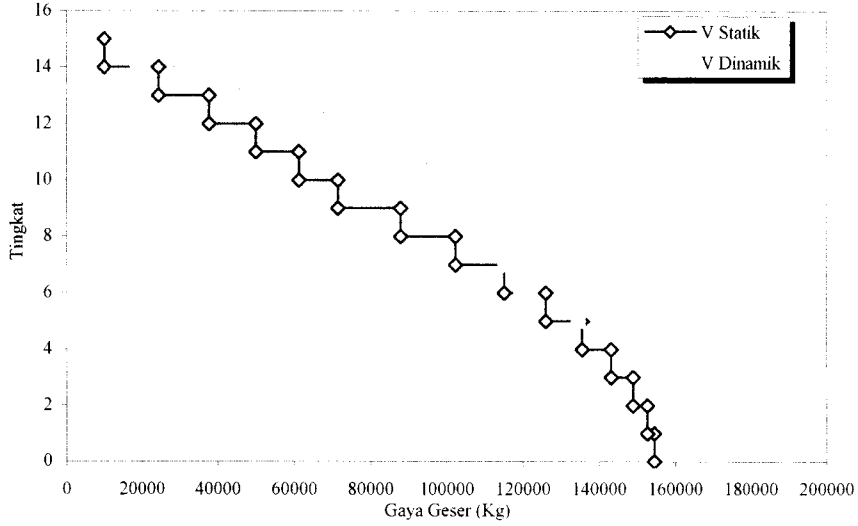
Tipikal



Setback 1

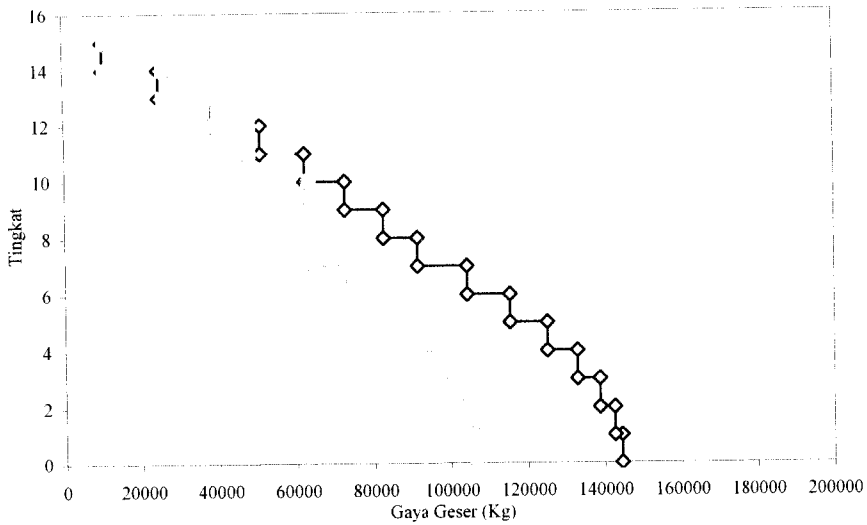


Setback 2

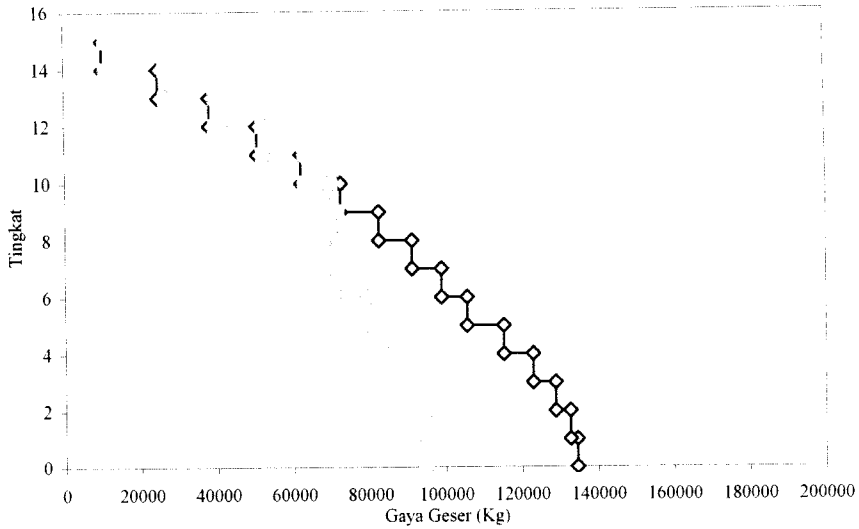


Setback 3

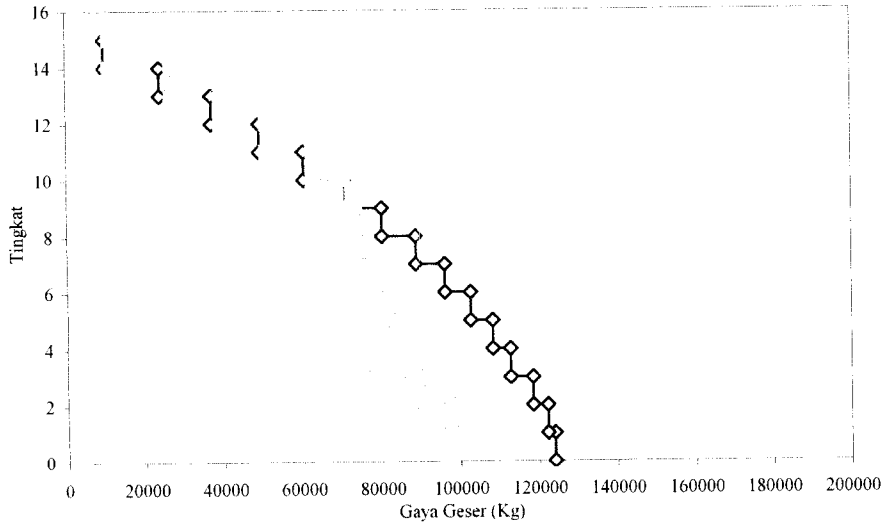
Gambar 5.177 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy



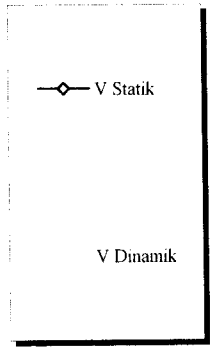
Setback 4



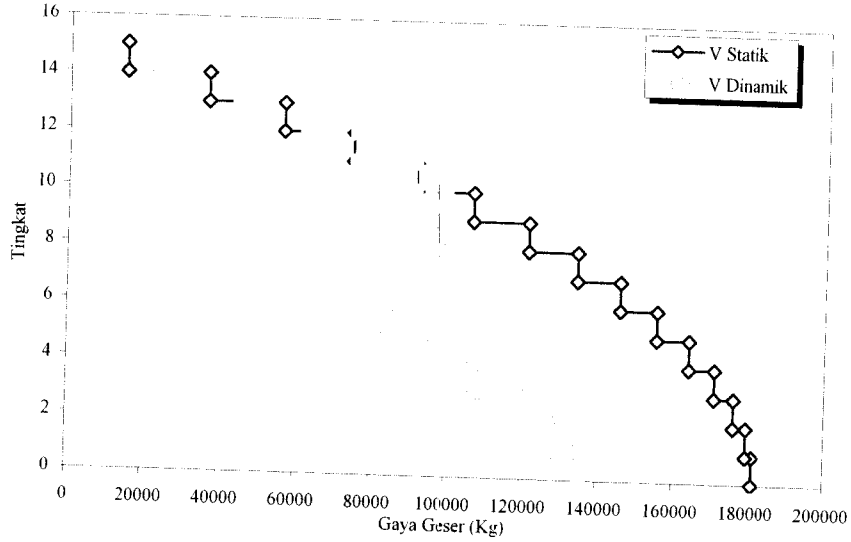
Setback 5



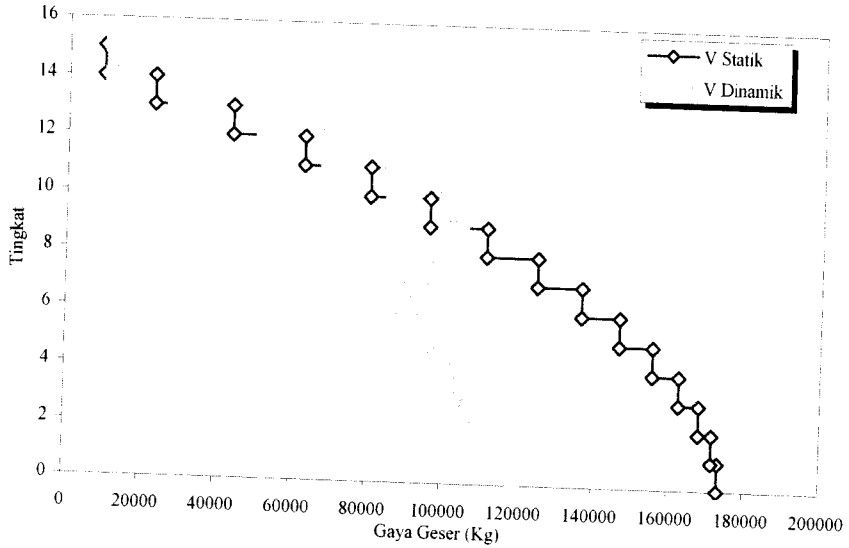
Setback 6



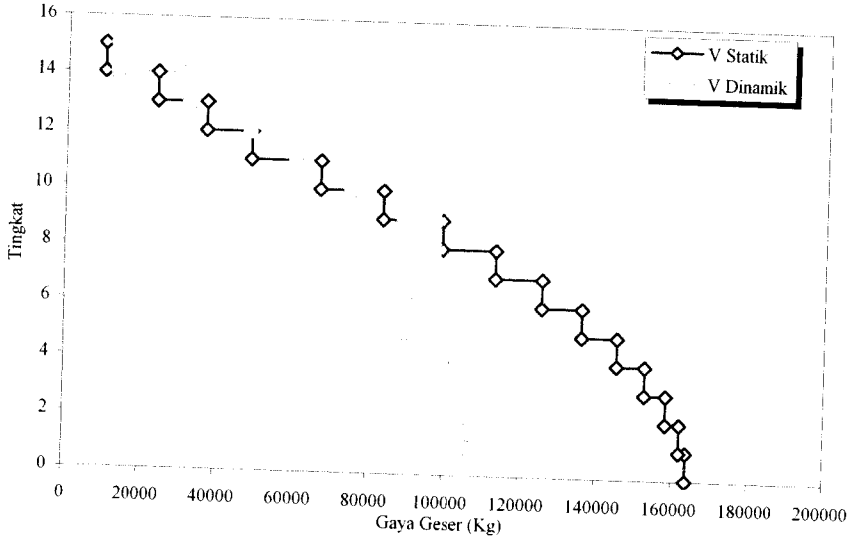
Gambar 5.178 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna



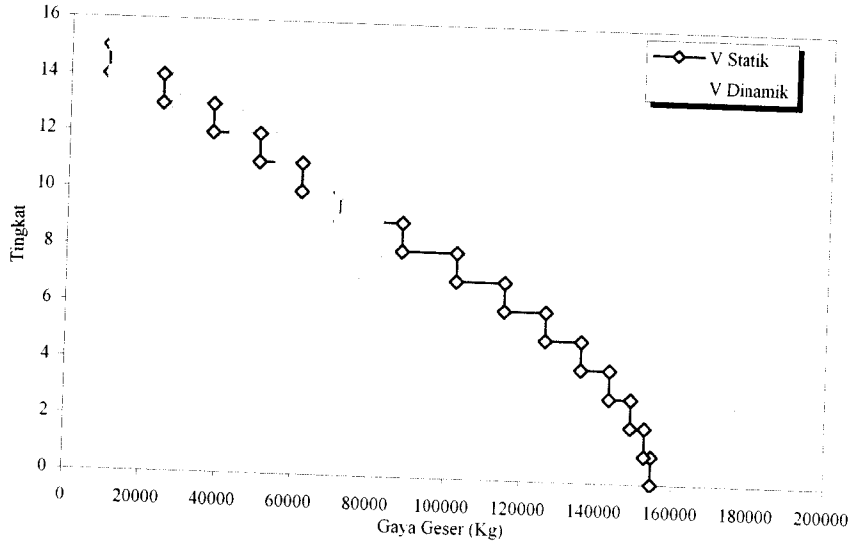
Tipikal



Setback 1

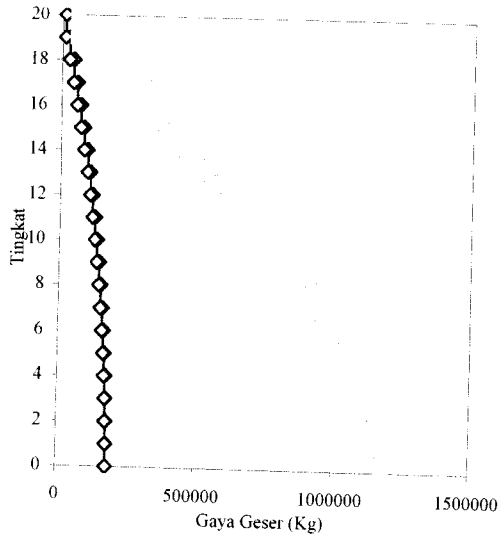


Setback 2

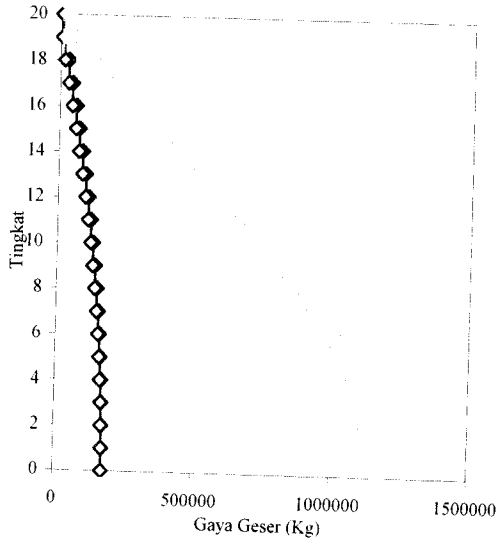


Setback 3

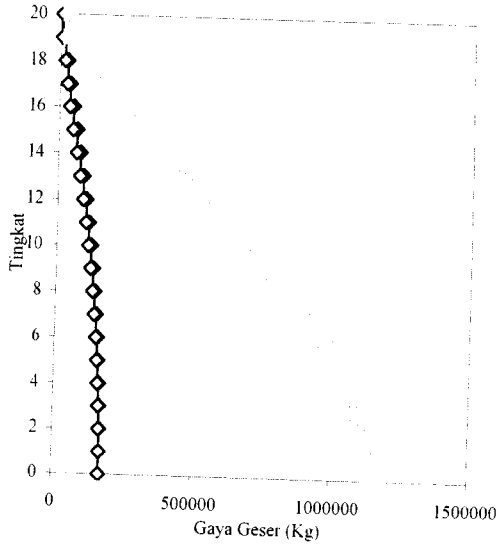
Gambar 5.178 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna



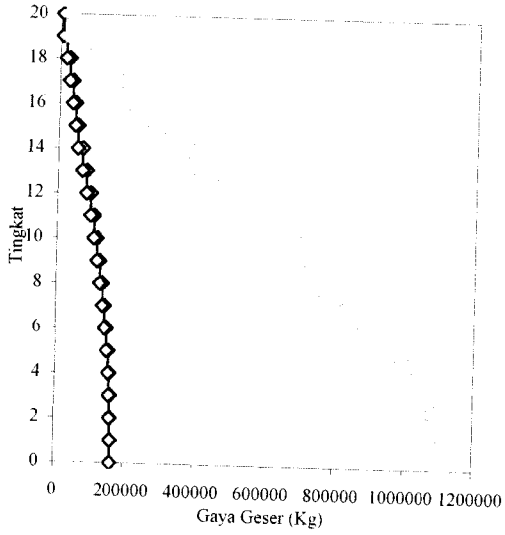
Tipikal



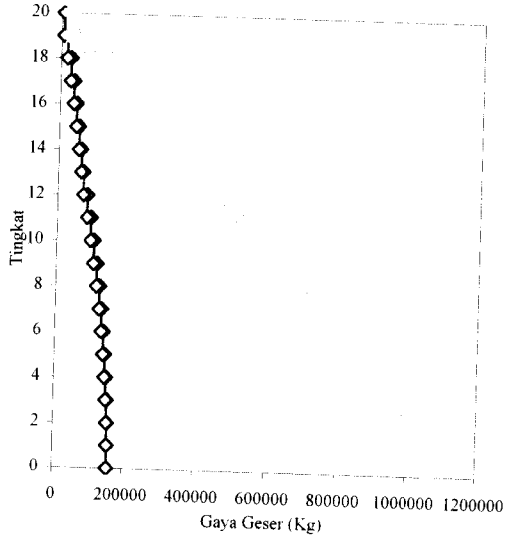
Setback 1



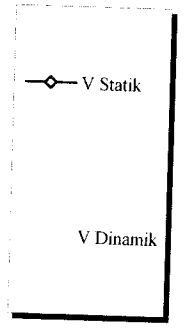
Setback 2



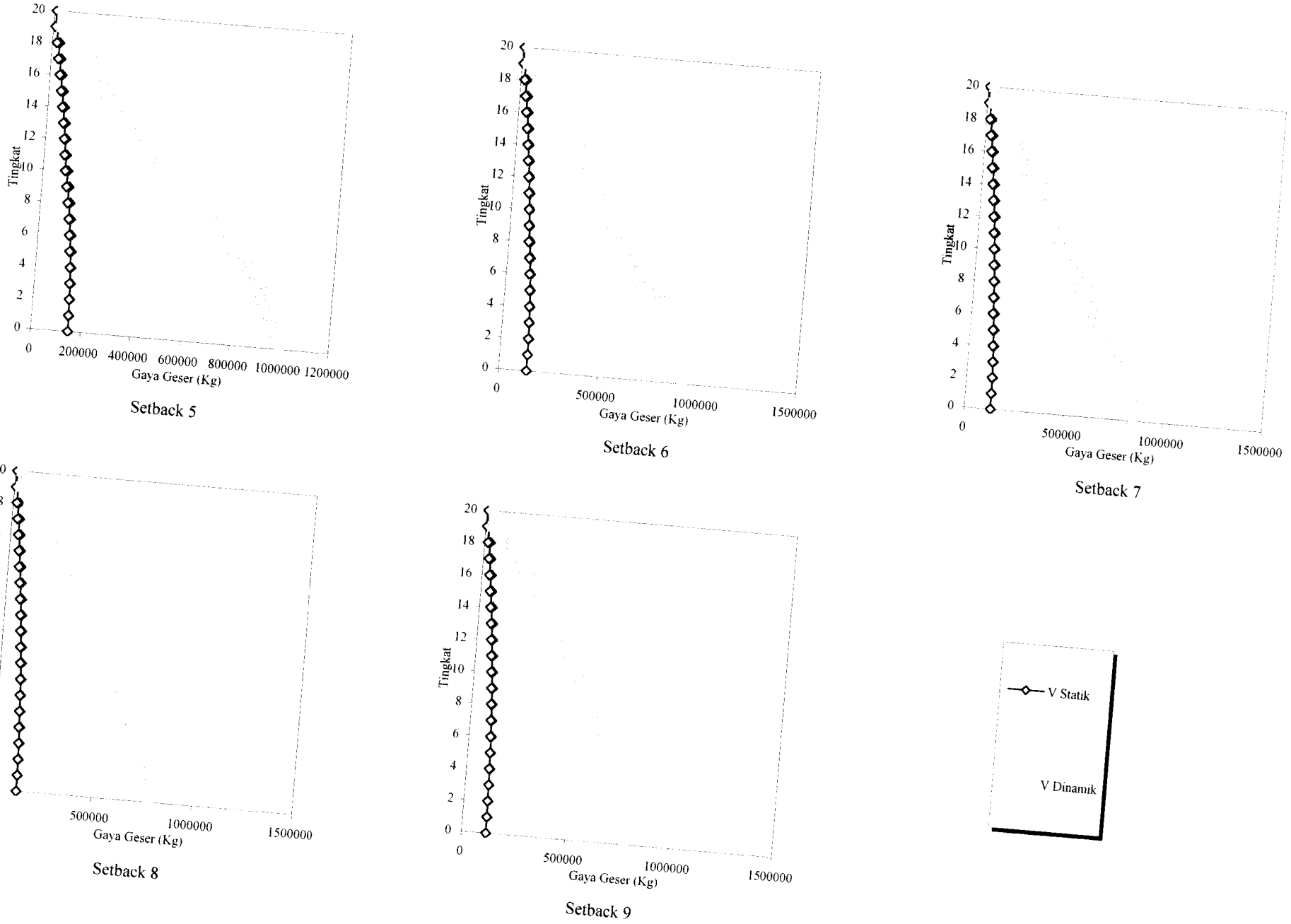
Setback 3



Setback 4



Gambar 5.179 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest



Setback 5

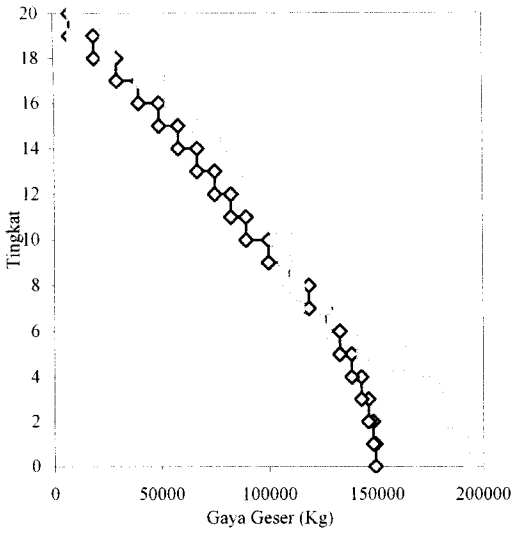
Setback 6

Setback 7

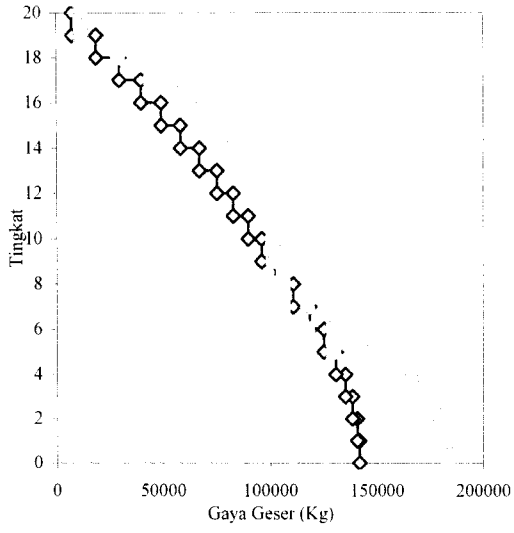
Setback 8

Setback 9

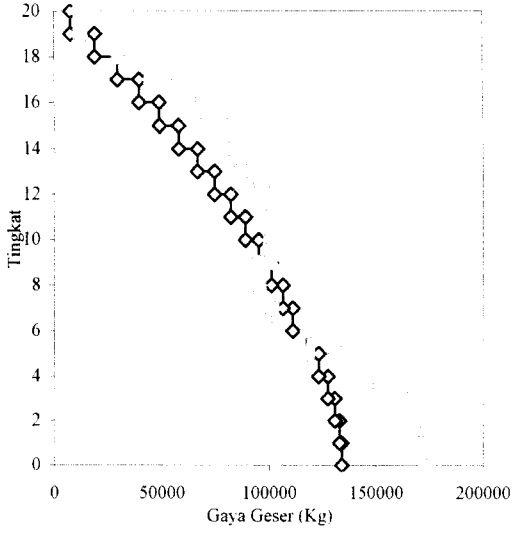
Gambar 5.179 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest



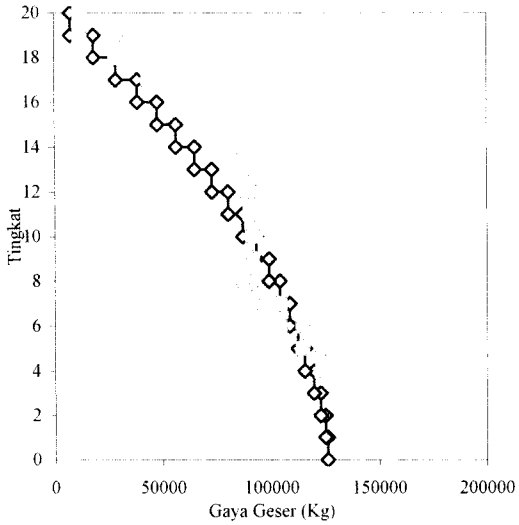
Setback 5



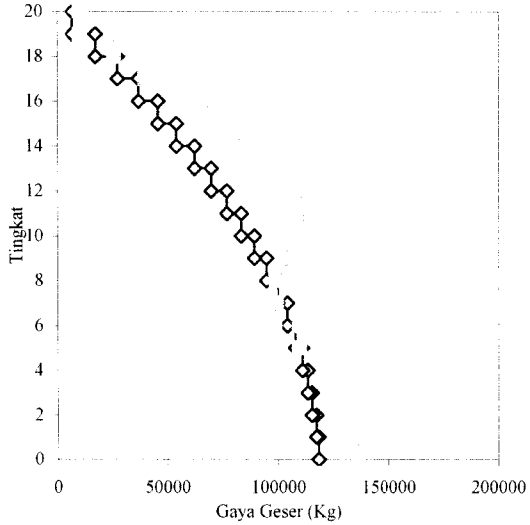
Setback 6



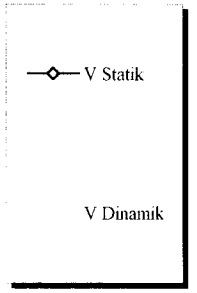
Setback 7



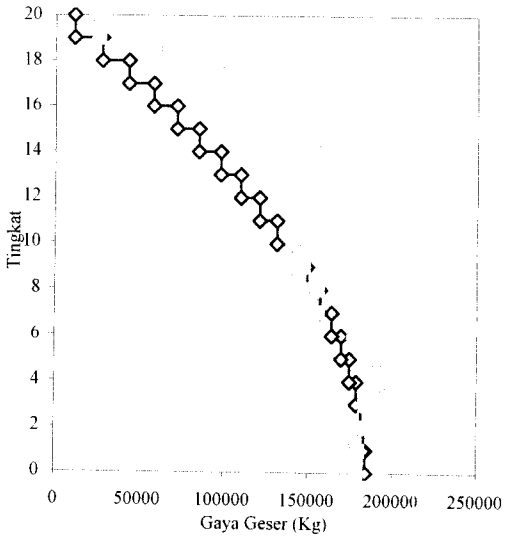
Setback 8



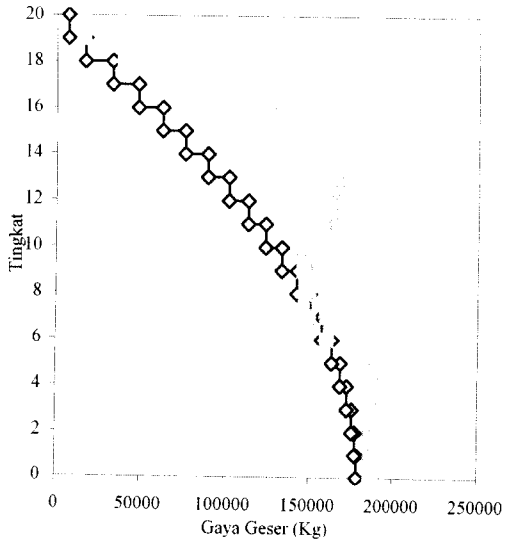
Setback 9



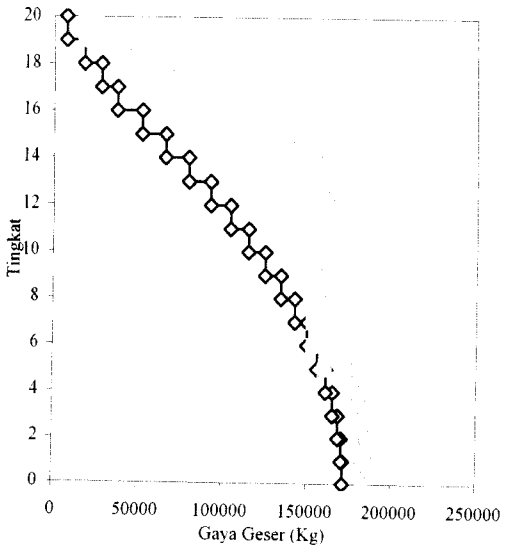
Gambar 5.180 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro



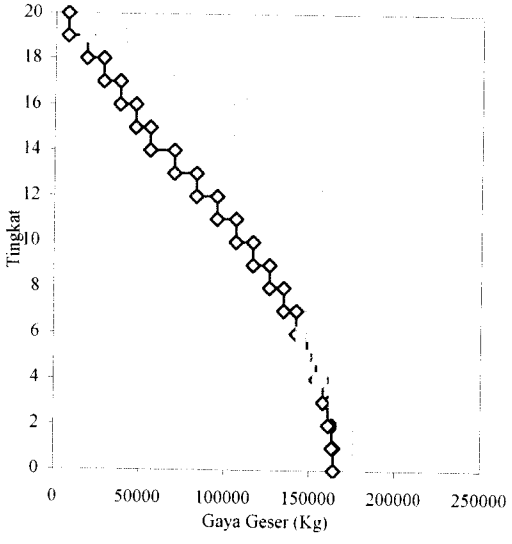
Tipikal



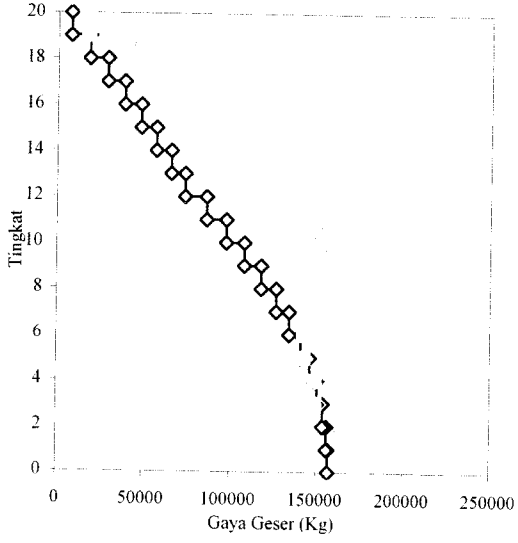
Setback 1



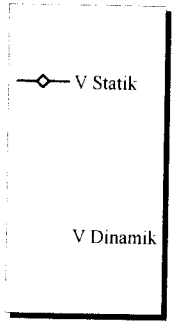
Setback 2



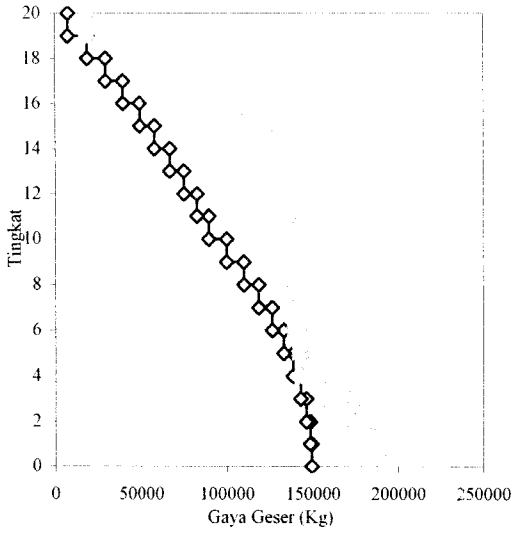
Setback 3



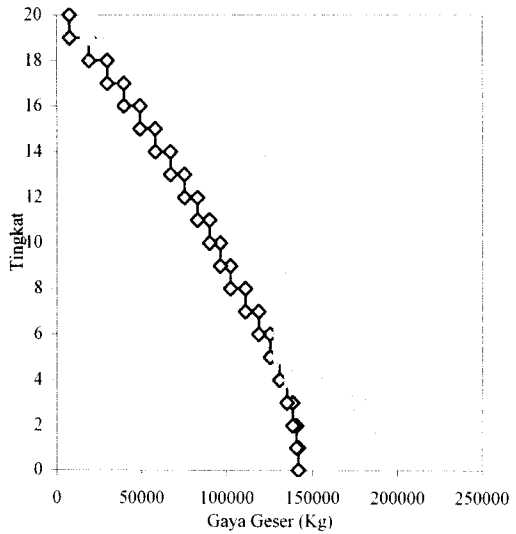
Setback 4



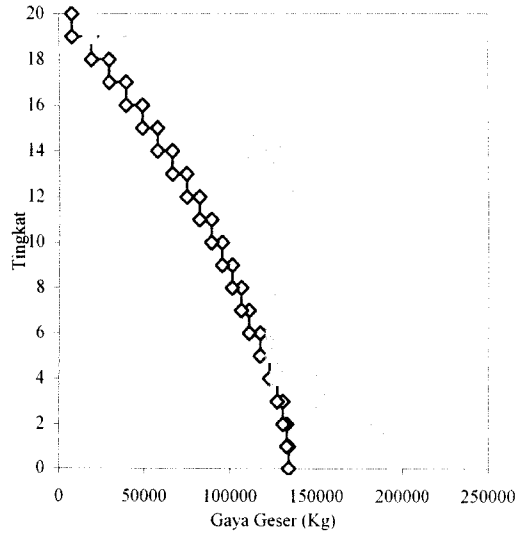
Gambar 5.181 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy



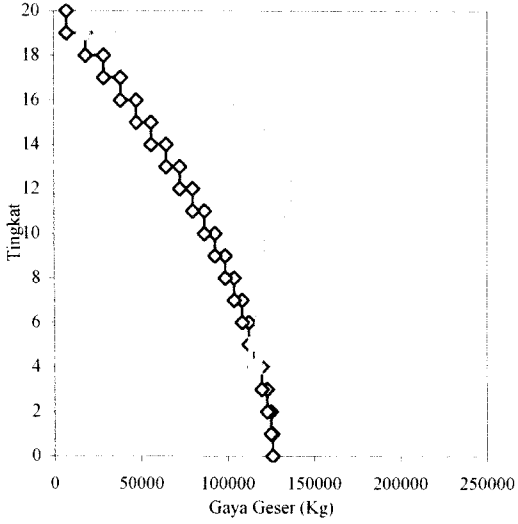
Setback 5



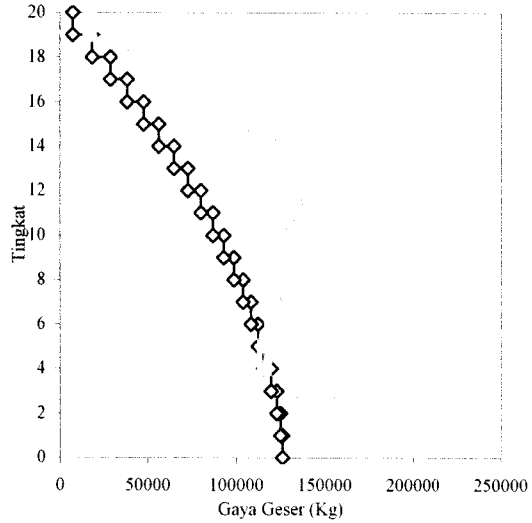
Setback 6



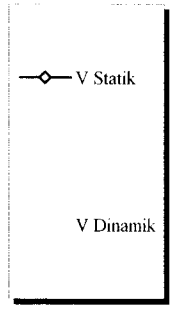
Setback 7



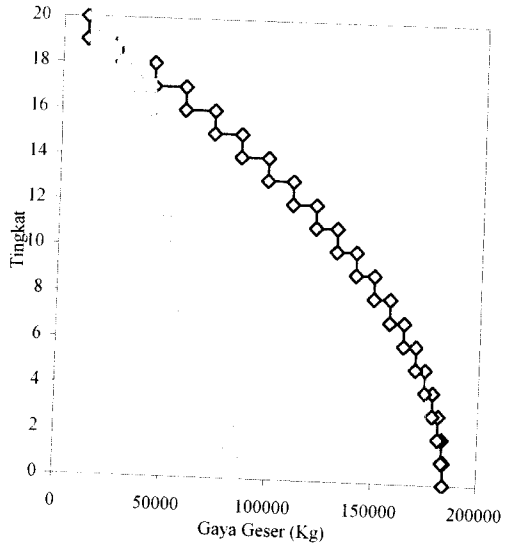
Setback 8



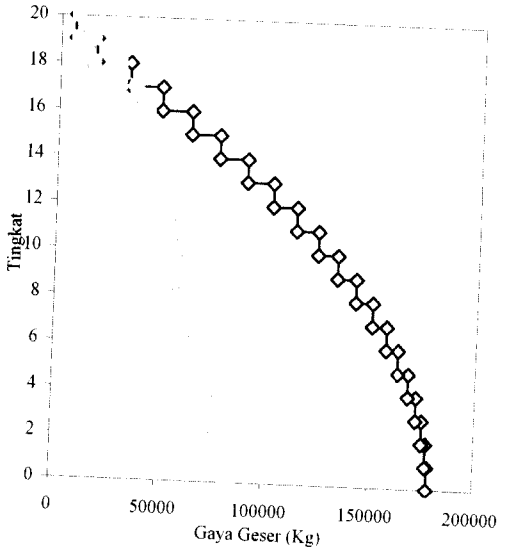
Setback 9



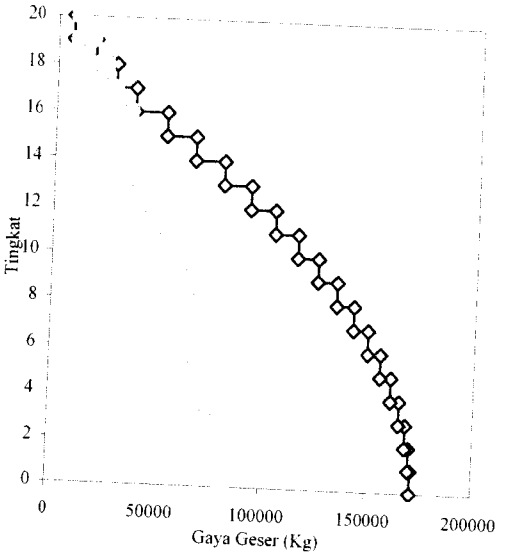
Gambar 5.181 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy



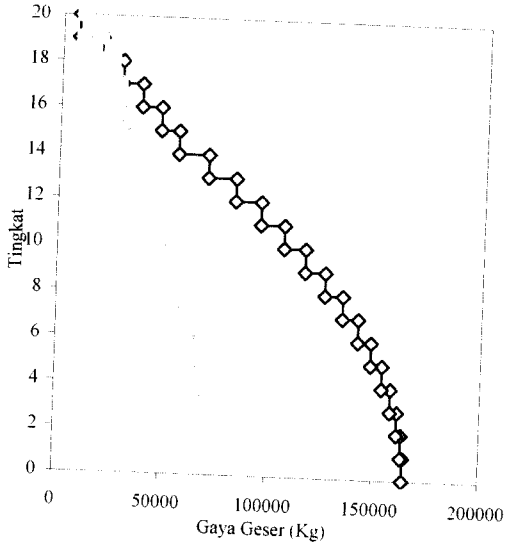
Tipikal



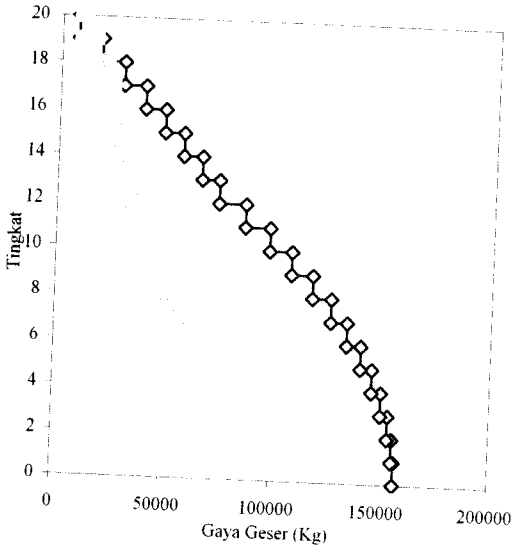
Setback 1



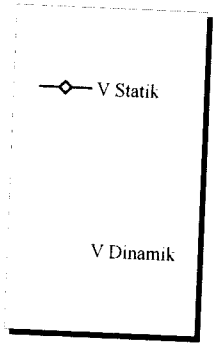
Setback 2



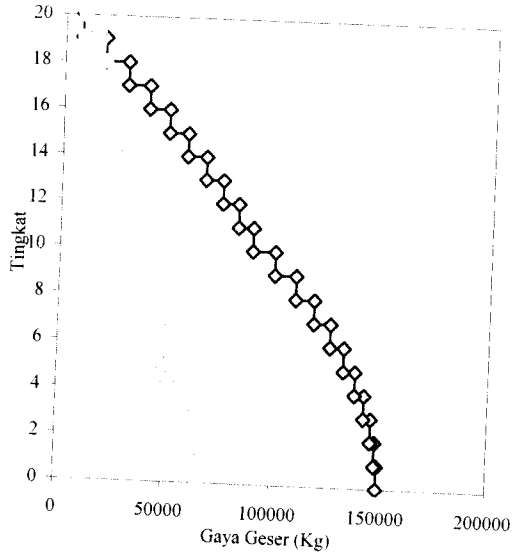
Setback 3



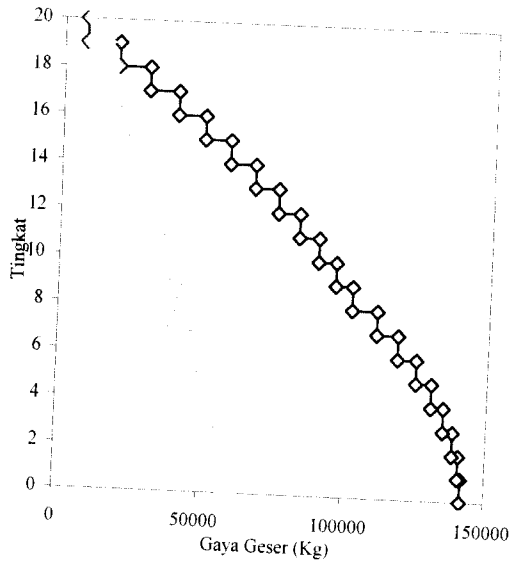
Setback 4



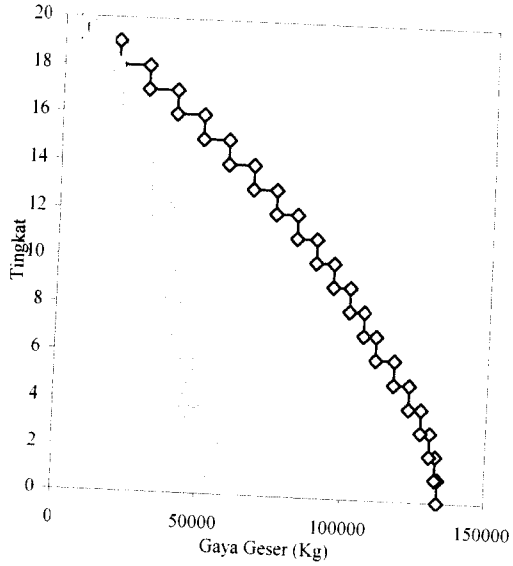
Gambar 5.182 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna



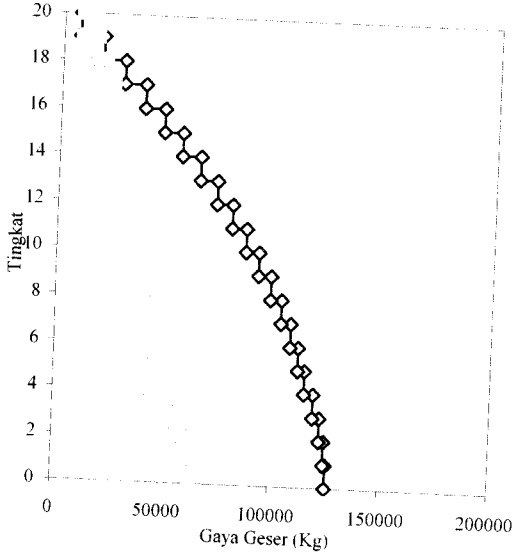
Setback 5



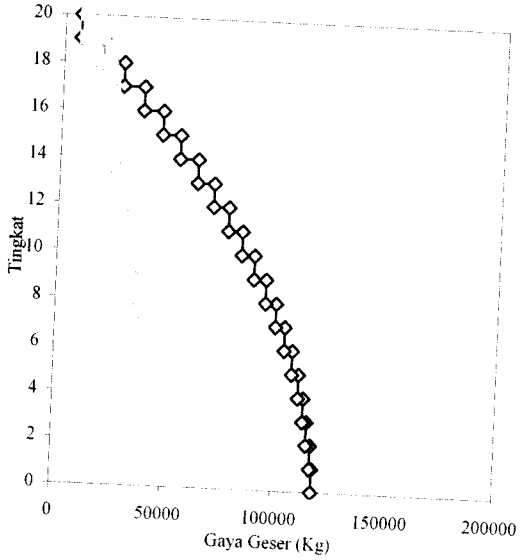
Setback 6



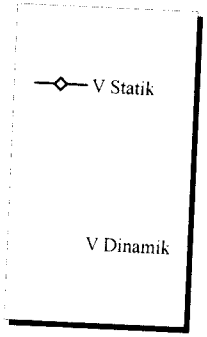
Setback 7



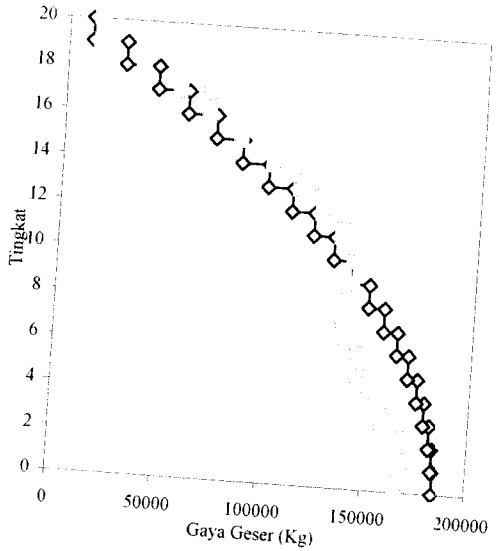
Setback 8



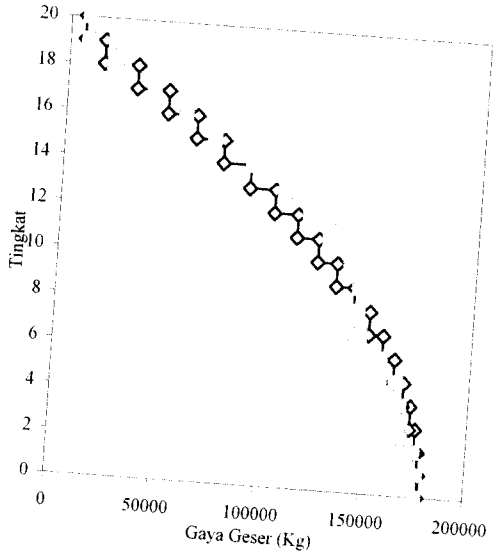
Setback 9



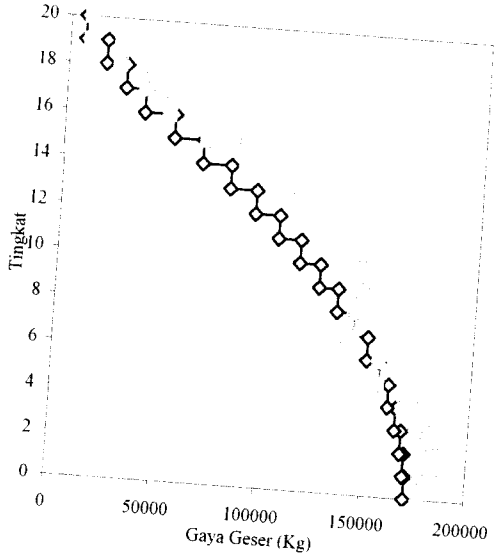
Gambar 5.182 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna



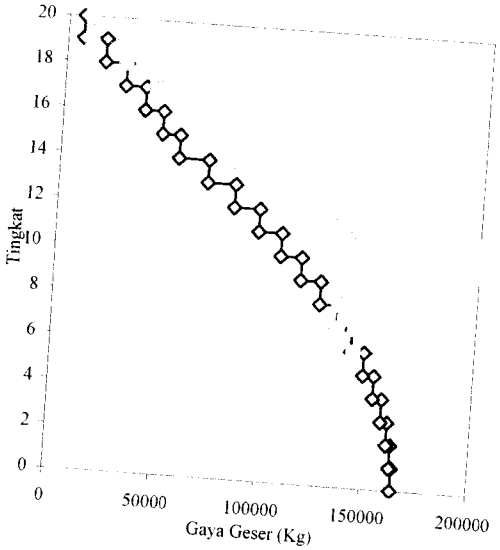
Tipikal



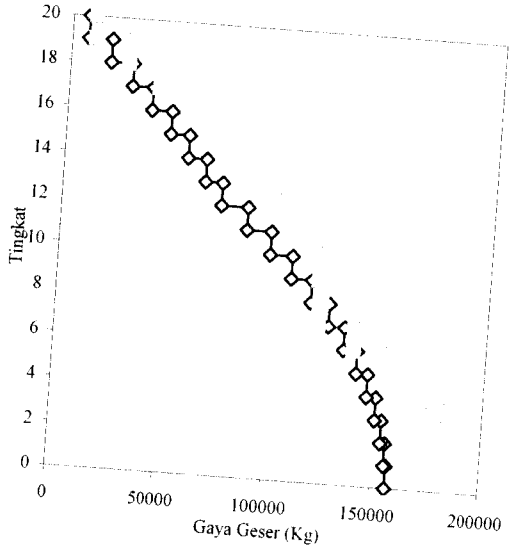
Setback 1



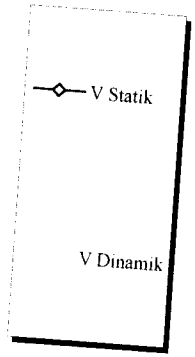
Setback 2



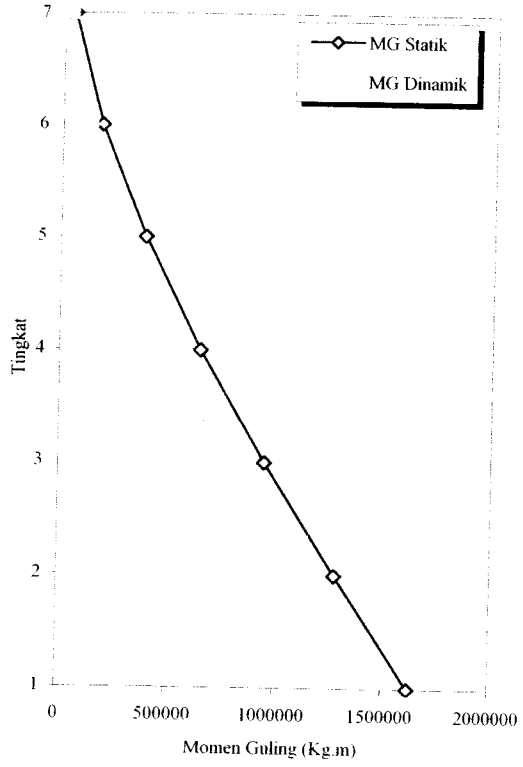
Setback 3



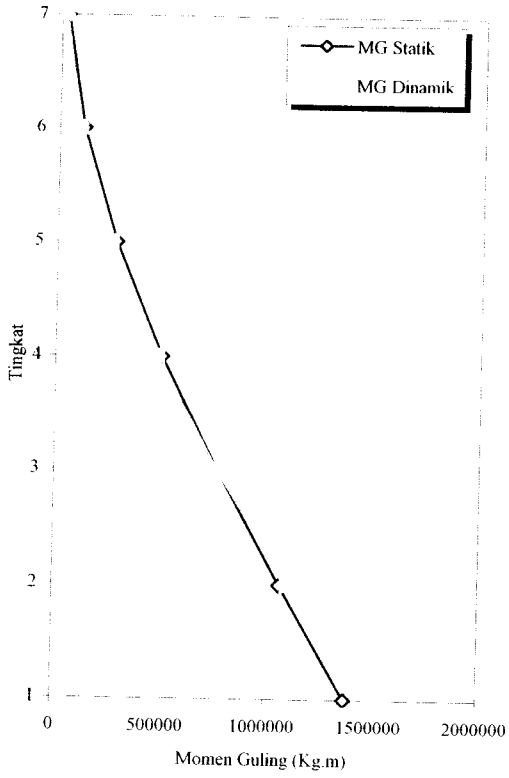
Setback 4



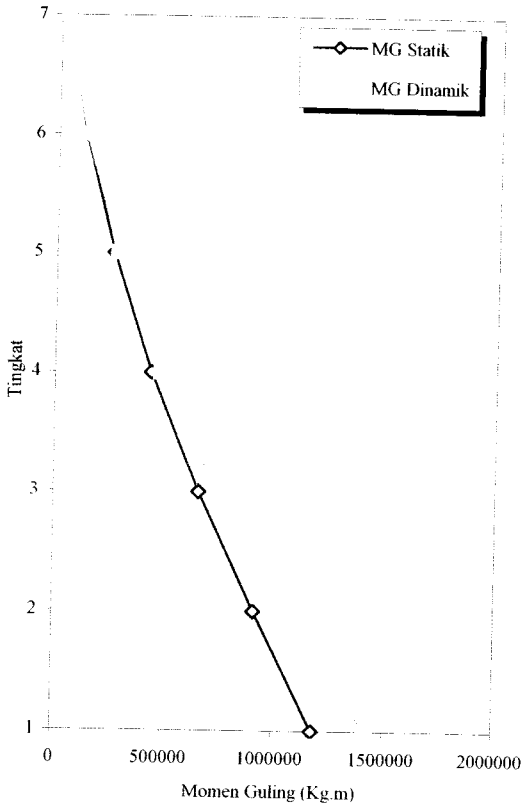
Gambar 5.180 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro



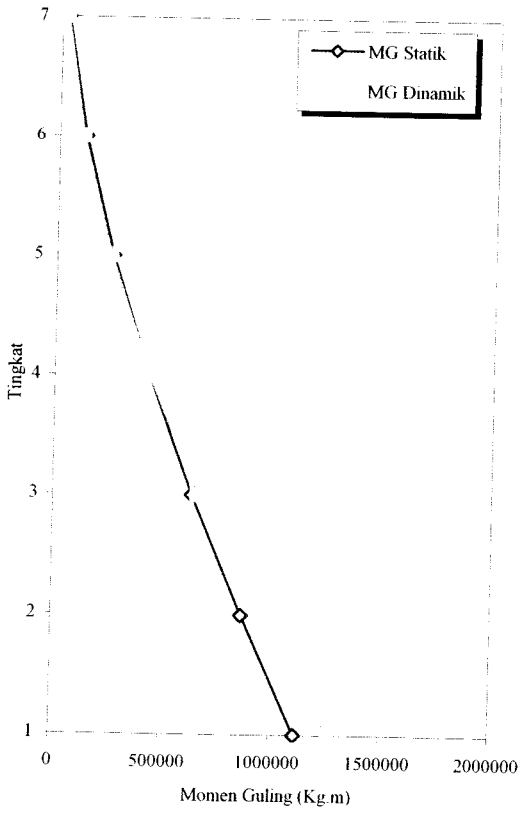
Tipikal



Setback 1

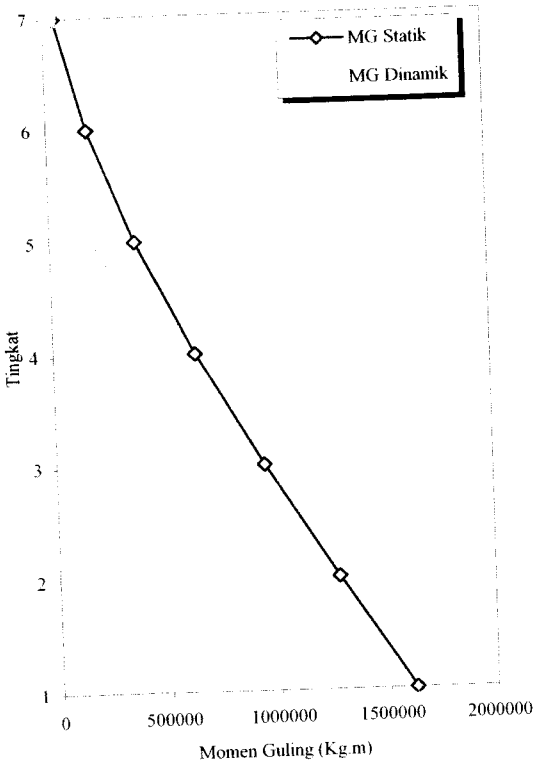


Setback 2

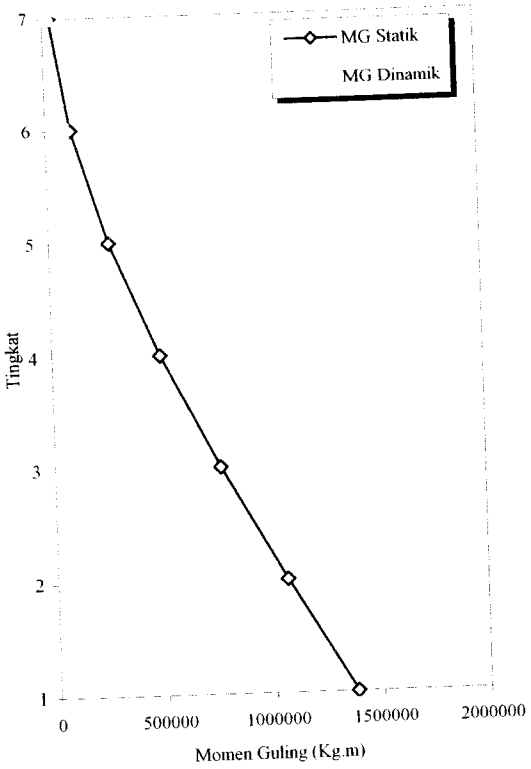


Setback 3

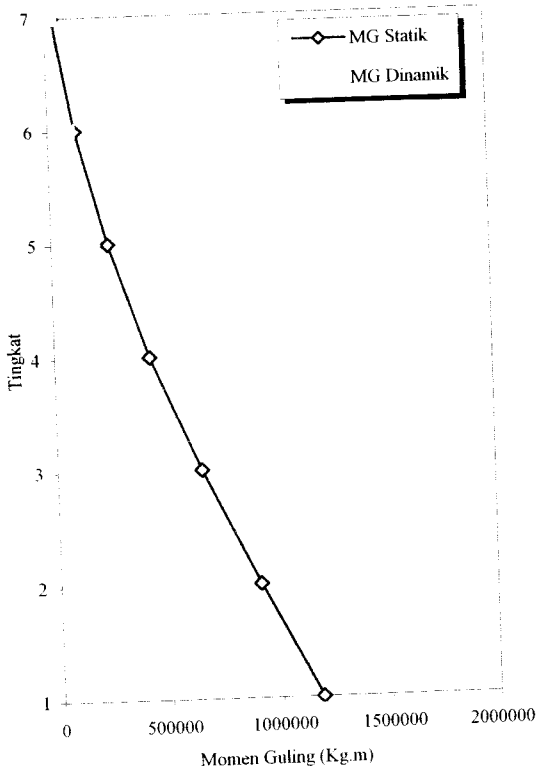
Gambar 5.183 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Bucharest



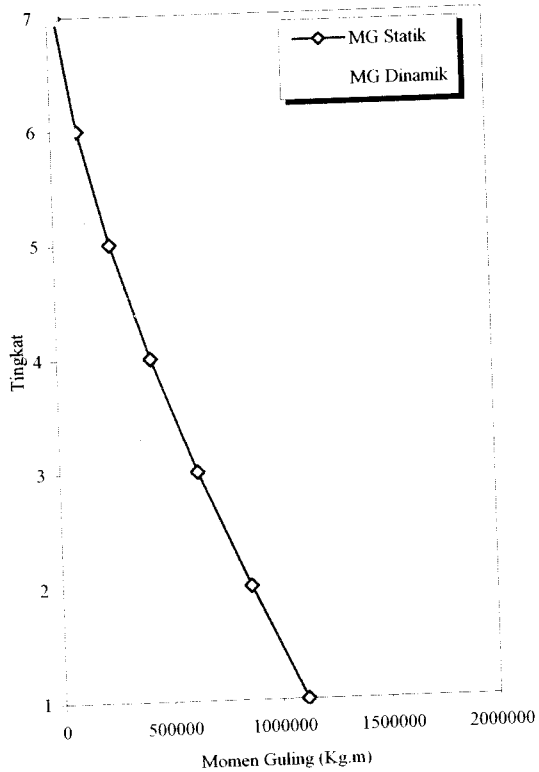
Tipikal



Setback 1

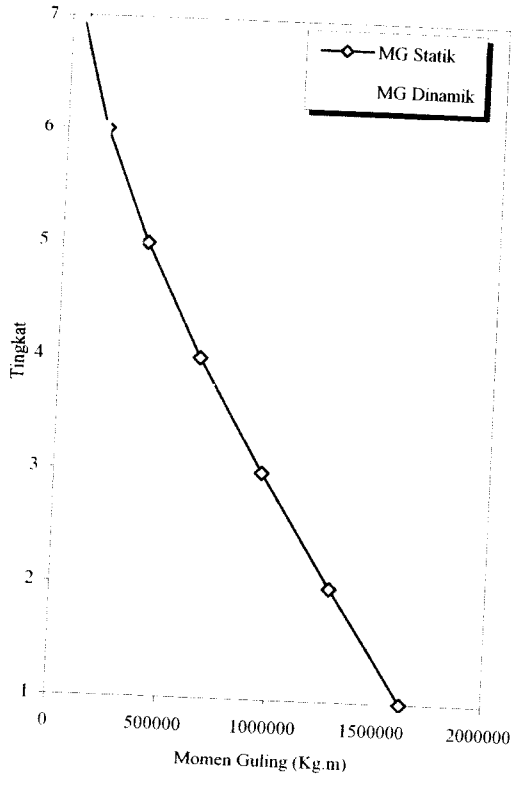


Setback 2

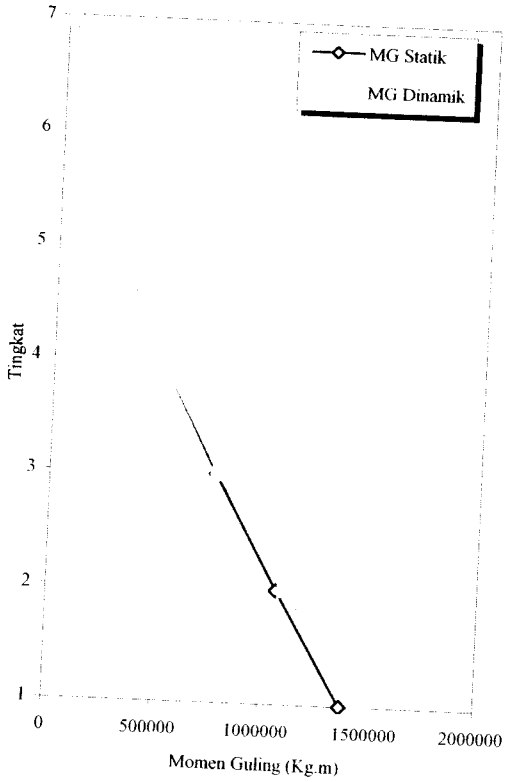


Setback 3

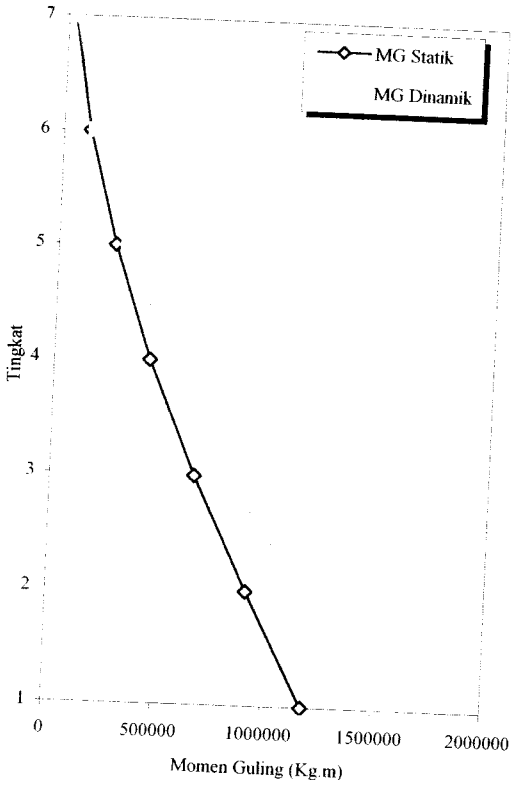
Gambar 5.184 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa El Centro



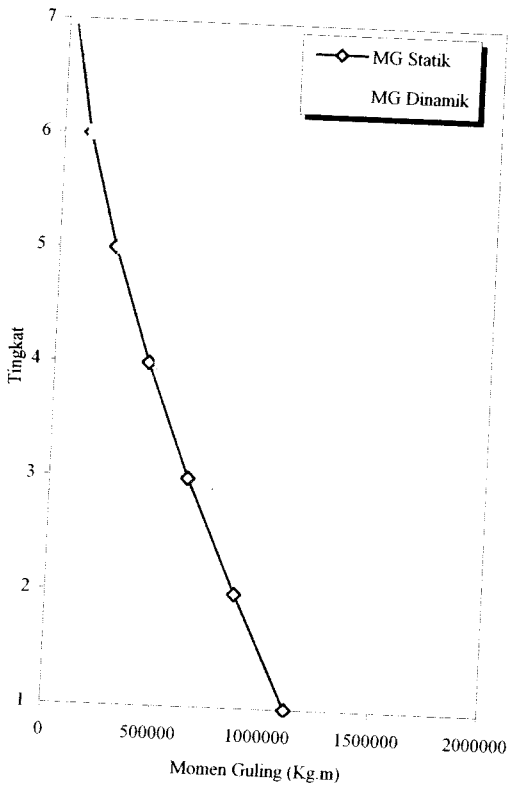
Tipikal



Setback 1

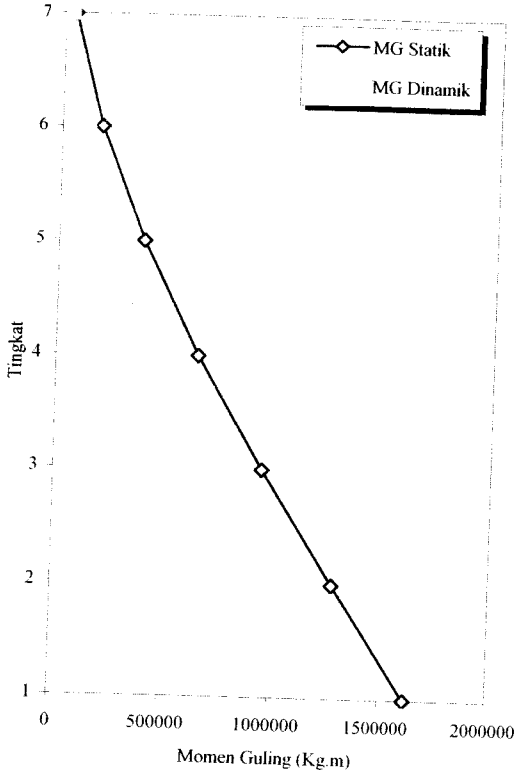


Setback 2

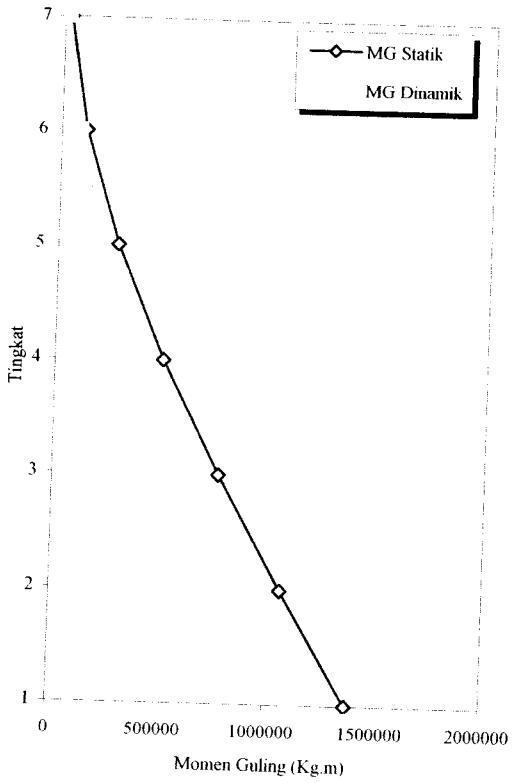


Setback 3

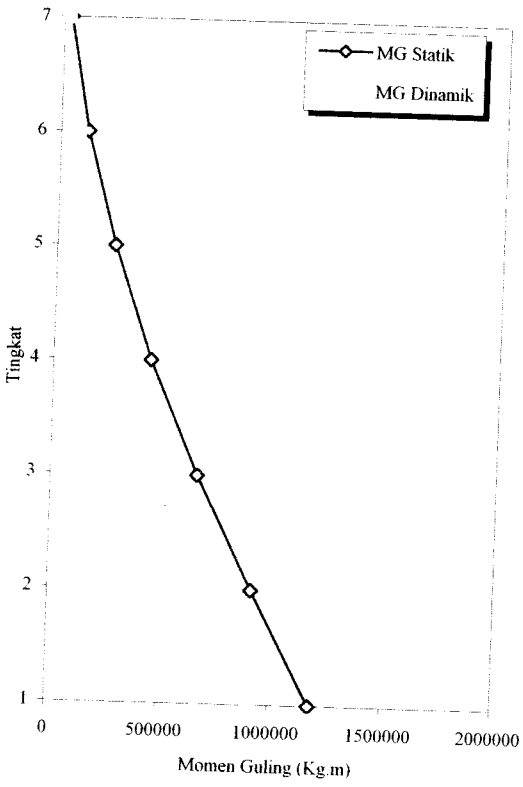
Gambar 5.185 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Gilroy



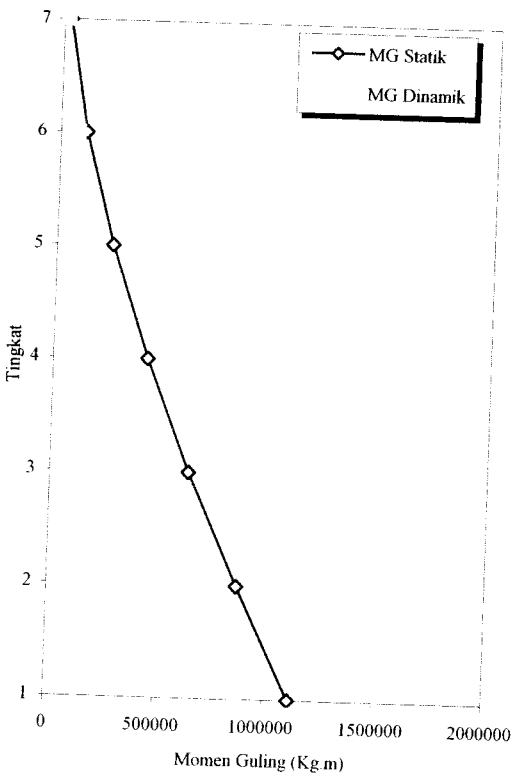
Tipikal



Setback 1

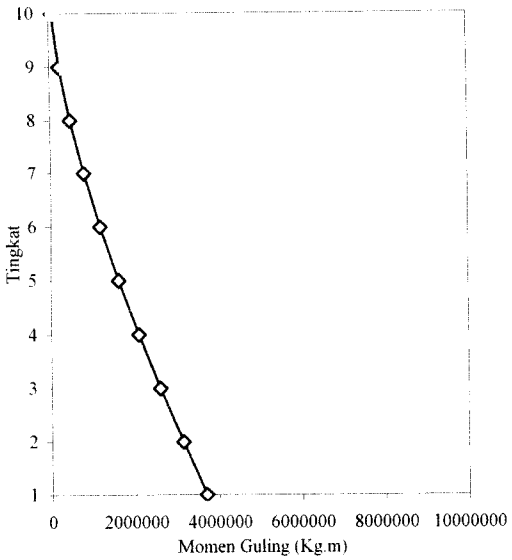


Setback 2

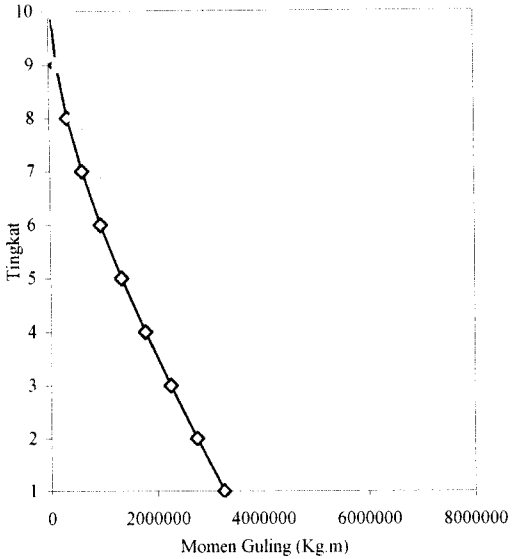


Setback 3

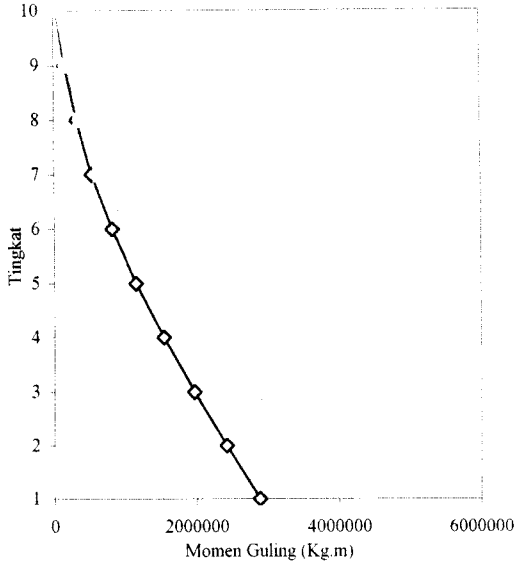
Gambar 5.186 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Koyna



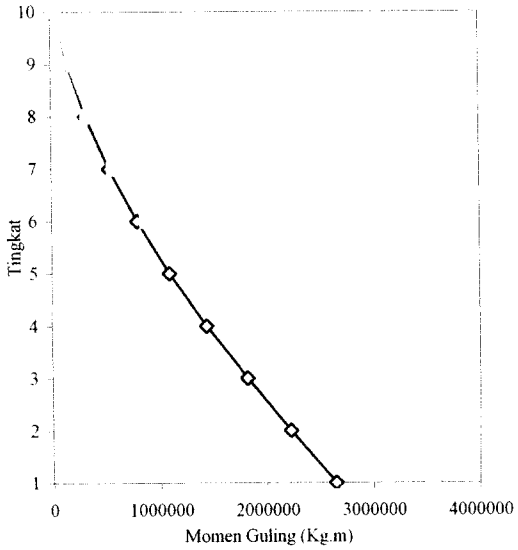
Tipikal



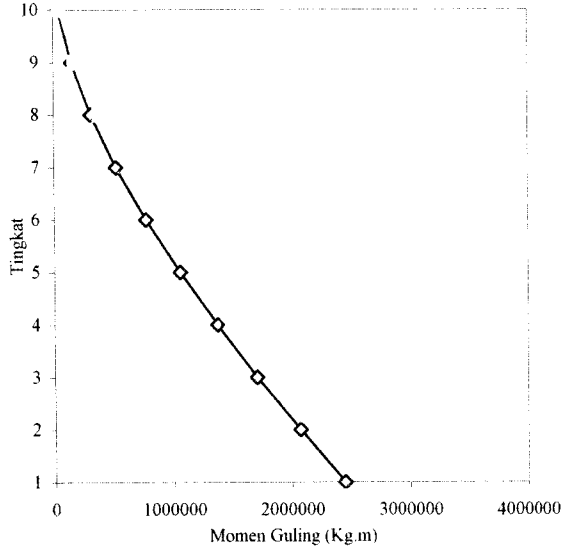
Setback 1



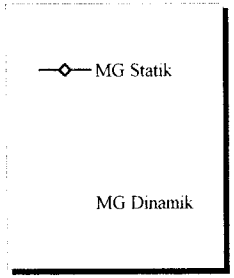
Setback 2



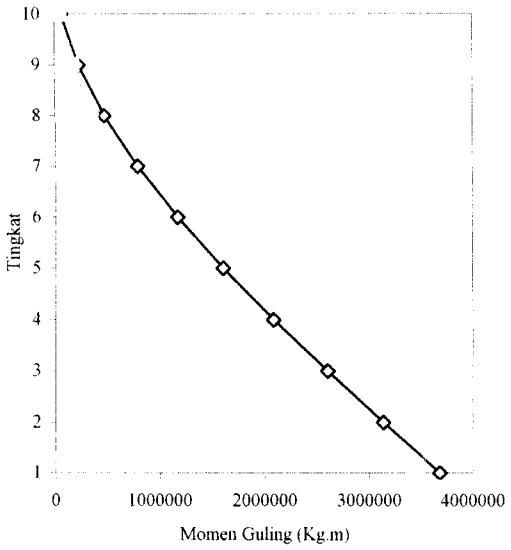
Setback 3



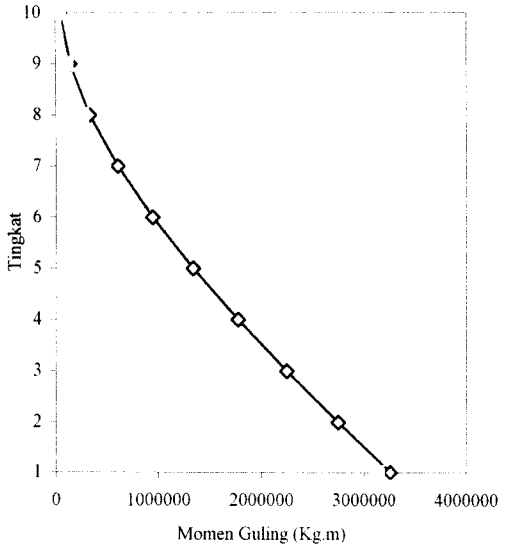
Setback 4



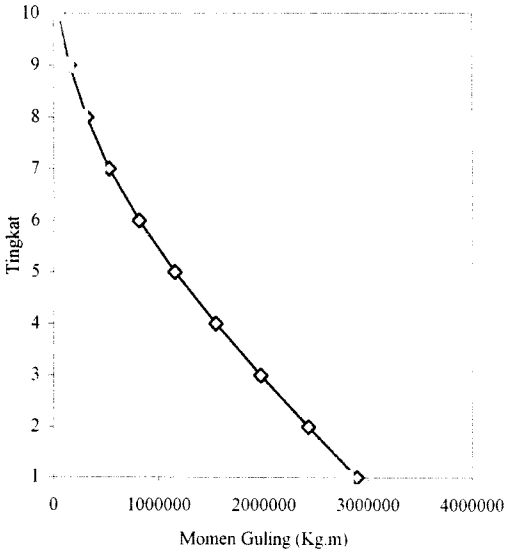
Gambar 5.187 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Bucharest



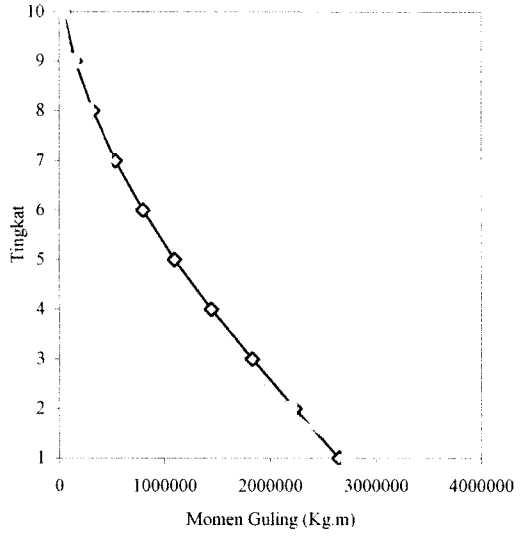
Tipikal



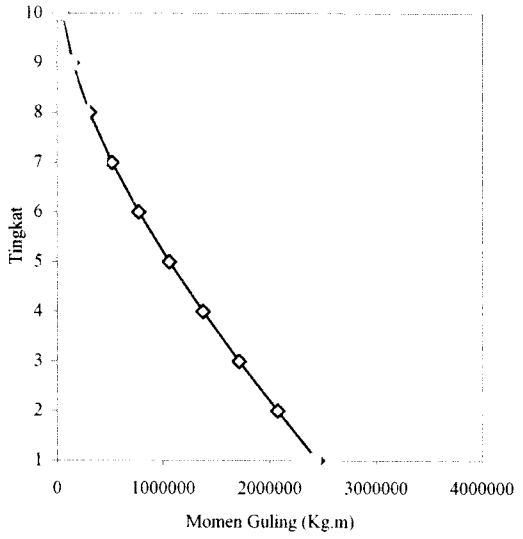
Setback 1



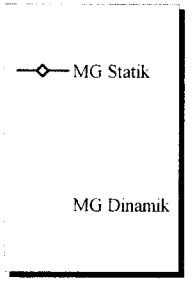
Setback 2



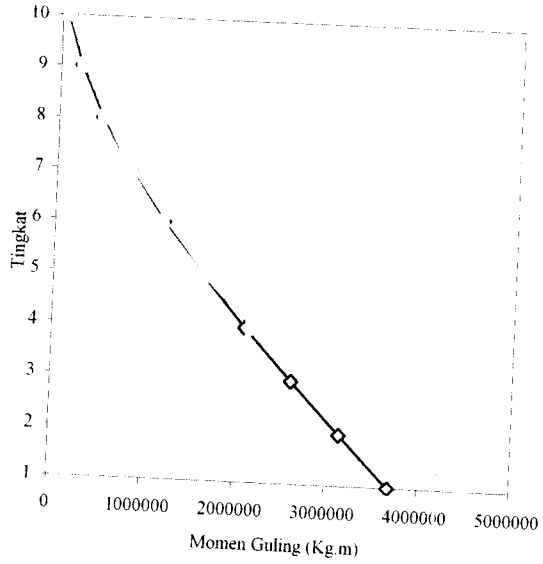
Setback 3



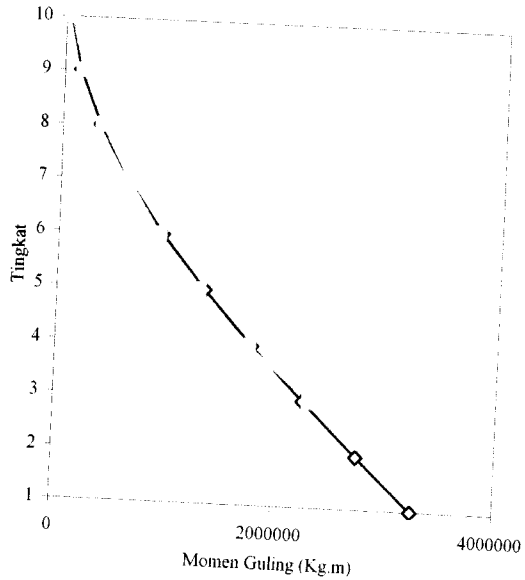
Setback 4



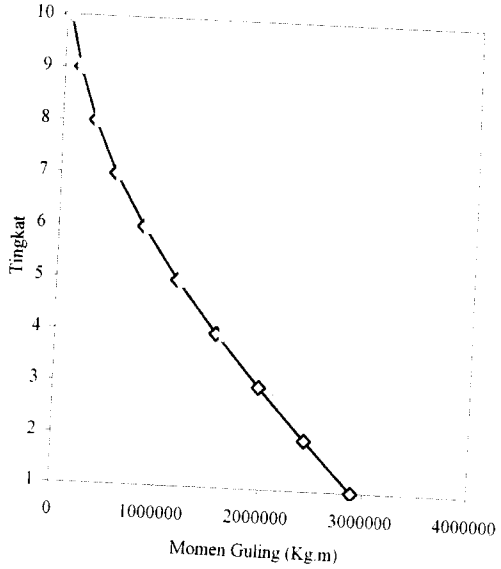
Gambar 5.188 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa El Centro



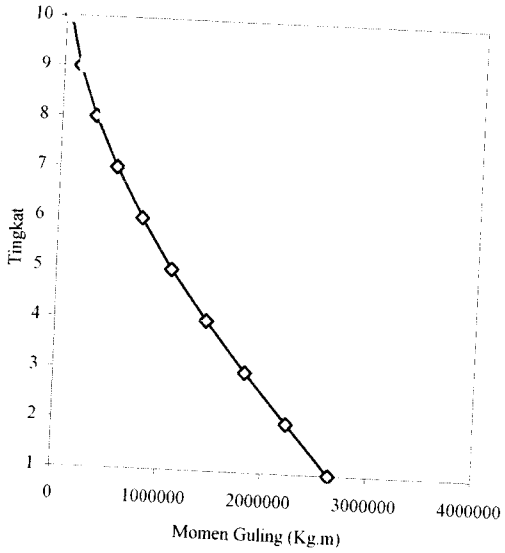
Tipikal



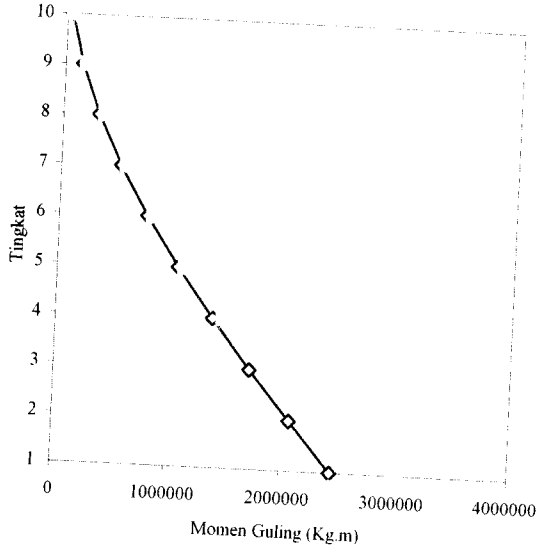
Setback 1



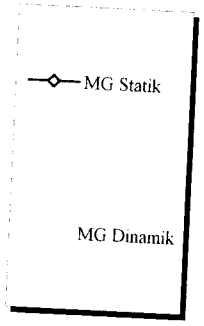
Setback 2



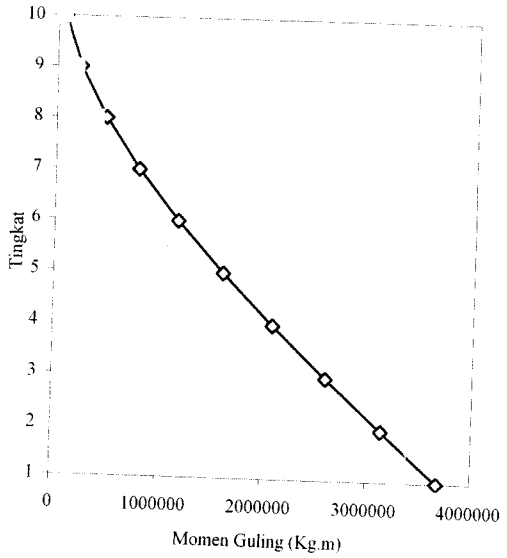
Setback 3



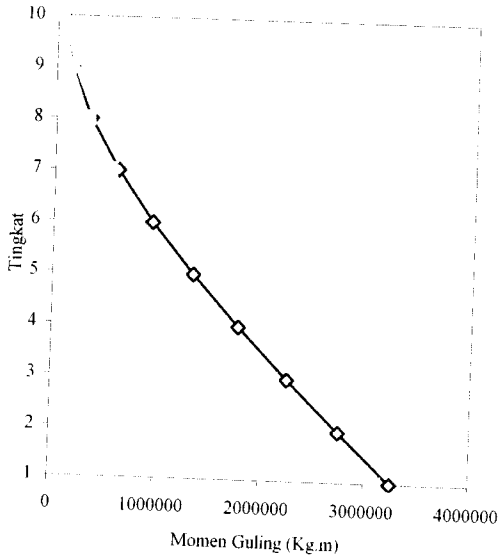
Setback 4



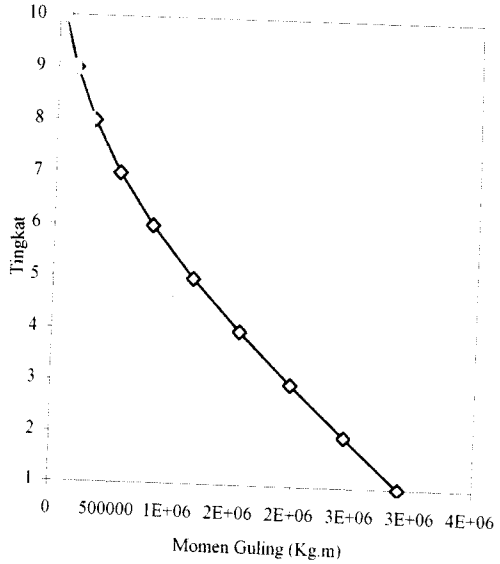
Gambar 5.189 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Gilroy



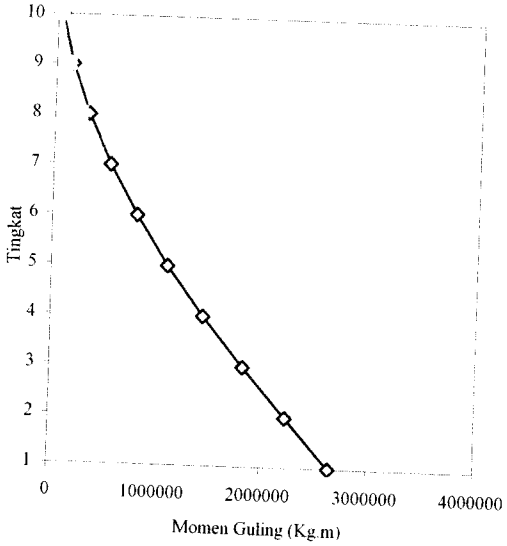
Tipikal



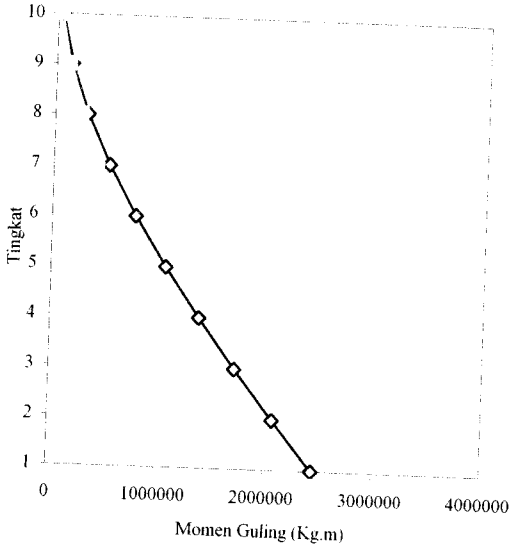
Setback 1



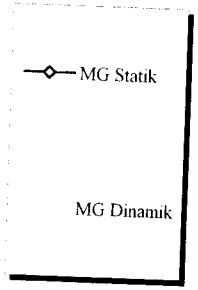
Setback 2



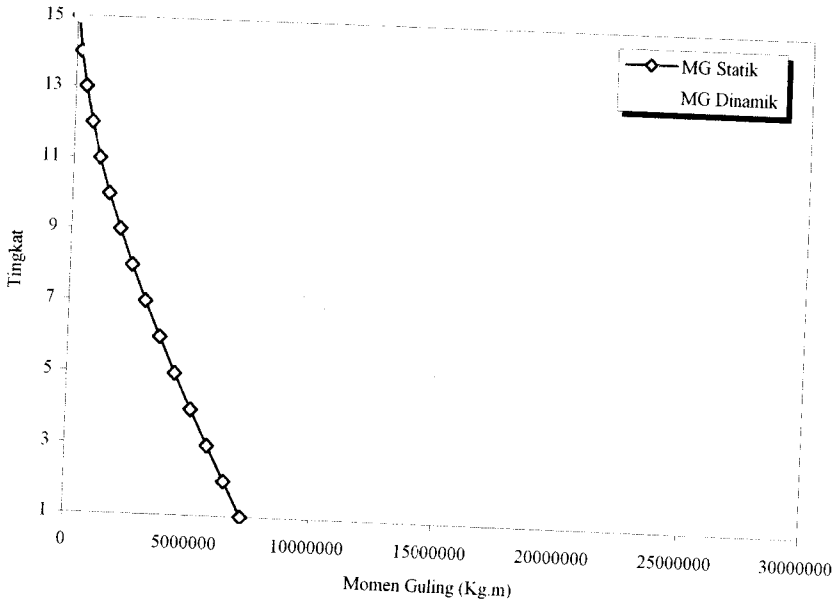
Setback 3



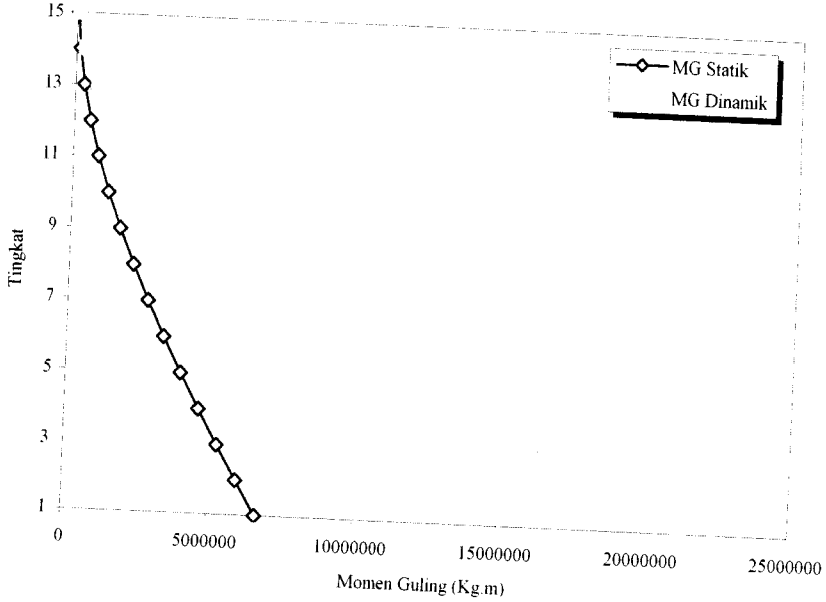
Setback 4



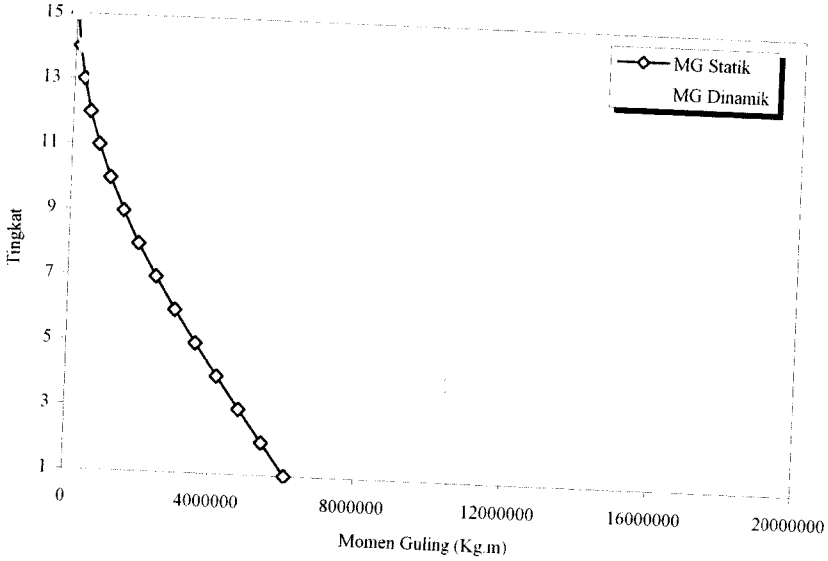
Gambar 5.190 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Koyna



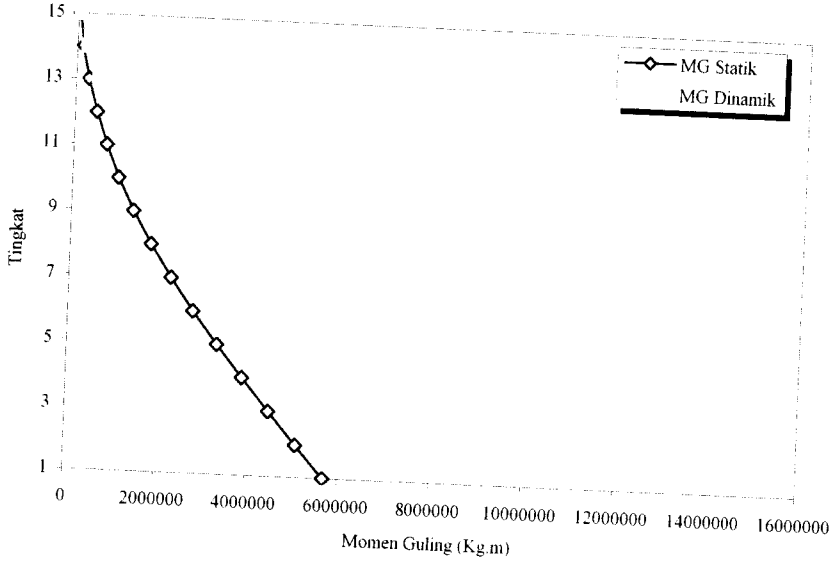
Tipikal



Setback 1

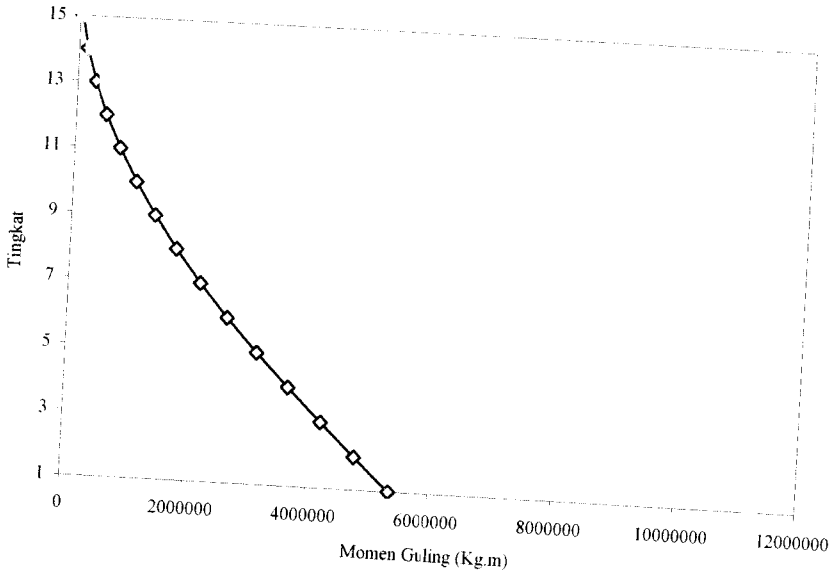


Setback 2

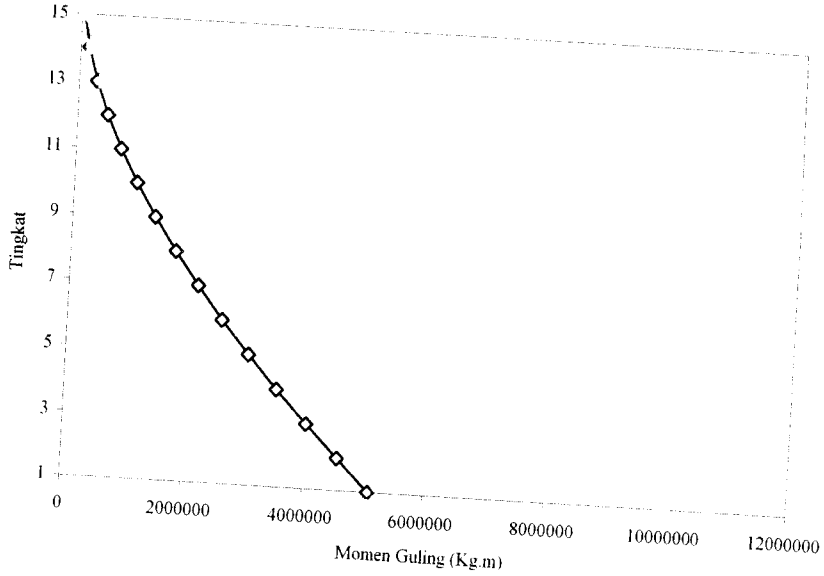


Setback 3

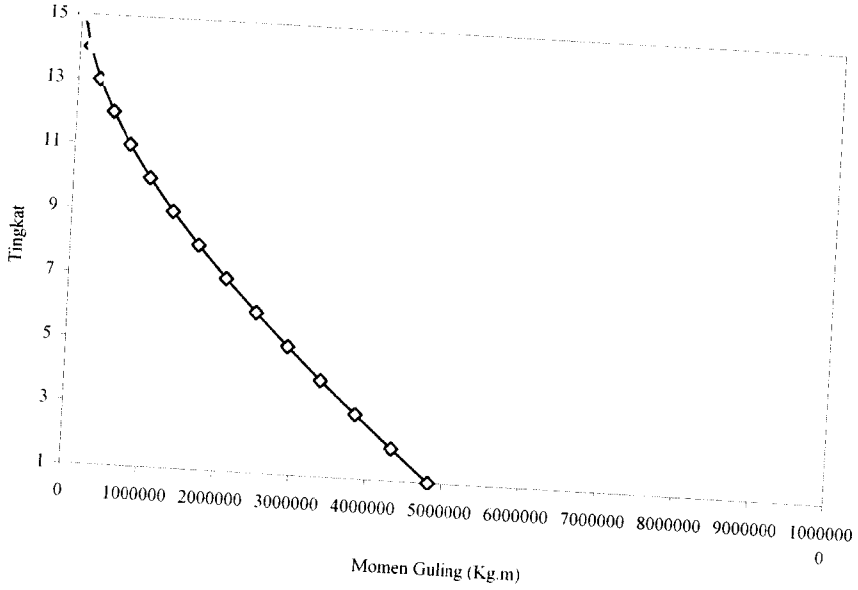
Gambar 5.191 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest



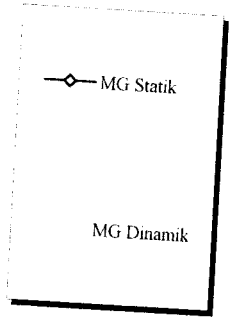
Setback 4



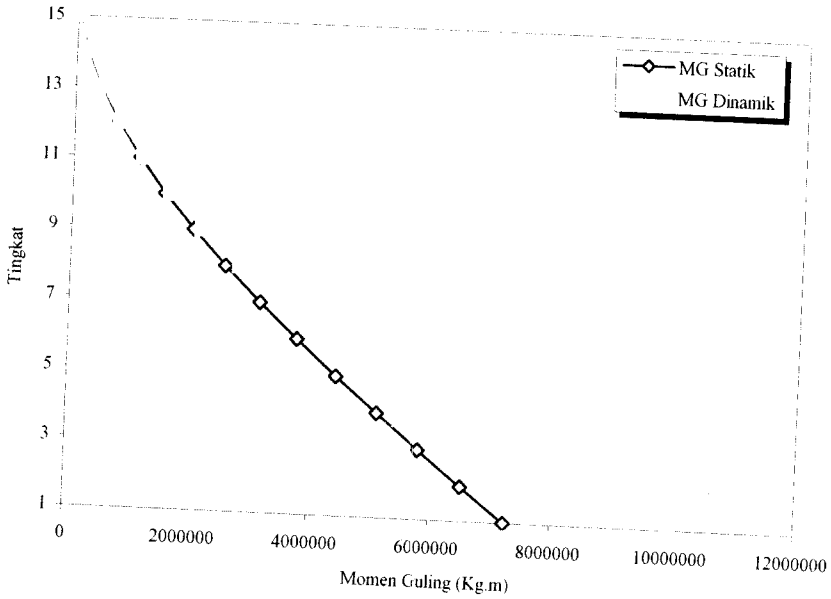
Setback 5



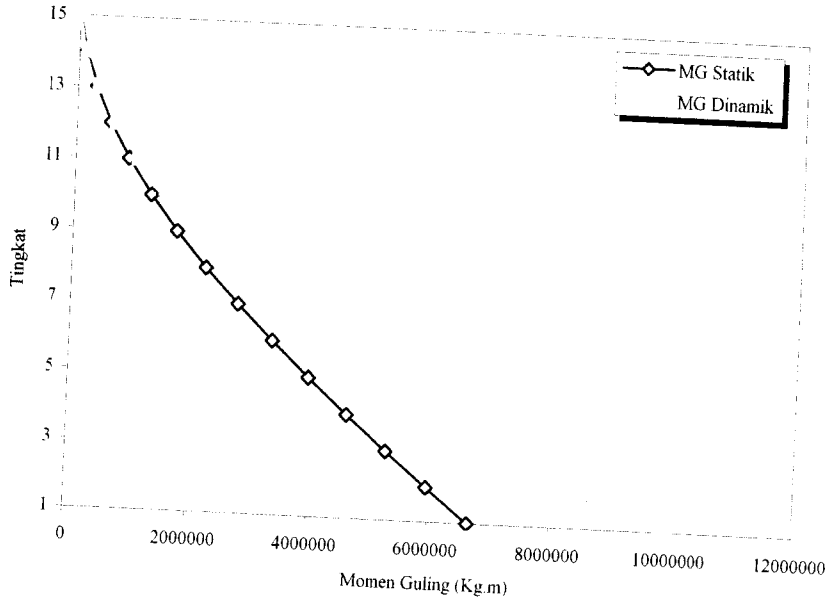
Setback 6



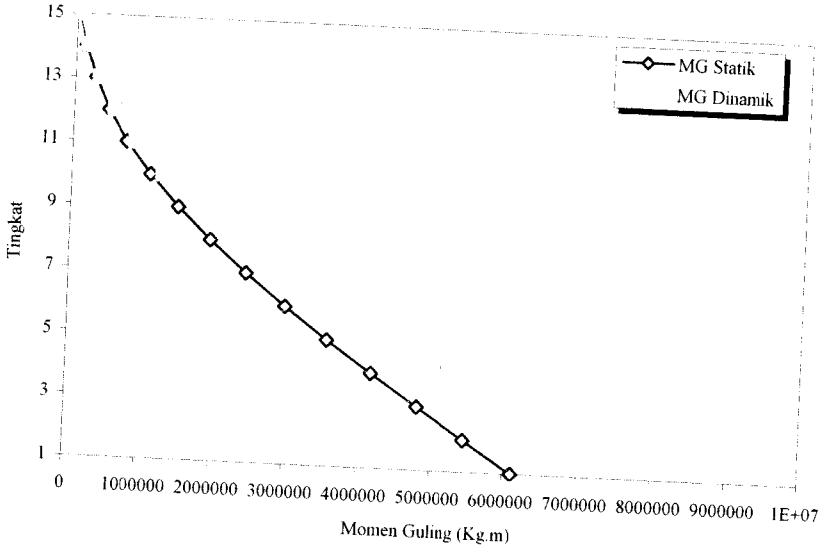
Gambar 5.191 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest



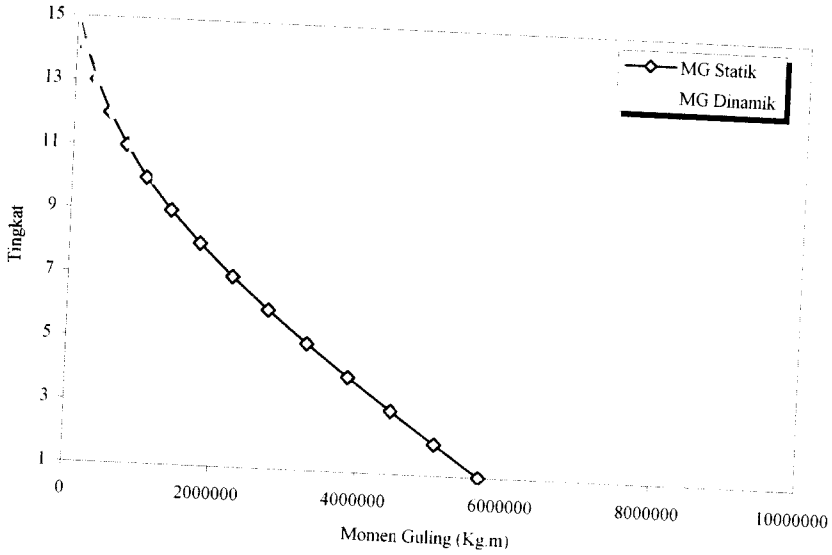
Tipikal



Setback 1

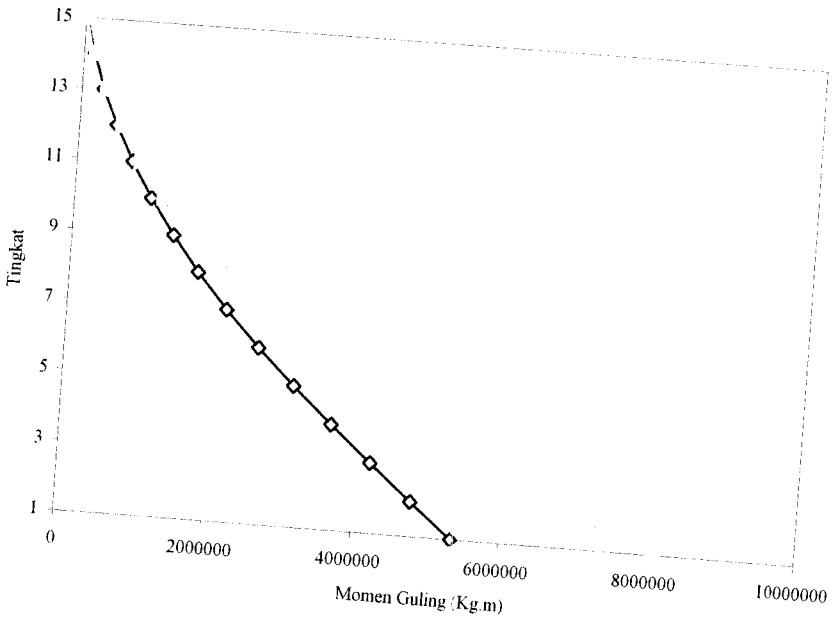


Setback 2

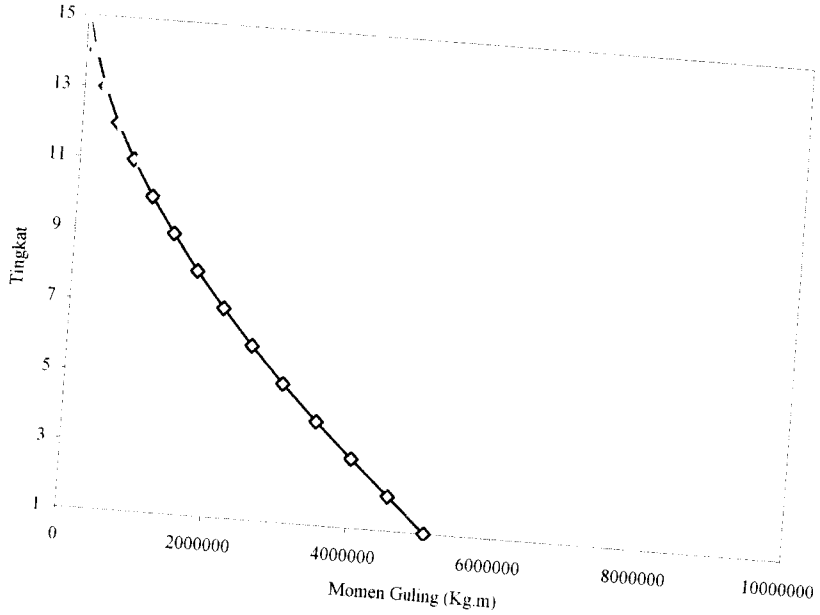


Setback 3

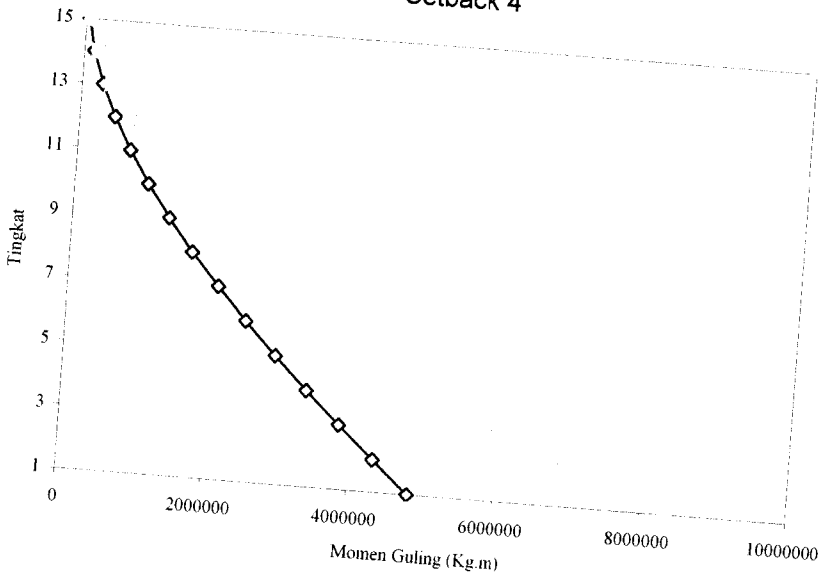
Gambar 5.192 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro



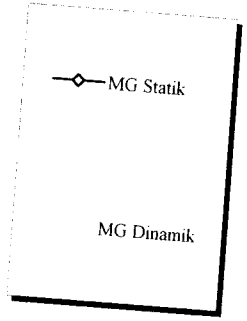
Setback 4



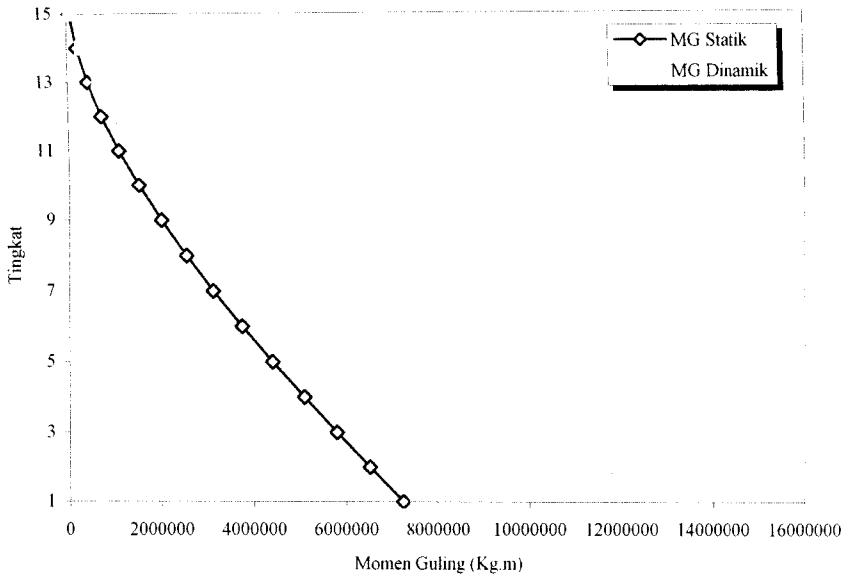
Setback 5



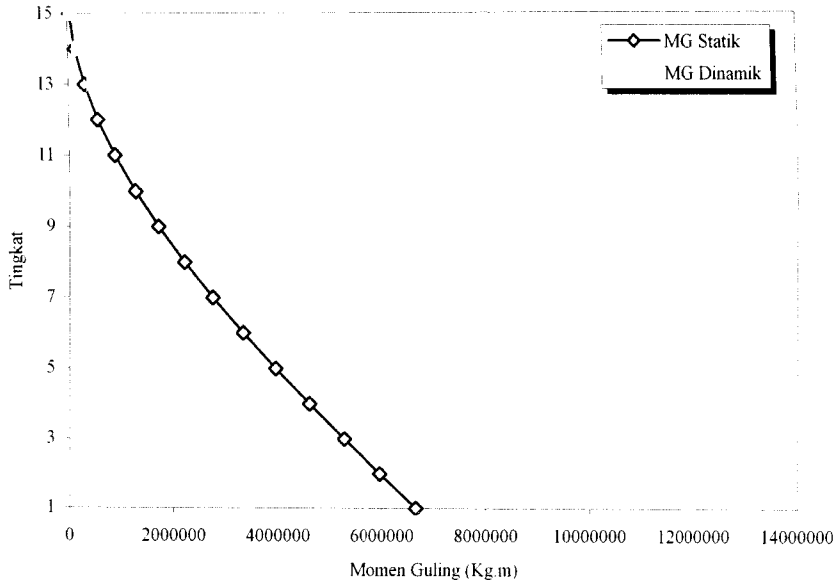
Setback 6



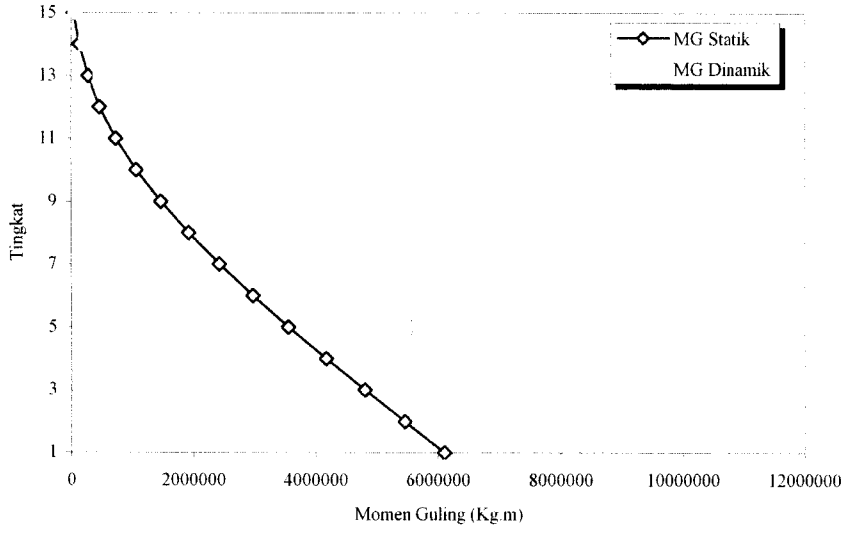
Gambar 5.192 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro



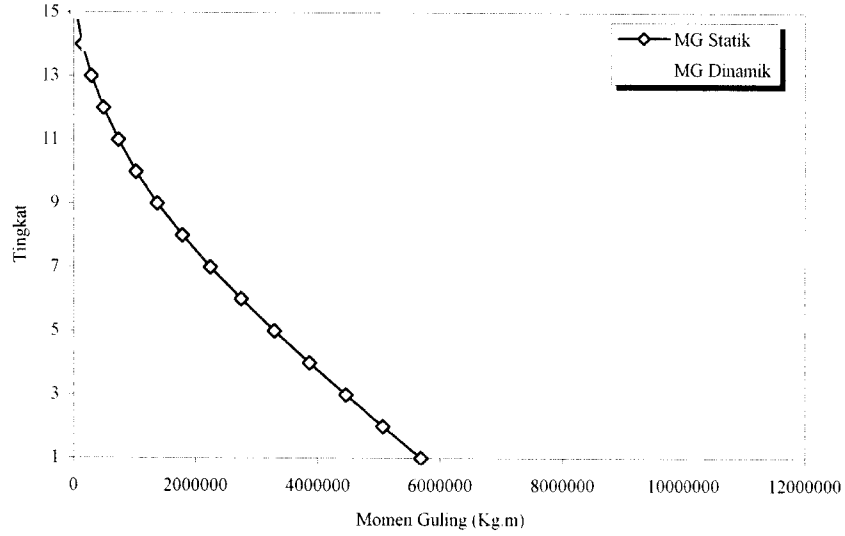
Tipikal



Setback 1

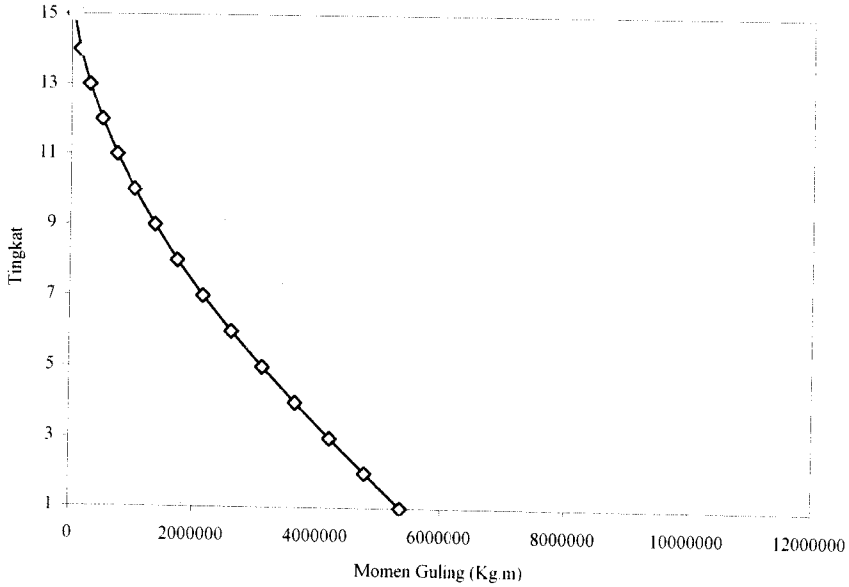


Setback 2

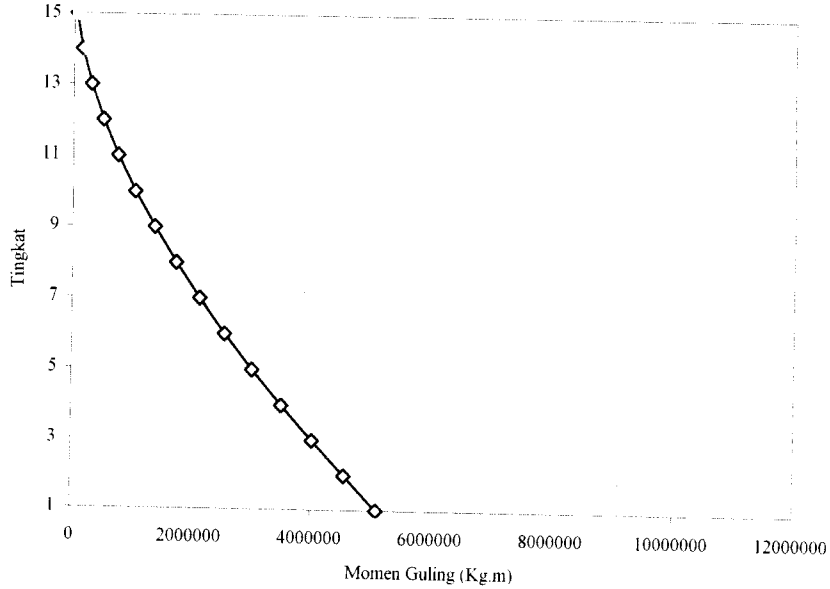


Setback 3

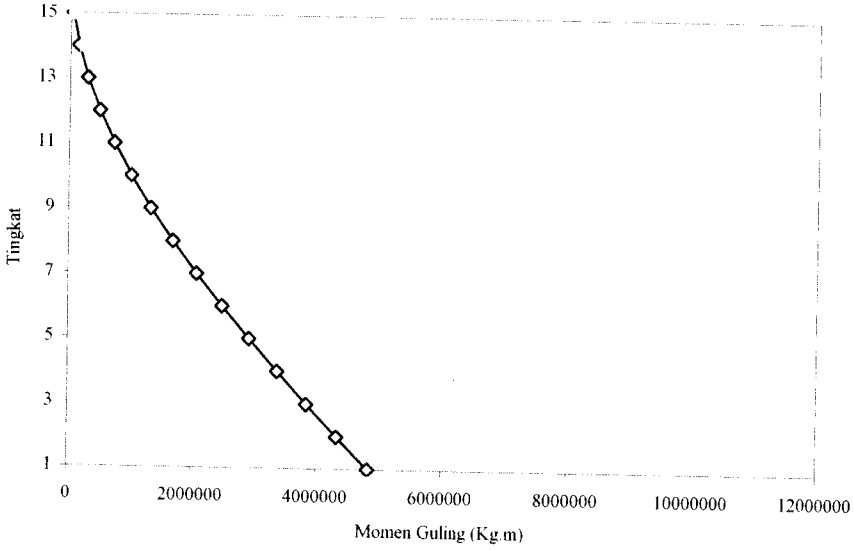
Gambar 5.193 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy



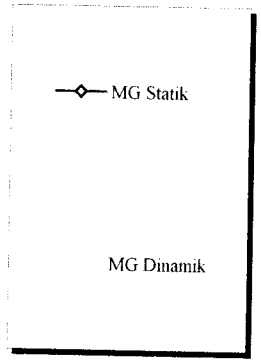
Setback 4



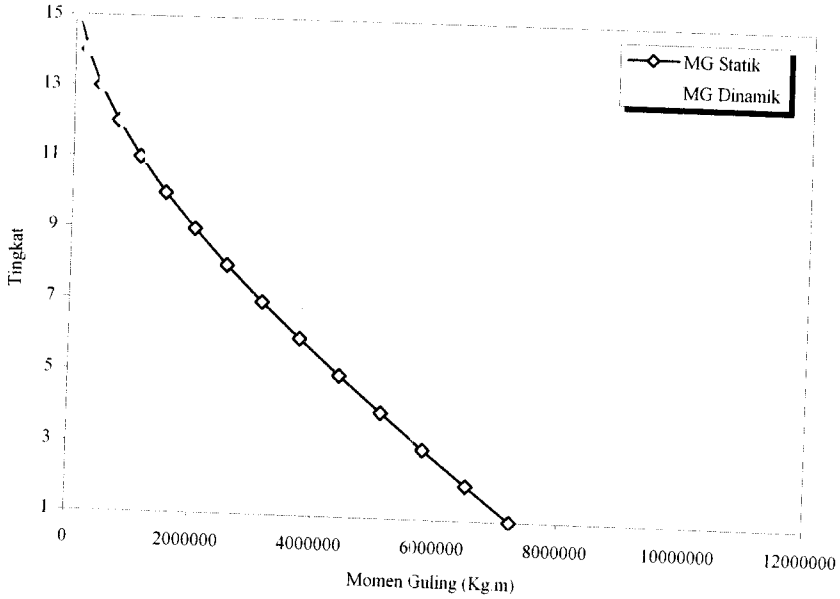
Setback 5



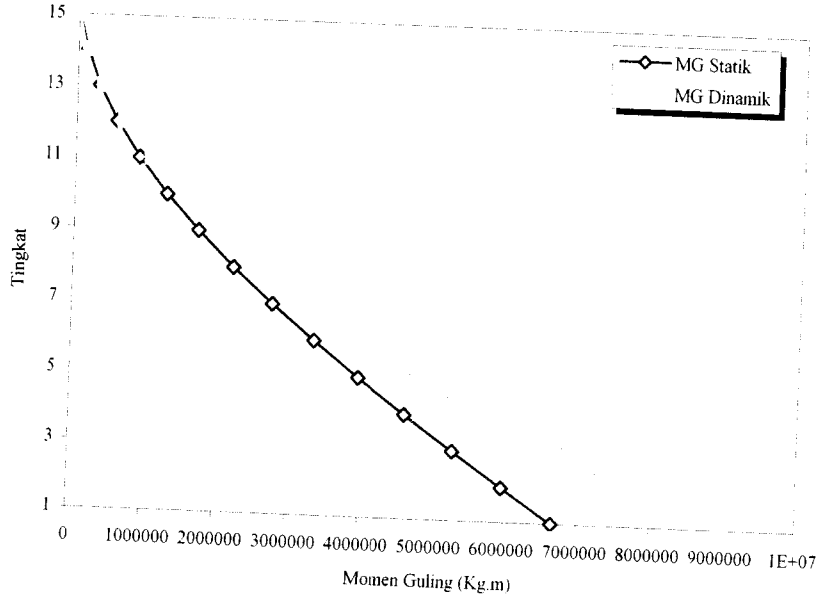
Setback 6



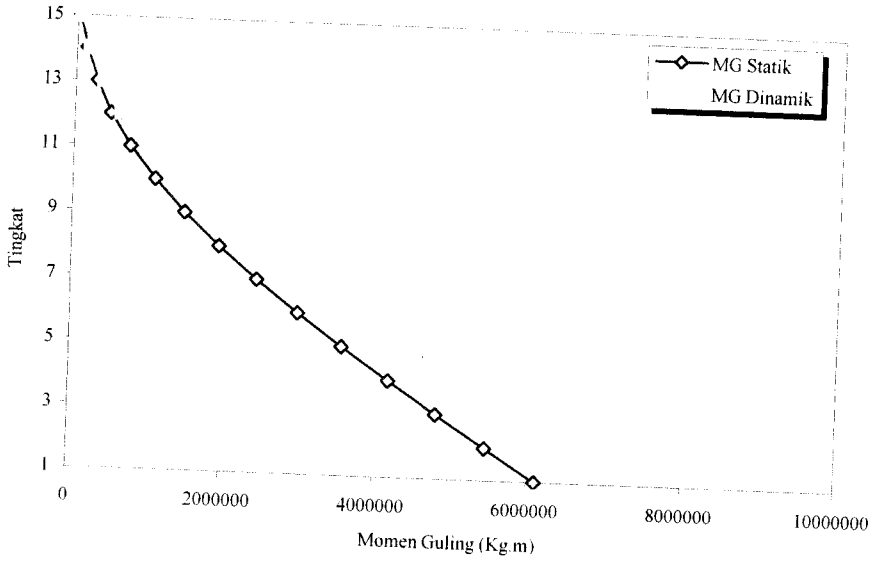
Gambar 5.193 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy



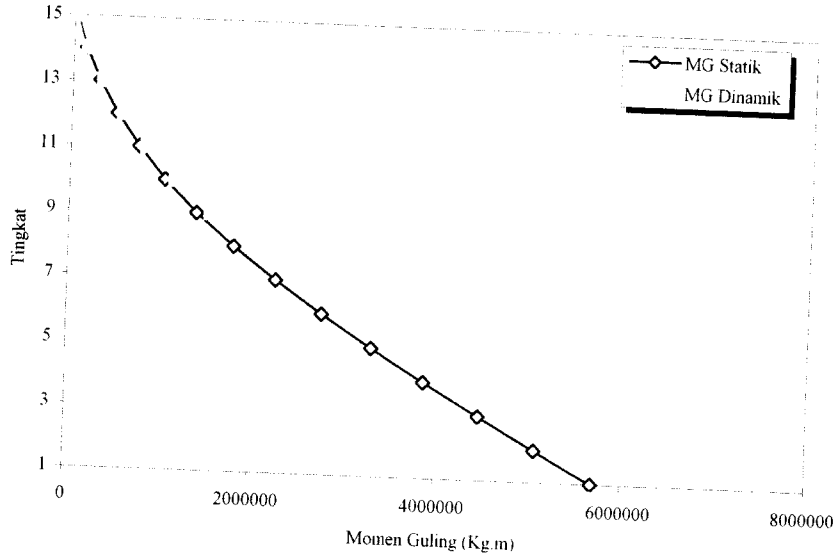
Tipikal



Setback 1

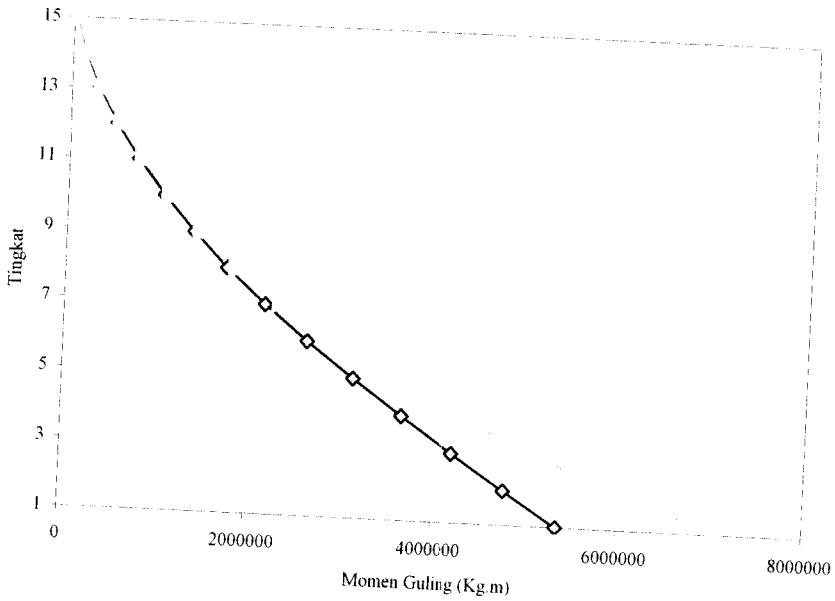


Setback 2

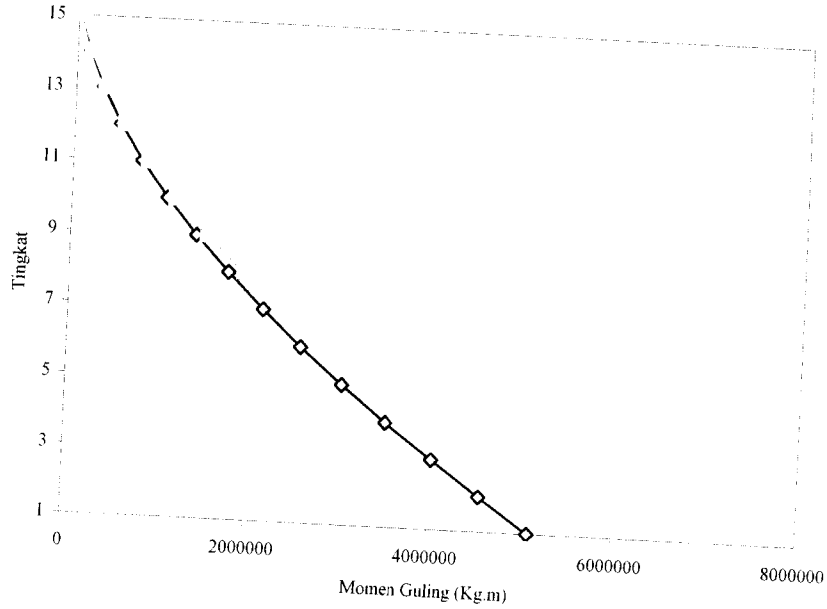


Setback 3

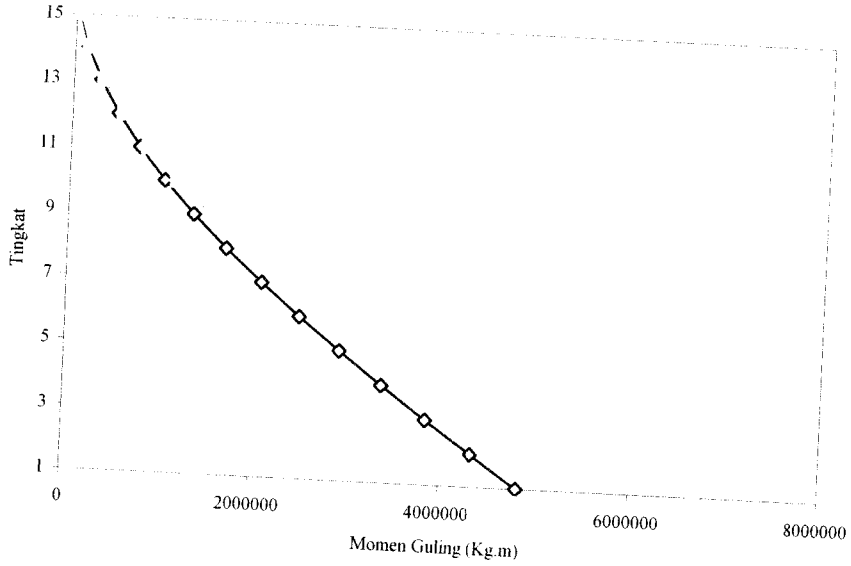
Gambar 5.194 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna



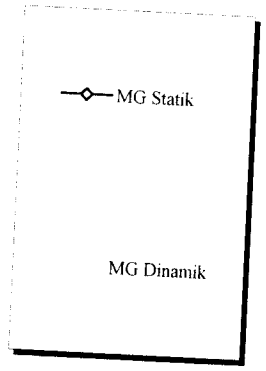
Setback 4



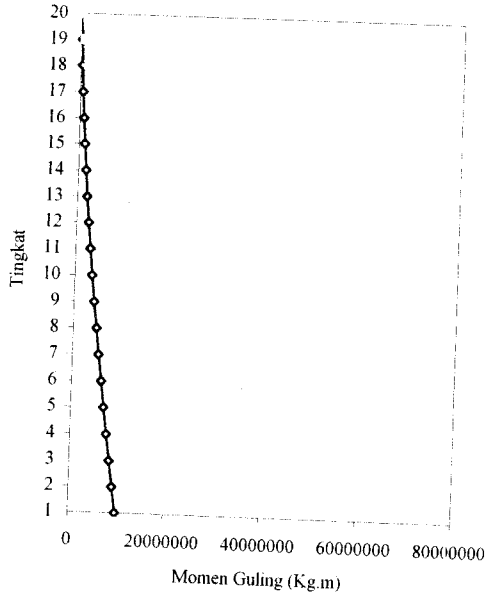
Setback 5



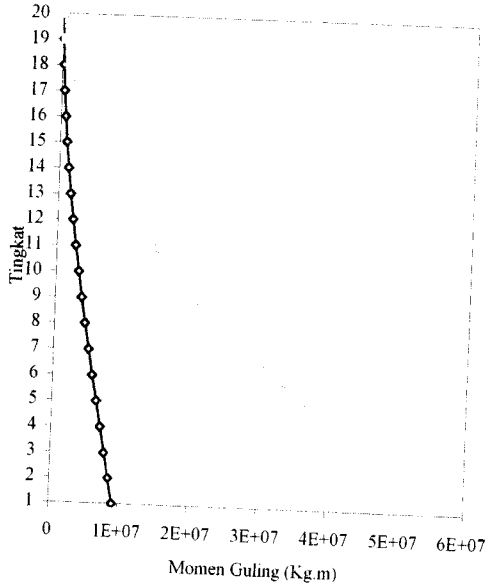
Setback 6



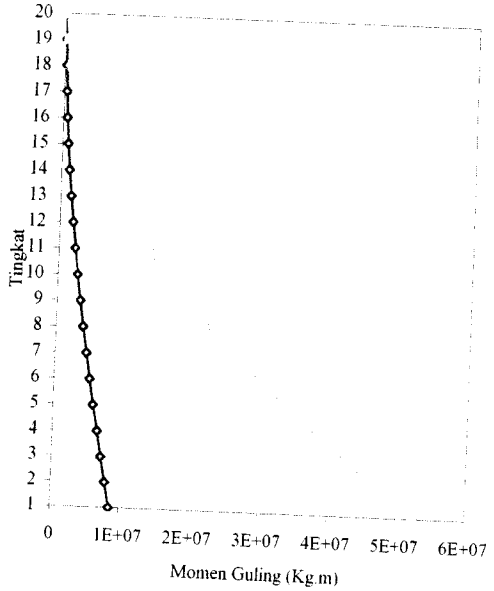
Gambar 5.194 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna



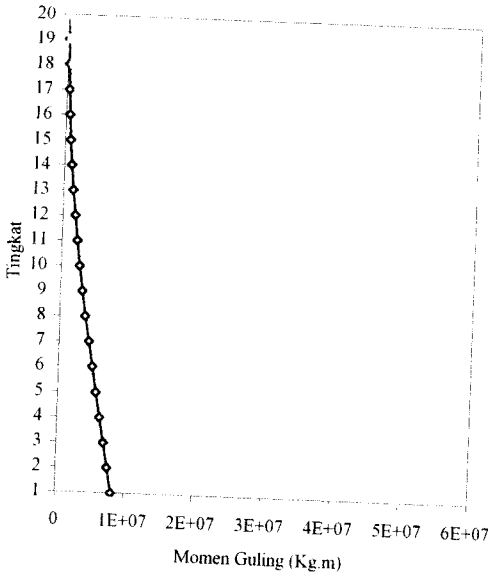
Tipikal



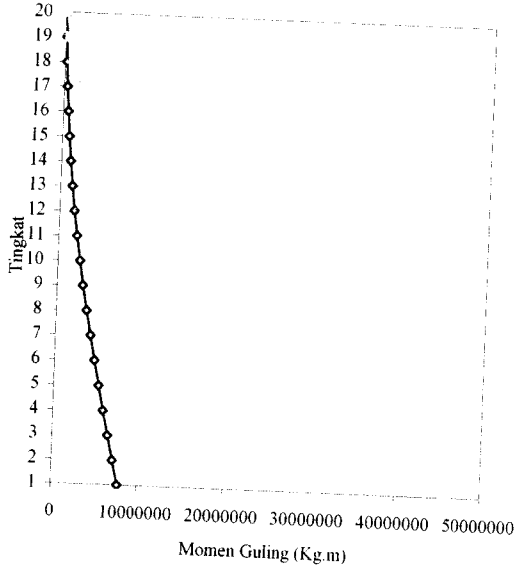
Setback 1



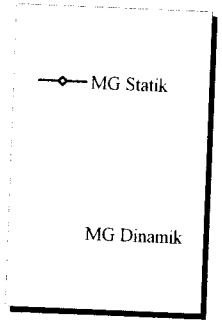
Setback 2



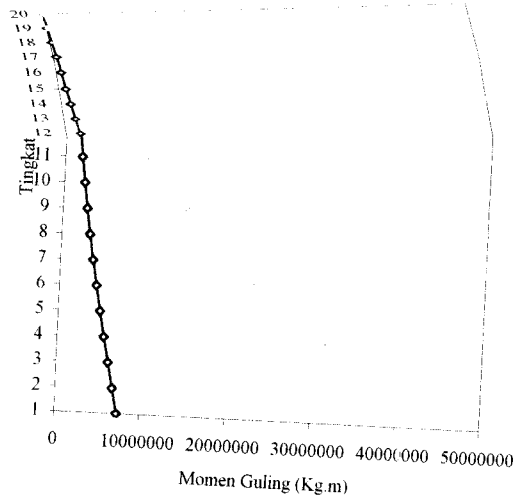
Setback 3



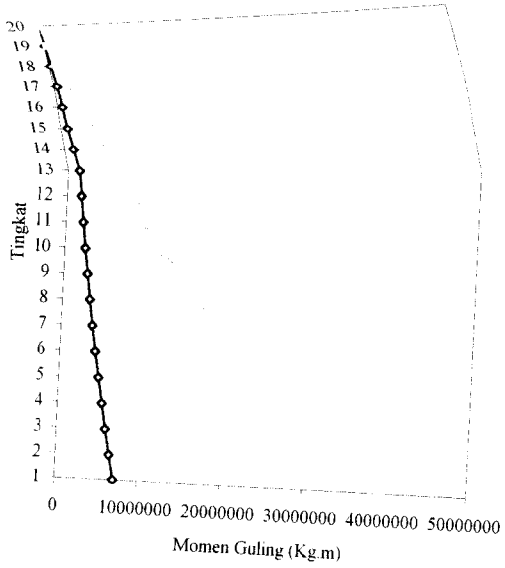
Setback 4



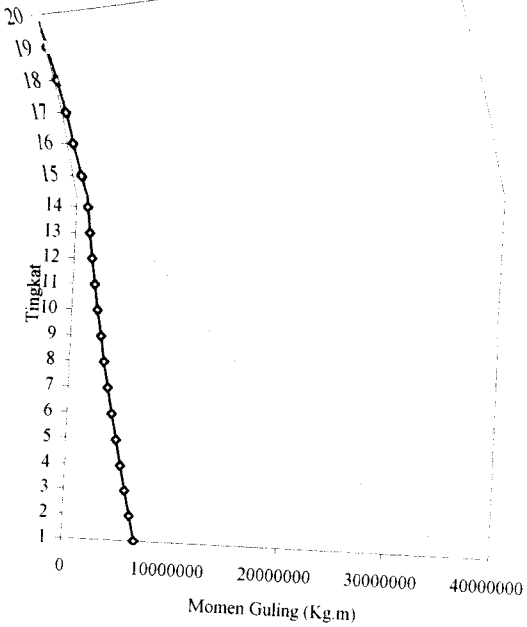
Gambar 5.195 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest



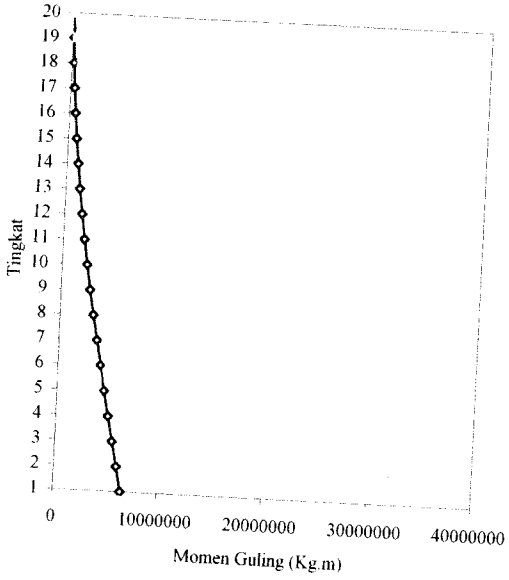
Setback 5



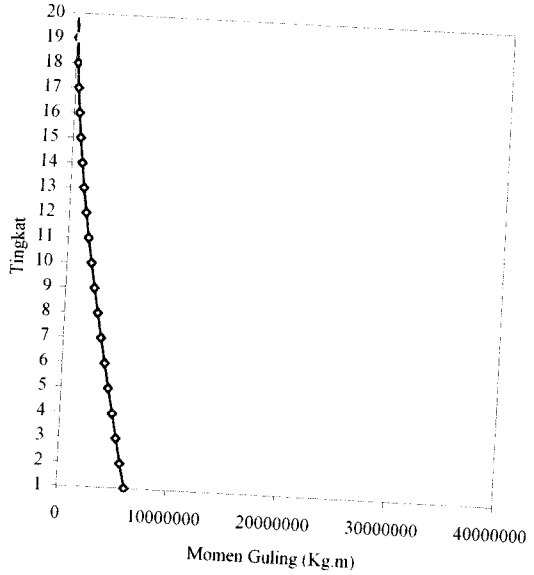
Setback 6



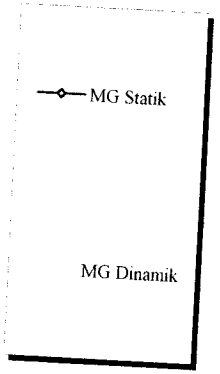
Setback 7



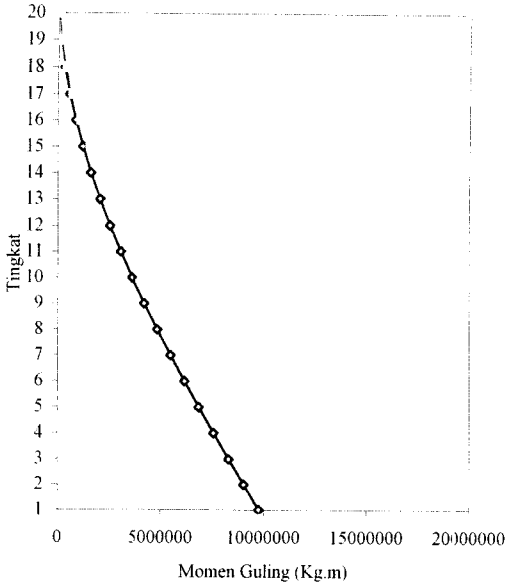
Setback 8



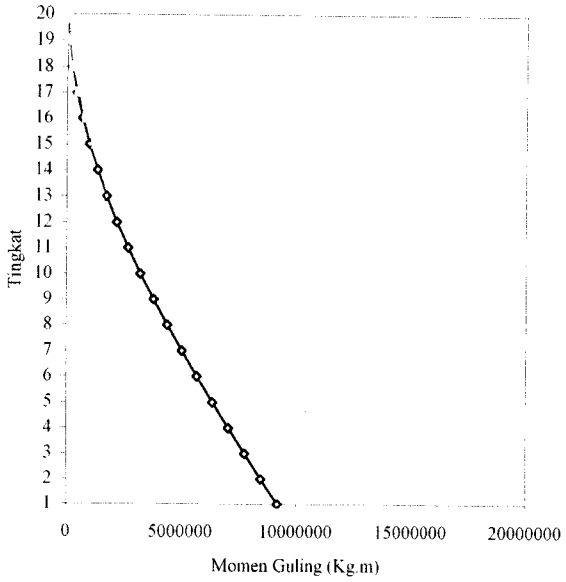
Setback 9



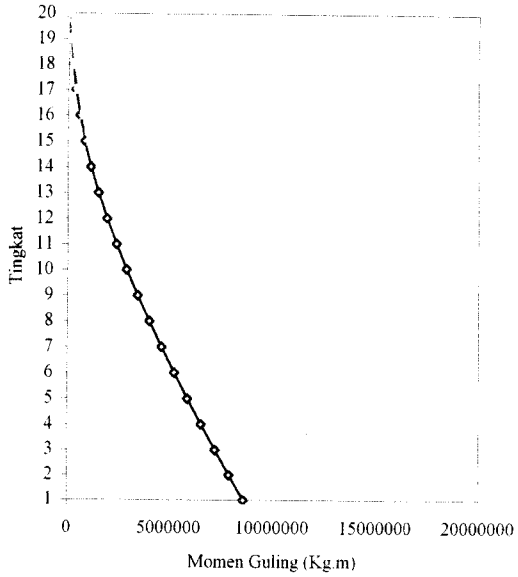
Gambar 5.195 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest



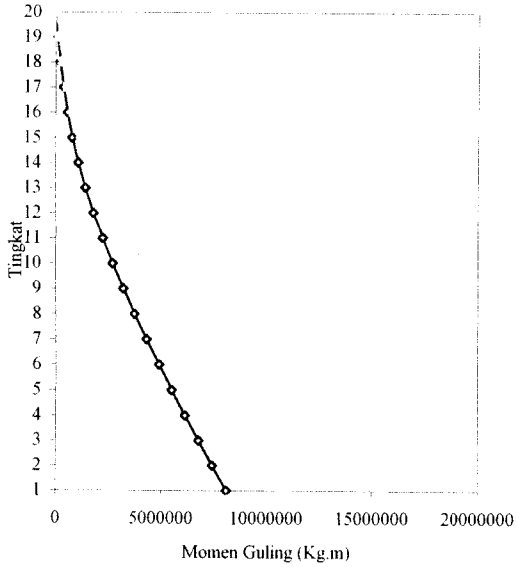
Tipikal



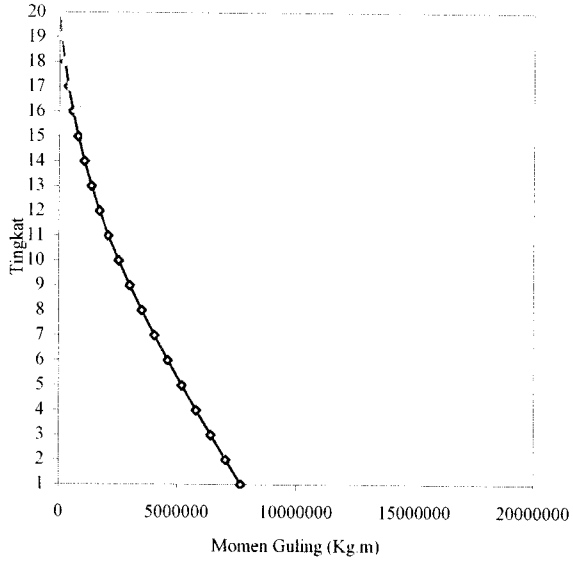
Setback 1



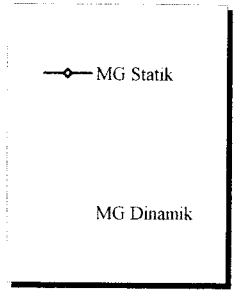
Setback 2



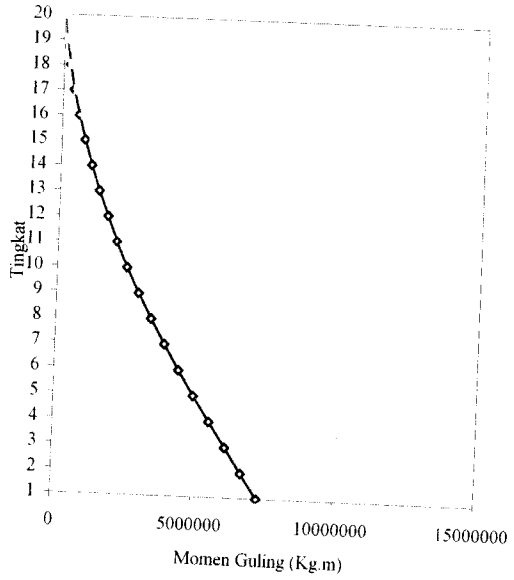
Setback 3



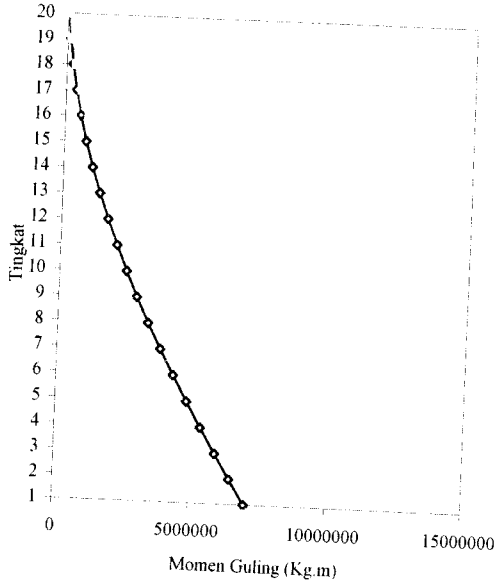
Setback 4



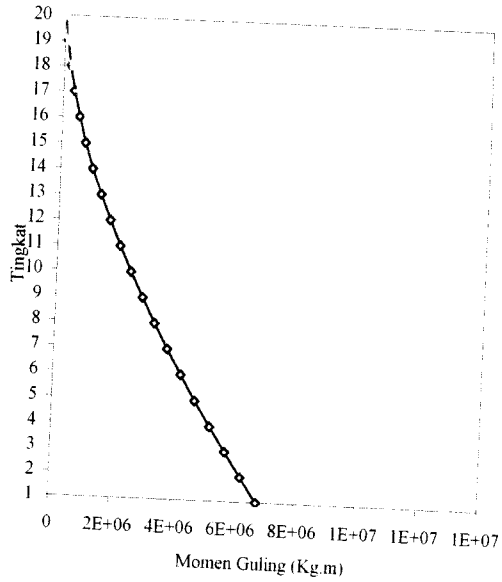
Gambar 5.196 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro



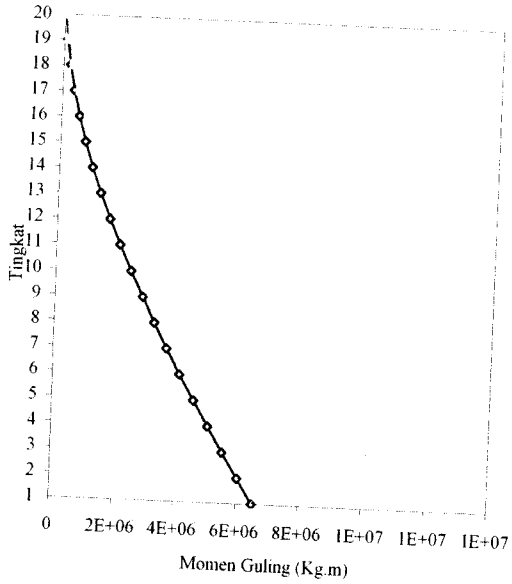
Setback 5



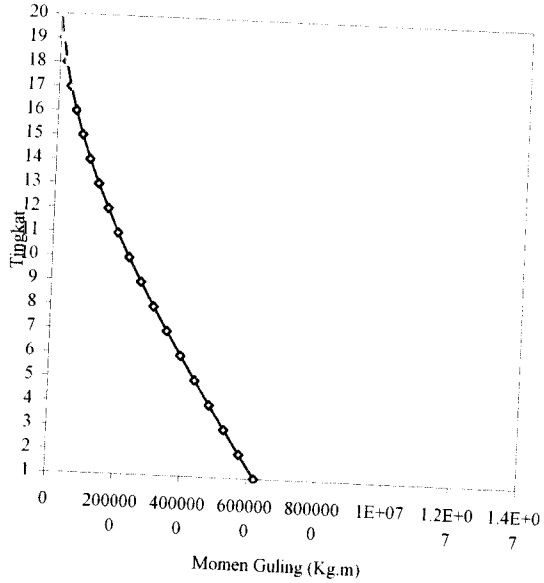
Setback 6



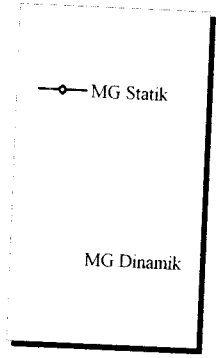
Setback 7



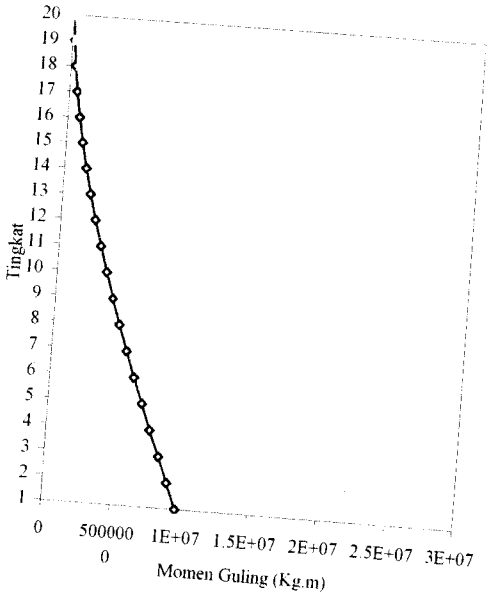
Setback 8



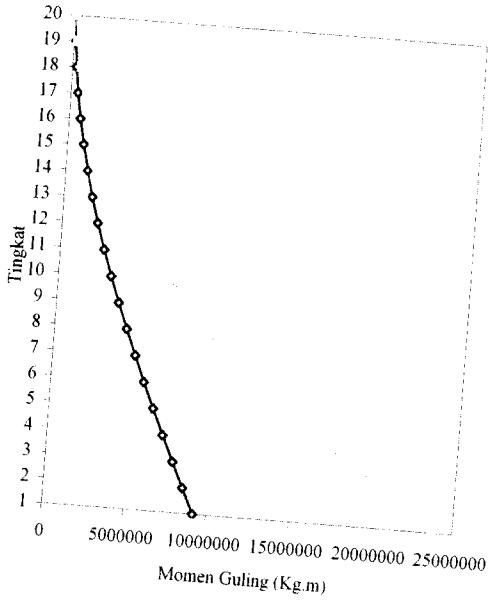
Setback 9



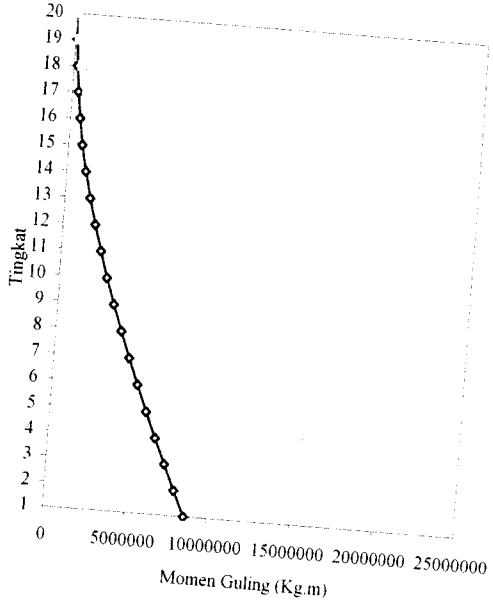
Gambar 5.196 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro



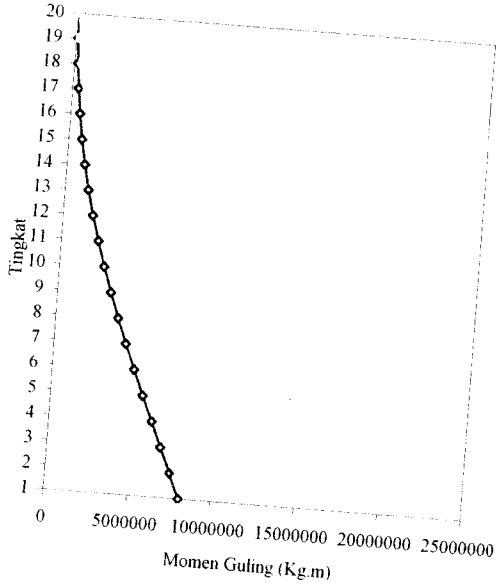
Tipikal



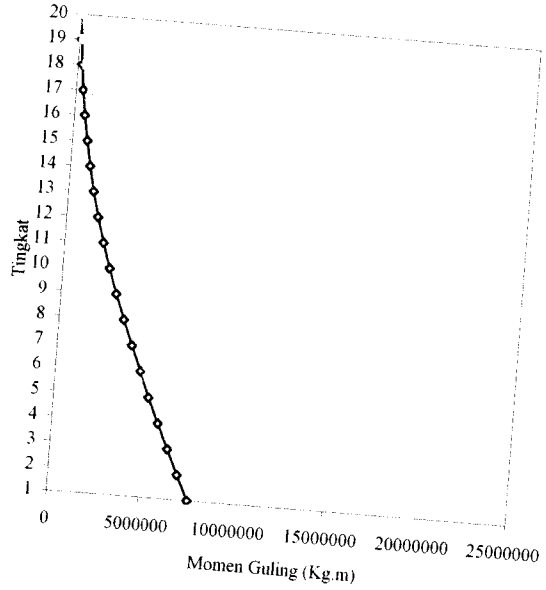
Setback 1



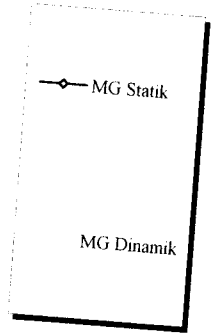
Setback 2



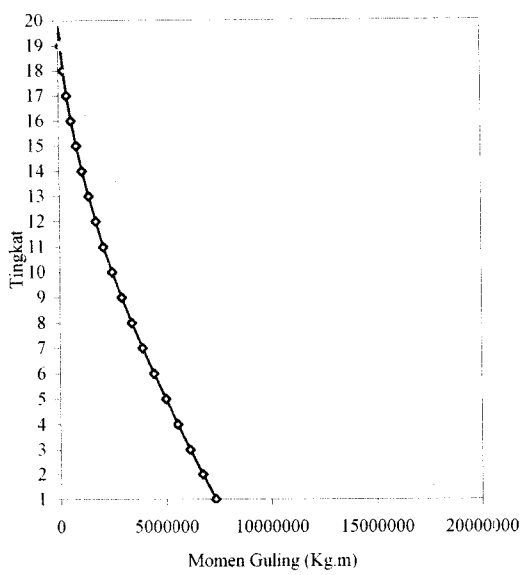
Setback 3



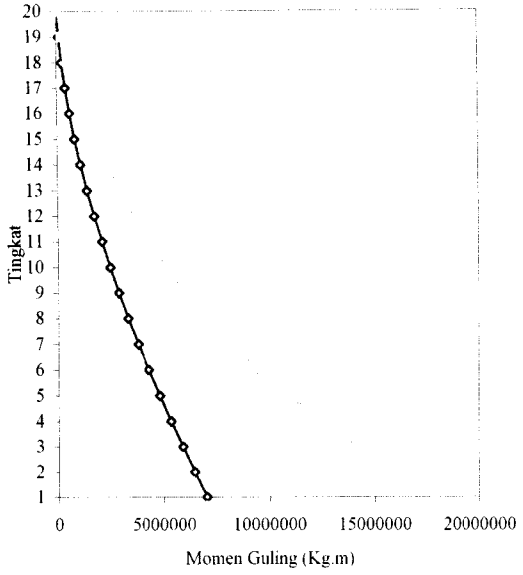
Setback 4



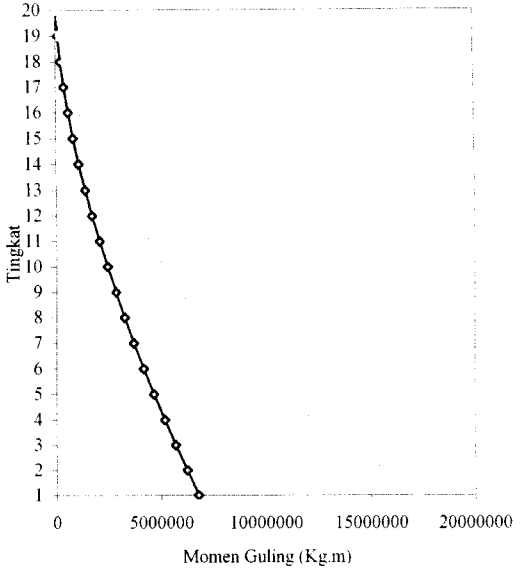
Gambar 5.197 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy



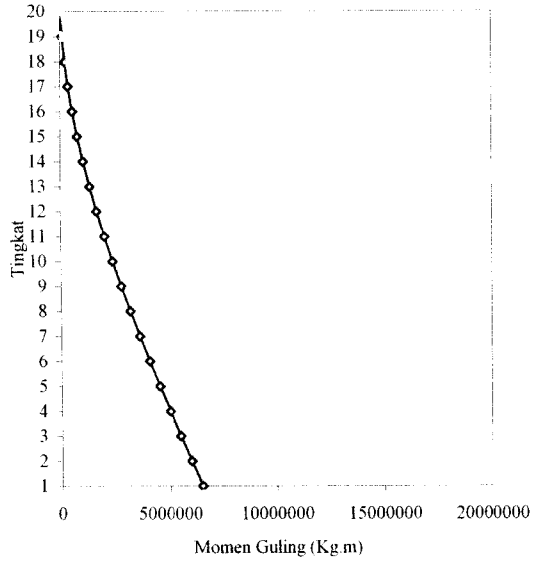
Setback 5



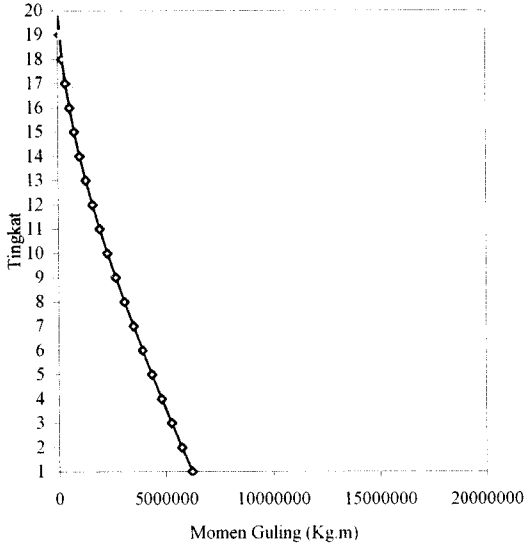
Setback 6



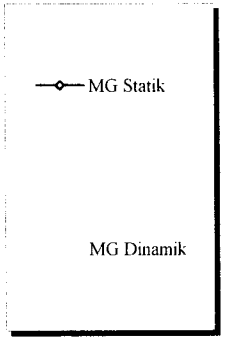
Setback 7



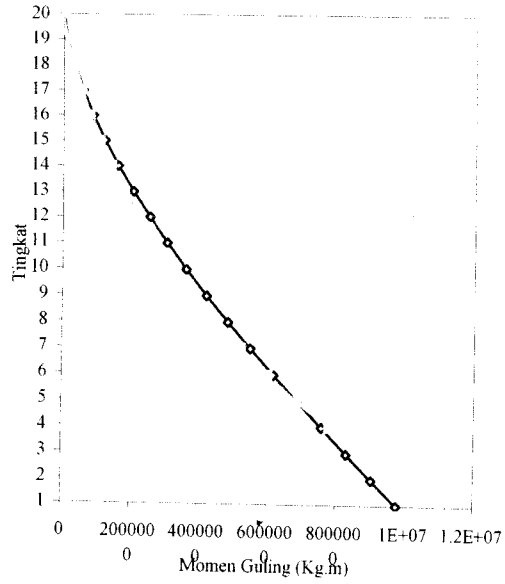
Setback 8



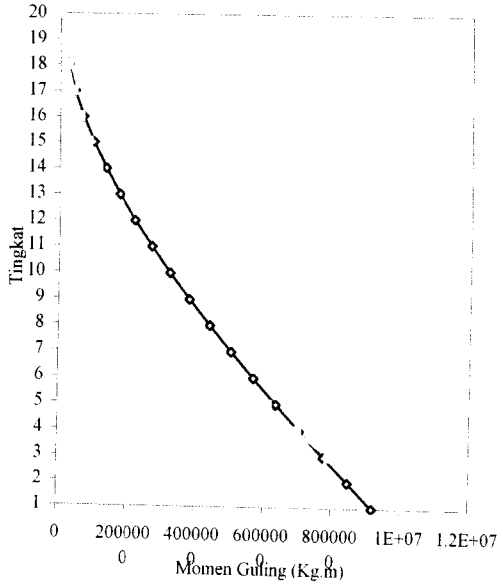
Setback 9



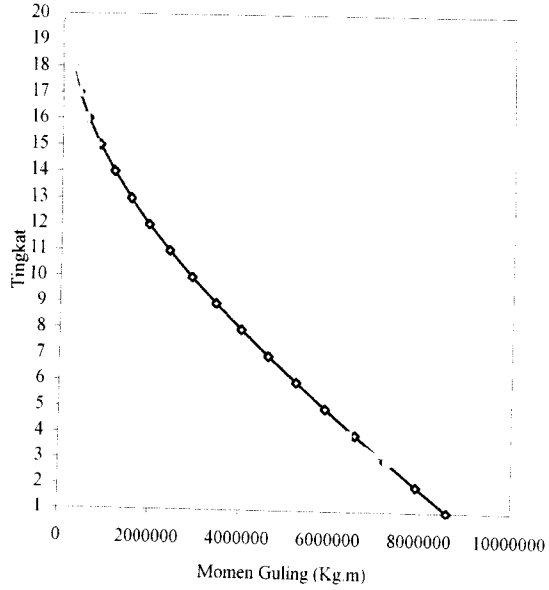
Gambar 5.197 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy



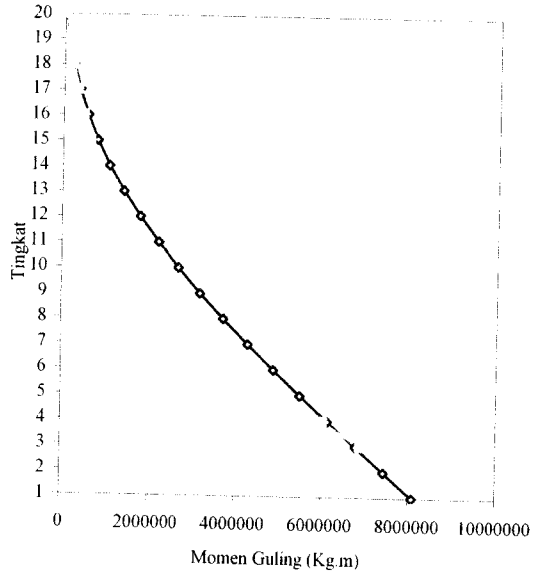
Tipikal



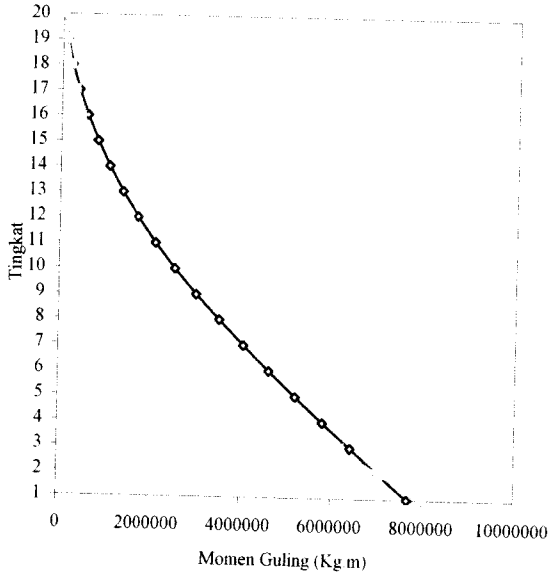
Setback 1



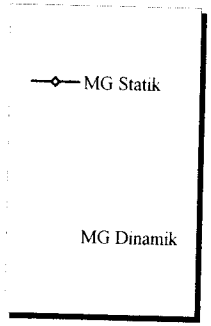
Setback 2



Setback 3



Setback 4



Gambar 5.198 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

5.4.8 Fundamental Periode

Periode masing-masing struktur dapat dilihat sebagai berikut:

Periode Struktur Tingkat 7

	Tipikal	Setback 1	Setback 2	Setback 3
λ_1	0.30204	0.35988	0.44706	0.48048
ω_1	8.551538	9.334496	10.40387	9.647053
T_1	0.734743	0.673114	0.603927	0.651306

Periode Struktur Tingkat 10

	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
λ_1	0.14358	0.16362	0.192	0.21882	0.2355
ω_1	6.312982	6.73916	7.300258	7.793474	7.231494
T_1	0.995279	0.932339	0.860679	0.80621	0.868863

Periode Struktur Tingkat 15

	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
λ_1	0.06672	0.07272	0.08082	0.08946	0.09822	0.10524	0.10962
ω_1	6.212293	6.48561	6.837279	7.193468	7.53744	7.80215	7.962855
T_1	1.011411	0.968788	0.918959	0.873456	0.833596	0.805314	0.789061

Periode Struktur Tingkat 20

	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
λ_1	0.03726	0.03972	0.04296	0.04638	0.05022	0.05388	0.05718	0.05976	0.06132	0.06198
ω_1	4.298055	4.437671	4.615116	4.795301	4.989866	5.168497	5.324423	5.443219	5.513807	4.958169
T_1	1.461866	1.415873	1.361435	1.310279	1.259188	1.215669	1.180068	1.154313	1.139536	1.267238

Dari hasil grafik fundamental periode pada Gambar 5.199 dan tabel di atas tampak bahwa kecepatan sudut (ω) pada bangunan Tipikal, setback 1, setback 2, setback 3, dan seterusnya semakin membesar, kecuali untuk struktur tingkat 7, 10 dan 20 pada setback yang paling kritis kecepatan sudutnya lebih kecil daripada tipe setback sebelumnya. Sebaliknya, periode (T) pada bangunan Tipikal, setback 1, setback 2, setback 3, dan seterusnya semakin mengecil karena T berbanding terbalik dengan ω.

BAB VI

KESIMPULAN DAN SARAN

6.1 Kesimpulan

Kesimpulan yang dapat kami ambil dari Penelitian **Respon Dinamik Struktur Setback Secara Vertikal** ini adalah sebagai berikut :

1. Nilai Mode Shape dari struktur bangunan tipikal sampai setback yang paling kritis semakin mengecil baik untuk bangunan tingkat 7, 10, 15 dan 20, hal ini dipengaruhi karena adanya pengurangan muka lantai secara vertikal (setback vertikal) dimana secara tidak langsung nilai massa struktur dan kekakuan kolom juga berkurang. Sehingga pada struktur bangunan yang mengalami pengurangan muka lantai secara vertikal (setback vertikal) akan cenderung mempunyai pola goyangan (mode shape) yang semakin mengecil pada mode di atasnya.
2. Bangunan dengan struktur setback vertikal mengalami pengurangan massa dan kekakuan dimana pada umumnya massa pada struktur atas lebih kecil daripada massa yang ada di bawahnya. Nilai simpangan akan semakin besar pada bangunan bertingkat yang semakin tinggi. Hal ini disebabkan karena semakin tinggi suatu bangunan maka akan semakin fleksibel. Sehingga semakin rendah (kaku) suatu bangunan maka nilai

simpangannya akan semakin kecil. Hal semacam ini berlaku juga untuk Simpangan antar Tingkat (*Interstorey Drift*).

3. Pada struktur tipikal sampai setback vertikal yang paling kritis nilai Gaya Horisontal Tingkat semakin mengecil karena terdapat pengurangan nilai massa dan kekakuan kolom. Ini juga berlaku untuk Gaya Geser maupun Momen Guling, karena Gaya Geser merupakan penjumlahan dari gaya horizontal tingkat sedangkan Momen Guling tergantung pada gaya horizontal tingkat dan tinggi tingkat.
4. Dengan adanya setback vertikal akan menimbulkan dampak yang baik karena nilai respon struktur yang dihasilkan yaitu nilai *Simpangan, Simpangan antar tingkat (Interstorey Drift), Gaya Horisontal Tingkat, Gaya Geser* maupun *Momen Guling* menjadi lebih kecil. Maka dalam hal keamanan bangunan berstruktur setback vertikal bisa dikatakan lebih aman jika dibandingkan dengan bangunan berstruktur tipikal.
5. Pada bangunan struktur tingkat 7, 10, 15 dan 20 *Modal Effective* yang mencapai 90% energi gempa berbeda-beda. Pada struktur tingkat 7 tipe tipikal Modal Effective pada mode kedua sudah mencapai 90% energi gempa, tapi pada setback 1, 2 dan 3 *Modal Effective* pada mode ketiga baru mencapai 90% energi gempa. Berbeda pula untuk struktur tingkat 10, 15 dan 20. Ini berarti bahwa *Modal Effective* pada setback vertkal sangat fluktuatif. Hal ini sangat dipengaruhi oleh spektrum respon yang sangat fluktuatif pula, dimana pada periode getar (T) yang semakin besar belum

tentu mempunyai nilai spektrum respon yang semakin besar secara regular maupun mengecil secara regular.

6. Bangunan tinggi/fleksibel yang mempunyai frekuensi rendah jika dibebani oleh gempa berfrekuensi tinggi (Koyna) maka respon yang dihasilkan kecil. Begitu sebaliknya, jika bangunan tinggi dibebani oleh gempa yang mempunyai frekuensi rendah akan menghasilkan respon struktur yang cukup besar. Demikian sebaliknya untuk bangunan tingkat rendah/kaku yang berfrekuensi tinggi.
7. Pada setback vertikal terjadi perbedaan waktu getar antara massa yang lebih kecil pada struktur atas (setback) dengan massa yang lebih besar di bawahnya sehingga dapat mengurangi besarnya Simpangan, Simpangan antar tingkat *(Interstorey Drift)*, Gaya Horisontal Tingkat, Gaya Geser serta Momen Guling yang terjadi atau dapat dikatakan bahwa struktur setback vertikal bisa menjadi faktor yang dapat mengurangi simpangan.
8. Pengaruh dinamik lebih dominan pada bangunan tinggi. Sebaliknya, pada bangunan tingkat rendah perhitungan secara statik akan lebih besar dari dinamik.

6.2 Saran

1. Perlu dilakukan penelitian yang lebih lengkap lagi dengan mengkombinasikan bentuk struktur setback vertikal dengan setback horisontal.
2. Perlu dilakukan penelitian dengan bentuk struktur yang lebih bervarisi agar lebih menguatkan hasil dari penelitian ini.
3. Ukuran kolom yang dipakai pada penelitian ini terlalu besar karena perhitungan dimensi kolom bukan merupakan hasil desain, maka disarankan untuk memakai dimensi kolom dari hasil desain.
4. Dalam penelitian ini mutu beton yang digunakan sangat rendah dan banyak variable yang dianggap konstan contohnya yaitu kekakuan tanah dan rotasi tanah, maka perlu dilakukan penelitian lebih lanjut yang menggunakan mutu beton tinggi serta dengan memperhitungkan variable tersebut sehingga dapat diketahui apakah hasil dari penelitian ini masih berlaku.
5. Perlu diteliti lebih lanjut tentang setback hoirisontal ini pada bangunan diatas 20 tingkat.

LAMPIRAN

Tabel 1 Perbandingan Mode Shape Struktur Tingkat 7

Tingkat	Mode Shape							
	Mode 1				Mode 2			
	Tipikal	Setback 1	Setback 2	Setback 3	Tipikal	Setback 1	Setback 2	Setback 3
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
2	1.94966	1.94002	1.92549	1.91992	1.56196	1.48911	1.47095	1.42814
3	2.80117	2.76368	2.70751	2.68607	1.43971	1.21745	1.16369	1.03958
4	3.51167	3.42157	3.28778	3.32316	0.6868	0.32381	0.24078	0.29433
5	4.0454	3.87424	3.72107	3.80057	-0.36695	-0.73526	-0.75856	-0.55191
6	4.37547	4.09454	3.988	4.09535	-1.25996	-1.4187	-1.51711	-1.20879
7	4.48528	4.16748	4.07664	4.19335	-1.60106	-1.66726	-1.79408	-1.45091

Tingkat	Mode Shape							
	Mode 3				Mode 4			
	Tipikal	Setback 1	Setback 2	Setback 3	Tipikal	Setback 1	Setback 2	Setback 3
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
2	0.86334	0.72578	0.54263	0.43107	-0.00783	-0.15947	-0.52813	-0.6754
3	-0.25465	-0.47324	-0.70556	-0.81418	-0.99994	-0.97457	-0.72108	-0.54384
4	-1.08319	-1.06925	-0.92548	-1.29299	0.01566	0.31488	0.90895	0.46071
5	-0.68051	-0.3028	-0.33615	-0.55464	0.99982	0.92436	1.16021	0.72571
6	0.49568	0.84948	0.54712	0.70583	-0.02349	-0.46229	-0.34843	-0.17423
7	1.10844	1.35231	0.95198	1.30186	-0.99963	-1.24996	-1.32855	-0.79449

Tingkat	Mode Shape							
	Mode 5				Mode 6			
	Tipikal	Setback 1	Setback 2	Setback 3	Tipikal	Setback 1	Setback 2	Setback 3
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
2	-0.87901	-1.03082	-1.40516	-1.83041	-1.57769	-1.72506	-2.94319	-3.47677
3	-0.22735	0.06258	0.97447	2.3504	1.4891	1.97582	7.66243	11.08799
4	1.07885	0.9663	0.03588	1.12941	-0.77165	-1.68334	-19.60878	-10.78315
5	-0.72096	-1.05866	-0.97602	-2.68725	-0.27168	0.92803	11.27809	2.77992
6	-0.44511	0.12498	0.00619	-0.32794	1.20028	0.08243	8.71502	7.20796
7	1.11222	1.08135	0.97575	2.78506	-1.62198	-0.94741	-19.69608	-12.04986

Tingkat	Mode Shape			
	Mode 7			
	Tipikal	Setback 1	Setback 2	Setback 3
0	0	0	0	0
1	1	1	1	1
2	-1.96657	-3.99949	-4.48941	-4.55676
3	2.86739	14.99723	19.15521	19.76409
4	-3.67234	-55.98676	-81.50702	-33.66806
5	4.3545	208.9369	135.1931	45.35177
6	-4.89107	-779.717	-174.5053	-54.04485
7	5.2641	1038.517	195.2641	59.17379

ıel 2 Perbandingan Mode Shape Struktur Tingkat 10

ıgkat	Mode Shape									
	Mode 1					Mode 2				
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	1.97607	1.97273	1.968	1.96353	1.96075	1.79061	1.76345	1.74798	1.74211	1.69102
3	2.90333	2.88993	2.87102	2.85314	2.84209	2.1943	2.0964	2.04135	2.02057	1.84285
4	3.75888	3.72579	3.67923	3.63537	3.65436	2.12385	1.9176	1.80381	1.76129	1.64211
5	4.5216	4.45678	4.36595	4.28075	4.37782	1.59447	1.27067	1.09715	1.03326	1.12721
6	5.1761	5.06622	4.91297	4.83246	4.99818	0.73122	0.32316	0.11398	0.14535	0.40335
7	5.70672	5.53748	5.30277	5.2784	5.50085	-0.28513	-0.70079	-0.89792	-0.76505	-0.3953
8	6.10076	5.85771	5.59078	5.60883	5.87397	-1.24178	-1.55897	-1.77404	-1.55708	-1.12066
9	6.34879	6.01818	5.77144	5.81651	6.10877	-1.93842	-2.04837	-2.3819	-2.10816	-1.63826
10	6.44487	6.08015	5.8413	5.8969	6.19972	-2.22917	-2.24703	-2.62958	-2.33303	-1.85215

ıgkat	Mode Shape									
	Mode 3					Mode 4				
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	1.43369	1.3702	1.35444	1.23584	1.20894	0.94457	0.85397	0.75172	0.66634	0.45955
3	1.02951	0.84986	0.80657	0.49712	0.43098	-0.13965	-0.30202	-0.46492	-0.58439	-0.81144
4	0.02368	-0.22283	-0.27863	-0.63362	-0.55809	-1.07177	-1.10082	-1.08265	-1.03084	-1.30847
5	-0.996	-1.1507	-1.17821	-1.2647	-1.2738	-0.83656	-0.59772	-0.30573	-0.05855	-0.55746
6	-1.45163	-1.35385	-1.31719	-1.31593	-1.38492	0.28158	0.59039	0.85283	0.96058	0.70879
7	-1.08519	-0.70435	-0.60585	-0.76381	-0.83871	1.10253	1.10189	0.94681	1.21107	1.31993
8	-0.10419	0.38875	0.34016	0.13851	0.10558	0.75984	0.35059	0.33166	0.49246	0.7111
9	0.93581	1.23702	1.15442	0.97733	0.99975	-0.3848	-0.8025	-0.5319	-0.62021	-0.55498
10	1.44585	1.61784	1.52152	1.36804	1.41941	-1.12332	-1.40377	-0.99708	-1.23659	-1.30811

ıgkat	Mode Shape									
	Mode 5					Mode 6				
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	0.36588	0.26152	0.03465	-0.15414	-0.39262	-0.24221	-0.35329	-0.58113	-0.82799	-1.08152
3	-0.88524	-0.94614	-1.00098	-0.96563	-0.81583	-0.92398	-0.84861	-0.61435	-0.23959	0.2762
4	-0.64354	-0.45638	-0.00644	0.36946	-0.03042	0.53222	0.71693	0.98882	1.04803	1.10692
5	0.68339	0.85215	1.00116	0.88324	0.80005	0.75693	0.5414	-0.04187	-0.72289	-0.17437
6	0.89358	0.67923	0.04113	0.25545	0.482	-0.71555	-0.9082	-0.96449	-1.26721	-1.13327
7	-0.35644	-0.67452	-0.99973	-0.70251	-0.528	-0.58362	-0.22054	0.60236	0.33866	0.00315
8	-1.024	-0.85563	-0.8617	-0.75249	-0.78001	0.85691	0.98612	1.23635	1.3699	1.13375
9	-0.01823	0.45075	0.29246	0.17011	0.08773	0.37607	-0.12784	-0.04436	0.0767	0.16815
10	1.01733	1.28696	1.10175	0.87284	0.82953	-0.94799	-1.06129	-1.25637	-1.34664	-1.10834

el 2 Perbandingan Mode Shape Struktur Tingkat 10

gkat	Mode Shape									
	Mode 7					Mode 8				
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
)	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	-0.81427	-0.95284	-1.19108	-1.47273	-2.06823	-1.31192	-1.46089	-1.6876	-2.3069	-3.09531
3	-0.26372	-0.00216	0.54016	1.33241	3.54651	0.86003	1.29581	2.0469	4.6394	9.085
4	1.05273	0.9551	0.49261	-0.63744	0.22774	0.09259	-0.57549	-2.00801	-9.03449	-7.39696
5	-0.68818	-0.99804	-1.17714	-0.32286	-3.66469	-0.9913	-0.39141	1.57849	17.4461	-0.54228
6	-0.49237	-0.00413	0.90945	0.66445	1.38815	1.20791	1.1473	-0.65584	-1.1566	7.97021
7	1.0891	1.00198	0.09392	0.26729	3.05261	-0.59339	-1.28467	-0.4717	-16.77047	-7.88366
8	-0.39445	-0.95059	-0.90143	-0.6868	-2.73416	-0.42943	0.72946	0.75611	10.95303	0.36421
9	-0.76791	-0.09622	-0.17086	-0.20985	-1.84702	1.15677	0.21902	0.31098	10.3723	7.49862
10	1.01974	0.92863	0.88685	0.70435	3.54858	-1.08816	-0.74622	-0.82221	-17.01203	-8.29161

igkat	Mode Shape									
	Mode 9					Mode 10				
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	-1.65671	-1.81488	-2.68547	-3.58883	-3.93665	-1.90524	-3.46004	-4.20051	-4.41338	-4.4867
3	1.93835	2.51509	6.61329	12.5201	15.24394	2.86776	11.59078	17.479	19.38561	20.05973
4	-1.78113	-3.05641	-16.06386	-43.57935	-21.60925	-3.91649	-38.70633	-72.70455	-85.12271	-35.96026
5	1.22067	3.40462	38.92879	151.6581	20.96902	5.08295	129.1767	302.3672	373.7747	52.44709
6	-0.24117	-3.12255	-88.47166	-161.6488	-11.14332	-5.76768	-408.6458	-1197.672	-605.7043	-63.26494
7	-0.82113	2.26243	198.6448	67.09023	-3.56364	5.90583	1285.954	4729.568	745.7158	67.24404
8	1.60153	-0.98348	-72.66508	70.8604	16.70951	-5.48425	-4044.655	-6941.257	-772.5629	-63.95434
9	-1.83214	-0.47753	-139.7005	-162.9814	-22.53578	4.54292	12720.83	7215.355	682.1731	53.7514
10	1.4338	1.12146	185.9875	149.6916	18.49023	-3.17105	-12210.38	-5475.383	-488.2642	-37.73806

Tabel 3 Perbandingan Mode Shape Struktur Tingkat 15

Tingkat	Mode Shape													
	Mode 5							Mode 6						
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1.18857	1.13466	1.10904	1.02089	0.98156	0.9025	0.7915	0.8259	0.76306	0.6922	0.63611	0.49956	0.40603	0.31839
3	0.36447	0.23833	0.18053	-0.00778	-0.08655	-0.23504	-0.42138	-0.36639	-0.46496	-0.56615	-0.63876	-0.78793	-0.86752	-0.92541
4	-0.77018	-0.87455	-0.91687	-1.02846	-1.0621	-1.10172	-1.09954	-1.10699	-1.08908	-1.04704	-0.99886	-0.83404	-0.68909	-0.53519
5	-1.24861	-1.19279	-1.1565	-0.99179	-0.90186	-0.69878	-0.94054	-0.48285	-0.29868	-0.09011	0.07152	0.43388	0.64267	0.42204
6	-0.66321	-0.42722	-0.31419	0.06452	0.22282	0.50944	-0.06544	0.73656	0.87965	0.99056	1.03947	1.01823	0.89879	0.93214
7	0.46033	0.70804	0.80805	1.05766	1.12057	1.38219	0.85712	1.09118	0.9699	0.77577	0.58971	0.07479	0.29532	0.50174
8	1.21036	1.2306	1.21035	1.01523	0.87709	1.34477	1.15818	0.16465	-0.13956	-0.45358	-0.66435	-0.98087	-0.59059	-0.43489
9	0.97826	0.68827	0.53427	-0.02121	0.09765	0.42182	0.61944	-0.95519	-1.0764	-1.08974	-1.01231	-1.15348	-0.91167	-0.93273
10	-0.04761	-0.44965	-0.61783	-1.03689	-0.74146	-0.7789	-0.36845	-0.95354	-0.68179	-0.30073	0.02041	-0.28766	-0.36084	-0.48948
11	-1.03712	-1.22118	-1.25159	-1.47898	-1.15393	-1.49664	-1.10477	0.10232	0.50694	0.85862	1.0374	0.82202	0.51495	0.41882
12	-1.23418	-0.99764	-0.8353	-1.10293	-0.90243	-1.28636	-1.08677	1.04506	1.1052	0.9606	1.255	1.23485	0.92699	0.92921
13	-0.48825	0.03882	0.00146	-0.11676	-0.13167	-0.27845	-0.32674	0.83241	0.41618	0.3528	0.50553	0.60087	0.50422	0.55677
14	0.63074	1.04364	0.83749	0.934	0.71485	0.90212	0.65639	-0.30054	-0.75759	-0.51567	-0.63348	-0.54248	-0.37264	-0.34464
15	1.2678	1.53823	1.25194	1.46809	1.15005	1.52332	1.19134	-1.10122	-1.40192	-1.00313	-1.28436	-1.22596	-0.91391	-0.91862
Tingkat	Mode Shape													
	Mode 7							Mode 8						
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	0.42794	0.35897	0.23609	0.17102	0.07068	-0.08075	-0.24803	0.02586	-0.04821	-0.21719	-0.35654	-0.49993	-0.6659	-0.89777
3	-0.85052	-0.90061	-0.96509	-0.9864	-1.00182	-0.98507	-0.91059	-1.00189	-0.99274	-0.92874	-0.83085	-0.68755	-0.46777	-0.06388
4	-0.72502	-0.60834	-0.37878	-0.24947	-0.04481	0.26282	0.57628	0.04717	0.19778	0.52191	0.75071	0.92964	1.03977	0.96437
5	0.59727	0.73217	0.90909	0.96656	1.00298	0.9365	1.24697	0.99845	0.96294	0.7575	0.47471	0.10655	-0.36328	0.23203
6	0.93365	0.81106	0.51319	0.32633	0.0189	-0.43592	0.15159	-0.11995	-0.34287	-0.77045	-0.97592	-0.99623	-0.74942	-0.92392
7	-0.19773	-0.44101	-0.78793	-0.91075	-1.00164	-1.26411	-1.14826	-1.00155	-0.94641	-0.59017	-0.12676	0.3915	0.06317	-0.47348
8	-1.01827	-0.96938	-0.69921	-0.48209	-0.0897	-0.51413	-0.89932	0.09405	0.38849	0.89863	1.02111	0.80051	0.77471	0.80017
9	-0.23803	0.09303	0.62286	0.8283	0.92608	0.87772	0.56264	1.00398	0.92768	0.395	-0.2373	0.00879	0.24707	0.6826
10	0.91641	1.00277	0.84626	0.62375	0.86984	1.17378	1.2657	-0.06808	-0.43322	-0.98441	-0.93651	-0.79611	-0.67577	-0.62178
11	0.71427	0.36297	-0.33595	-0.22535	-0.13455	0.08996	0.3612	-1.01358	-0.95858	-0.30858	-0.38884	-0.47657	-0.58077	-0.90819
12	-0.54521	-0.83771	-0.96016	-0.84159	-0.99228	-1.09962	-1.00206	-0.07491	0.36484	1.0115	0.67653	0.51609	0.38898	0.29229
13	-0.99761	-0.74392	-0.62749	-0.58817	-0.76839	-0.9965	-1.09261	1.00302	0.9846	1.0645	0.84116	0.77982	0.77285	1.01423
14	0.02677	0.49942	0.33052	0.27303	0.29307	0.27809	0.20457	0.21641	-0.29462	-0.21598	-0.11413	-0.05788	-0.00734	0.07569
15	1.01152	1.27972	0.95914	0.85209	1.03507	1.22576	1.24192	-0.97249	-1.2329	-1.2259	-0.91747	-0.81383	-0.77648	-0.98677

Tabel 3 Perbandingan Mode Shape Struktur Tingkat 15

Tingkat	Mode Shape													
	Mode 9							Mode 10						
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	-0.39903	-0.47415	-0.62263	-0.79223	-0.95115	-1.10852	-1.29824	-0.78652	-0.87372	-1.00617	-1.15072	-1.33311	-1.53816	-1.92991
3	-0.79286	-0.7165	-0.53065	-0.26171	0.0451	0.40119	0.89962	-0.27175	-0.11101	0.16369	0.50551	0.99946	1.63818	3.10394
4	0.8105	0.90255	1.02264	1.03613	0.9016	0.60141	-0.01811	1.03814	0.98667	0.81686	0.48934	-0.16592	-1.27156	-4.67062
5	0.37225	0.17685	-0.24024	-0.70386	-1.03575	-1.16138	-0.89821	-0.68947	-0.8929	-1.10843	-1.14573	-0.7506	0.54273	-0.88121
6	-1.00375	-1.0083	-0.84155	-0.38019	0.23646	0.86661	0.08812	-0.39974	-0.07816	0.46509	1.00965	1.29171	0.34069	5.08998
7	0.0283	0.30123	0.76421	1.00506	0.81084	1.27828	0.90007	1.00388	0.9612	0.64046	-0.01609	-0.9714	-0.58462	-0.94073
8	0.99243	0.86547	0.36573	-0.41606	-1.00769	-0.69418	-0.06916	-0.38983	-0.76165	-1.10951	-0.99113	0.00328	-0.26882	-4.75324
9	-0.42427	-0.71159	-0.99192	-0.67545	-1.04192	-1.37192	-0.90152	-0.69727	-0.29572	0.4759	1.15661	0.97139	0.61763	2.64215
10	-0.82316	-0.52807	0.25186	0.95116	0.76877	0.50913	0.05018	0.93825	1.02004	0.63068	-0.33979	-0.00315	0.19294	3.80751
11	0.63749	0.88572	0.87365	1.07725	1.29765	1.49601	0.90838	0.1119	-0.42443	-0.99982	-1.23132	-0.97175	-0.61746	-3.48108
12	0.65799	0.236	-0.6621	-0.4961	-0.33711	-0.1445	0.07385	-1.00806	-0.72038	0.1999	0.06903	-0.1104	-0.19353	-3.0405
13	-0.80783	-0.96354	-1.21679	-1.28682	-1.40979	-1.53123	-0.89829	0.51703	0.93303	1.06011	1.2465	0.95885	0.61724	4.15101
14	-0.44887	0.08173	0.03148	-0.04749	-0.13186	-0.22871	-0.19651	0.68549	0.06166	0.11978	0.20507	0.22244	0.19418	2.12588
15	0.92419	1.01276	1.23311	1.26675	1.36592	1.47548	0.87146	-0.9447	-0.90982	-1.02398	-1.20141	-0.93284	-0.61708	-4.61941

Tingkat	Mode Shape													
	Mode 11							Mode 12						
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	-1.13296	-1.23501	-1.39136	-1.51485	-1.67544	-2.07116	-2.68251	-1.45738	-1.53264	-1.65106	-1.79199	-2.26192	-2.96355	-3.3626
3	0.46115	0.72509	1.17192	1.56113	2.11515	3.71149	6.8242	1.37602	1.61982	2.02753	2.55111	4.59899	8.51923	11.20885
4	0.53822	0.22217	-0.43801	-1.12452	-2.25726	-6.37172	-17.22187	-0.78599	-1.23621	-2.06681	-3.26345	-9.12267	-24.40027	-37.33469
5	-1.15528	-1.03543	-0.48818	0.34006	2.08178	10.78296	9.53732	-0.09459	0.4933	1.76238	3.91597	17.9851	69.85599	40.25644
6	0.95172	1.22415	1.20007	0.54958	-1.61339	-18.15739	8.161	0.94021	0.39299	-1.16485	-4.49671	-35.4017	-199.9799	-18.1582
7	0.07702	-0.4764	-1.18155	-1.1726	0.62137	-2.7448	-16.14363	-1.27566	-1.09562	0.16086	4.14205	62.10789	125.7745	-18.14823
8	-1.03899	-0.63579	0.44389	1.22674	0.57232	19.37247	4.9073	0.91892	1.2862	0.89926	-2.92578	-105.1102	76.94153	40.25434
9	1.10011	1.26161	0.56393	-0.68574	-0.73884	-5.83117	12.17117	-0.06357	-0.87567	-1.6456	1.1009	-3.51704	-201.0414	-30.86291
10	-0.20739	-0.92231	-1.22852	-0.18795	-0.42067	-16.7911	-14.75991	-0.82628	0.05589	1.81772	0.95298	107.0727	119.7268	-2.67772
11	-0.90306	-0.29669	0.90224	0.68308	0.77105	10.87077	-2.64308	1.10106	0.80153	-0.96825	-1.23661	-40.18925	104.7294	33.62037
12	1.06541	1.2327	0.15175	0.19762	0.36163	13.5284	16.46609	-0.55622	-1.11911	-0.42539	-0.77688	-90.66802	-203.9741	-31.94321
13	-0.1092	-0.99298	-0.8895	-0.68028	-0.79874	-14.93109	-7.98639	-0.40266	0.68293	0.99495	1.34724	77.19777	59.3545	-0.72669
14	-0.96165	-0.19384	-0.22642	-0.20726	-0.30048	-9.04705	-11.31059	1.0618	0.21321	0.36292	0.58504	59.15705	156.2284	32.69151
15	1.02288	0.95958	0.8705	0.67734	0.82174	17.64642	15.28779	-0.93054	-0.68205	-1.01774	-1.43055	-101.3426	-185.0303	-32.93766

Tabel 4 Perbandingan Mode Shape Struktur Tingkat 20

Tingkat	Mode Shape									
	Mode 1									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	1.99379	1.99338	1.99284	1.99227	1.99163	1.99102	1.99047	1.99004	1.98978	1.98967
3	2.97457	2.97291	2.97071	2.96836	2.96577	2.96326	2.96102	2.95928	2.95822	2.95776
4	3.93596	3.93177	3.92626	3.92034	3.91385	3.90756	3.90193	3.89757	3.89492	3.9066
5	4.87167	4.86331	4.8523	4.8405	4.82755	4.81501	4.8038	4.79512	4.78984	4.83002
6	5.77561	5.76105	5.74188	5.72135	5.69884	5.67706	5.65758	5.64252	5.65392	5.72201
7	6.64188	6.61874	6.58832	6.55574	6.52006	6.48557	6.45475	6.43093	6.48161	6.57676
8	7.46484	7.43044	7.38525	7.3369	7.28401	7.23292	7.18732	7.179	7.26758	7.3887
9	8.2391	8.19049	8.12668	8.05848	7.98397	7.91207	7.84796	7.88204	8.00677	8.15257
10	8.95963	8.89361	8.80705	8.71464	8.61378	8.5166	8.46147	8.53562	8.69443	8.86338
11	9.62451	9.53787	9.4244	9.3034	9.17153	9.04465	9.0266	9.13821	9.32878	9.51925
12	10.22961	10.119	9.9743	9.82021	9.65255	9.52396	9.5401	9.68621	9.90595	10.11613
13	10.77117	10.63315	10.45282	10.26109	10.05281	9.95195	9.99905	10.1763	10.4224	10.65031
14	11.24582	11.07691	10.85654	10.62261	10.4026	10.32632	10.40081	10.6057	10.875	11.11849
15	11.65063	11.44736	11.18256	10.90199	10.70018	10.64504	10.7431	10.9716	11.2608	11.51775
16	11.98729	11.74646	11.43323	11.13374	10.94717	10.90976	11.02754	11.2759	11.5817	11.8498
17	12.25384	11.97235	11.60686	11.31684	11.14242	11.11911	11.25259	11.5167	11.8358	12.11269
18	12.44871	12.12361	11.73356	11.4505	11.285	11.27205	11.41705	11.6927	12.0215	12.30489
19	12.57078	12.19931	11.81281	11.53413	11.37423	11.36778	11.52003	11.8029	12.1378	12.42528
20	12.61932	12.22939	11.8443	11.56737	11.4097	11.40584	11.56097	11.8467	12.184	12.47315

Tingkat	Mode Shape									
	Mode 2									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	1.94603	1.94243	1.93832	1.93562	1.93485	1.93468	1.93265	1.92705	1.91849	1.91173
3	2.78178	2.76744	2.7511	2.74037	2.73732	2.73667	2.72862	2.7065	2.6728	2.64629
4	3.45989	3.42515	3.38571	3.35987	3.35252	3.35096	3.33163	3.27863	3.19836	3.23368
5	3.94193	3.8758	3.80103	3.75221	3.73836	3.73543	3.69903	3.59963	3.45019	3.64126
6	4.20058	4.09216	3.97018	3.89089	3.86845	3.86369	3.80483	3.6449	3.52486	3.84635
7	4.22119	4.06115	3.88219	3.76652	3.73388	3.72696	3.64156	3.41098	3.41853	3.83755
8	4.00259	3.78463	3.54277	3.38752	3.34385	3.33461	3.22075	3.02031	3.13666	3.61536
9	3.55716	3.27933	2.9739	2.7795	2.72506	2.71356	2.57218	2.49082	2.69372	3.19211
10	2.91016	2.57579	2.21242	1.98357	1.91984	1.90639	1.81447	1.84685	2.11246	2.59136
11	2.10609	1.72395	1.31448	1.05993	0.98953	0.9747	0.98343	1.12206	1.42789	1.85337
12	1.18836	0.77287	0.33546	0.06805	-0.00525	0.00481	0.11266	0.34815	0.6735	1.01723
13	0.20649	-0.22271	-0.66425	-0.92822	-0.99969	-0.96527	-0.76267	-0.441	-0.11383	0.12721
14	-0.78652	-1.20547	-1.62299	-1.86472	-1.95505	-1.89752	-1.60718	-1.21085	-0.89559	-0.76954
15	-1.73708	-2.11882	-2.48162	-2.68116	-2.83398	-2.7554	-2.38674	-1.92769	-1.63356	-1.62553
16	-2.59937	-2.91732	-3.19612	-3.40007	-3.60859	-3.5116	-3.07549	-2.56509	-2.2963	-2.40047
17	-3.32955	-3.55766	-3.72499	-3.9953	-4.25036	-4.1382	-3.6472	-3.09677	-2.8533	-3.05569
18	-3.89053	-4.00513	-4.12404	-4.4452	-4.73567	-4.61209	-4.08013	-3.50082	-3.27891	-3.55854
19	-4.25379	-4.23548	-4.37938	-4.73339	-5.04665	-4.91577	-4.35781	-3.76058	-3.55352	-3.88392
20	-4.40088	-4.32806	-4.4821	-4.8494	-5.17185	-5.03805	-4.46966	-3.86535	-3.6645	-4.01562

Tabel 4 Perbandingan Mode Shape Struktur Tingkat 20

Tingkat	Mode Shape									
	Mode 3									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	1.85109	1.84147	1.83379	1.83295	1.82808	1.81301	1.79738	1.79443	1.7885	1.76384
3	2.41275	2.37641	2.34753	2.34437	2.32613	2.27006	2.21235	2.20152	2.17982	2.09031
4	2.59716	2.51576	2.45157	2.44457	2.40427	2.2814	2.15662	2.1334	2.08704	2.10577
5	2.37548	2.23634	2.12775	2.11596	2.04837	1.8448	1.64205	1.60477	1.53078	1.80793
6	1.78238	1.58466	1.43258	1.41618	1.32269	1.046	0.77812	0.72974	0.77055	1.24111
7	0.91059	0.66919	0.48739	0.46799	0.35822	0.04182	-0.25136	-0.3028	-0.09235	0.48963
8	-0.10358	-0.35767	-0.54287	-0.56229	-0.67091	-0.97056	-1.22737	-1.29613	-0.94295	-0.3347
9	-1.10155	-1.325	-1.47838	-1.49394	-1.57892	-1.79239	-1.94223	-2.1216	-1.66791	-1.10923
10	-1.92729	-2.07176	-2.15587	-2.16353	-2.2019	-2.2623	-2.40917	-2.67228	-2.17062	-1.71873
11	-2.46603	-2.49009	-2.47504	-2.4717	-2.44631	-2.30918	-2.5832	-2.89336	-2.39788	-2.08469
12	-2.63757	-2.51365	-2.38282	-2.36695	-2.27015	-2.097	-2.44319	-2.75756	-2.32085	-2.15526
13	-2.41634	-2.13873	-1.89456	-1.8668	-1.70368	-1.64954	-2.00615	-2.28163	-1.94932	-1.92045
14	-1.8353	-1.42475	-1.09139	-1.05478	-0.96147	-1.01702	-1.32522	-1.52428	-1.33041	-1.41352
15	-0.98097	-0.48491	-0.10683	-0.06656	-0.12008	-0.2704	-0.48317	-0.57892	-0.54268	-0.7063
16	0.01091	0.52733	0.89446	0.92794	0.73297	0.50479	0.41419	0.43368	0.3099	0.09515
17	1.00127	1.46084	1.75575	1.83486	1.51483	1.22665	1.26414	1.39591	1.12545	0.88391
18	1.85122	2.17628	2.45216	2.5686	2.14954	1.81892	1.96936	2.19601	1.80651	1.55474
19	2.4416	2.56685	2.91831	3.05991	2.57546	2.21903	2.44914	2.74106	2.27171	2.01812
20	2.68963	2.72751	3.1104	3.26241	2.75121	2.38472	2.64854	2.96774	2.46546	2.21224

Tingkat	Mode Shape									
	Mode 4									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	1.71228	1.69528	1.68836	1.68197	1.65389	1.63653	1.63106	1.59357	1.58084	1.558
3	1.90724	1.84813	1.82424	1.80226	1.70673	1.64848	1.63024	1.50706	1.46591	1.39291
4	1.52597	1.40965	1.36318	1.32071	1.1393	1.03128	0.99788	0.77739	0.7058	0.83994
5	0.68369	0.52014	0.45604	0.39812	0.15783	0.02049	-0.02107	-0.28404	-0.36496	0.05308
6	-0.36516	-0.5358	-0.60032	-0.65742	-0.881	-0.99811	-1.03185	-1.22425	-1.33934	-0.74857
7	-1.30368	-1.42031	-1.46025	-1.49342	-1.59966	-1.63579	-1.6429	-1.642	-1.96003	-1.34176
8	-1.84834	-1.85037	-1.84233	-1.83071	-1.73696	-1.64916	-1.61748	-1.6393	-2.06313	-1.56132
9	-1.83456	-1.68838	-1.62156	-1.55665	-1.24302	-1.03313	-0.96546	-1.21685	-1.6214	-1.3461
10	-1.26654	-0.98617	-0.87016	-0.76276	-0.29733	-0.02281	-0.08903	-0.48281	-0.75151	-0.75604
11	-0.33408	0.01654	0.15241	0.27371	0.75126	0.99581	0.80711	0.36896	0.30739	0.03452
12	0.69448	1.01421	1.12749	1.22313	1.53983	1.79726	1.52459	1.13076	1.28898	0.81593
13	1.52324	1.70283	1.75119	1.78355	1.79546	2.20676	1.90457	1.61681	1.9464	1.38095
14	1.91371	1.87257	1.82916	1.77676	1.67824	2.13501	1.86294	1.70859	2.11431	1.57974
15	1.75355	1.47169	1.33708	1.2049	1.2125	1.59765	1.40893	1.38371	1.75048	1.35959
16	1.1183	0.64854	0.45264	0.41653	0.50966	0.73221	0.66122	0.7411	0.97211	0.79991
17	0.18004	-0.36071	-0.56463	-0.44667	-0.29284	-0.2836	-0.22431	-0.0717	-0.03648	0.04047
18	-0.80697	-1.26645	-1.48249	-1.22961	-1.03807	-1.24116	-1.06309	-0.86803	-1.03642	-0.72907
19	-1.57538	-1.80881	-2.13932	-1.79162	-1.58032	-1.94385	-1.68027	-1.46503	-1.79093	-1.31655
20	-1.91692	-2.03975	-2.41948	-2.03171	-1.81354	-2.24736	-1.9472	-1.72563	-2.12131	-1.57525

Tabel 4 Perbandingan Mode Shape Struktur Tingkat 20

Tingkat	Mode Shape									
	Mode 7									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	1.06336	1.02003	0.9924	0.9313	0.88734	0.8444	0.75454	0.71243	0.6494	0.54381
3	0.08091	-0.00954	-0.06516	-0.18246	-0.26202	-0.3358	-0.47768	-0.53832	-0.62216	-0.74388
4	-0.98111	-1.02929	-1.05378	-1.09148	-1.10525	-1.10854	-1.08521	-1.06128	-1.01139	-1.34913
5	-1.07822	-0.98991	-0.9275	-0.77569	-0.65719	-0.53618	-0.27354	-0.1494	0.03369	-0.71666
6	-0.11489	0.06808	0.18009	0.41054	0.55868	0.68678	0.89585	0.96445	1.05011	0.57328
7	0.96142	1.05602	1.09714	1.13608	1.12184	1.0764	0.89368	0.77442	1.17299	1.33728
8	1.09219	0.95733	0.85341	0.58676	0.37433	0.15991	-0.27721	-0.04386	0.29778	0.87445
9	0.14879	-0.12645	-0.29323	-0.621	-0.81052	-0.95061	-1.08557	-0.82652	-0.83081	-0.39063
10	-0.94094	-1.08011	-1.12963	-1.1319	-1.04842	-0.90766	-1.04215	-0.93875	-1.25247	-1.29733
11	-1.14935	-0.9753	-0.82782	-0.43314	-0.11978	0.18418	-0.21993	-0.32571	-0.65917	-1.07054
12	-0.28123	0.08528	0.30811	0.72851	0.94213	1.14832	0.76663	0.5389	0.46829	0.09158
13	0.85031	1.06228	1.13358	1.11161	0.95577	1.31626	1.1803	0.9872	1.21627	1.1737
14	1.1854	0.99828	0.81686	0.30674	0.33134	0.57156	0.71197	0.67289	0.97863	1.23033
15	0.4102	-0.044	-0.32294	-0.82594	-0.5143	-0.56943	-0.2884	-0.16132	-0.05205	0.21201
16	-0.72679	-1.04569	-1.15633	-1.45992	-1.03662	-1.33865	-1.08584	-0.87814	-1.04301	-0.98073
17	-1.22277	-1.08243	-0.8926	-1.2124	-0.90729	-1.23387	-1.11919	-0.95617	-1.23809	-1.36662
18	-0.64029	-0.12033	-0.12073	-0.23284	-0.2076	-0.32351	-0.36503	-0.33862	-0.48841	-0.62815
19	0.50691	0.95281	0.71986	0.88731	0.62259	0.79807	0.646	0.52527	0.63395	0.62711
20	1.20703	1.49841	1.15066	1.47171	1.0614	1.3986	1.20247	1.007	1.27257	1.36642

Tingkat	Mode Shape									
	Mode 8									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	0.78807	0.74206	0.68982	0.64866	0.54888	0.49592	0.43882	0.33534	0.21864	0.10088
3	-0.42682	-0.49604	-0.56937	-0.6231	-0.73858	-0.79138	-0.84171	-0.91547	-0.97168	-0.99941
4	-1.09849	-1.07894	-1.04526	-1.01071	-0.90065	-0.82884	-0.74244	-0.5661	-0.34449	-0.90392
5	-0.3723	-0.23671	-0.08316	0.03582	0.30961	0.44271	0.5739	0.77278	0.92706	0.27308
6	0.82786	0.91818	0.99334	1.03152	1.04811	1.01507	0.94946	0.76089	1.15819	1.12335
7	0.97431	0.86028	0.70328	0.56355	0.1896	-0.01569	-0.23141	-0.58098	0.0895	0.62956
8	-0.11907	-0.33393	-0.5543	-0.70406	-0.95781	-1.02167	-1.03293	-1.31355	-1.07963	-0.61749
9	-1.06103	-1.08707	-1.04931	-0.97266	-0.64579	-0.41411	-0.1412	-0.66851	-1.03711	-1.12573
10	-0.65251	-0.40434	-0.10076	0.1389	0.65023	0.84746	0.88943	0.67765	0.16934	-0.28706
11	0.54662	0.78702	0.97981	1.06275	1.00269	0.83438	1.0869	1.34694	1.1948	0.8787
12	1.08341	0.98835	0.77664	0.55046	-0.09988	0.06831	0.26627	0.67095	0.94323	1.04321
13	0.30702	-0.0536	-0.44407	-0.70569	-1.05751	-0.75941	-0.80377	-0.67519	-0.31648	0.01901
14	-0.84139	-1.02813	-1.08297	-1.00821	-1.09439	-0.9018	-1.12092	-1.34698	-1.23794	-1.02686
15	-0.97005	-0.70934	-0.30298	0.05171	-0.17842	-0.23036	-0.38809	-0.67337	-0.83626	-0.90264
16	0.00822	0.44968	0.8508	1.07215	0.88383	0.63684	0.68707	0.63354	0.40706	0.19008
17	0.97737	1.07604	0.95493	1.27401	1.22146	0.96286	1.15617	1.34458	1.2407	1.07885
18	0.83083	0.4278	0.35219	0.50318	0.55766	0.47066	0.60551	0.79107	0.82564	0.81004
19	-0.26364	-0.72718	-0.51126	-0.65182	-0.56334	-0.4215	-0.47925	-0.50647	-0.42038	-0.32792
20	-1.05752	-1.36534	-0.99625	-1.30917	-1.22249	-0.95547	-1.1413	-1.32766	-1.24331	-1.11403

Tabel 4 Perbandingan Mode Shape Struktur Tingkat 20

Tingkat	Mode Shape									
	Mode 9									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	0.49028	0.43863	0.35649	0.31753	0.23604	0.12039	0.01552	-0.08742	-0.20668	-0.35519
3	-0.79665	-0.84186	-0.90222	-0.9259	-0.96511	-0.99683	-1.0013	-0.98323	-0.93447	-0.83199
4	-0.8207	-0.74215	-0.60395	-0.5336	-0.37869	-0.14667	0.06834	0.27604	0.50297	-0.07428
5	0.45625	0.5743	0.73657	0.80138	0.90914	0.99296	0.99558	0.93028	0.77499	0.79365
6	1.00994	0.9492	0.80598	0.72062	0.51306	0.17285	-0.15171	-0.4545	-0.03042	0.48396
7	-0.03737	-0.23209	-0.51551	-0.63321	-0.83331	-0.9884	-0.98287	-0.84309	-0.79354	-0.54383
8	-1.02544	-1.03287	-0.94737	-0.86838	-0.63623	-0.1989	0.23403	-0.12293	-0.45345	-0.76468
9	-0.38794	-0.14029	0.25566	0.43056	0.73927	0.98316	0.96327	0.75889	0.51704	0.14911
10	0.86454	0.98229	1.0175	0.96886	0.7455	0.22483	0.48819	0.6427	0.76872	0.84165
11	0.81181	0.57116	0.10707	-0.12292	-0.5633	-0.95609	-0.56817	-0.27844	0.00261	0.34484
12	-0.46652	-0.73177	-0.97933	-1.00789	-0.87846	-1.05876	-0.94802	-0.85085	-0.76696	-0.63927
13	-1.04054	-0.89213	-0.45619	-0.19712	0.35595	0.03261	-0.19907	-0.35761	-0.52106	-0.72002
14	-0.04363	0.34045	0.8167	0.9453	1.21363	1.0872	0.78691	0.58352	0.41473	0.2167
15	1.01914	1.04147	0.74734	0.49728	0.78683	0.91568	0.83593	0.79382	0.80141	0.84719
16	0.6331	0.21127	-0.4786	-0.42345	-0.42413	-0.22825	-0.05229	0.06792	0.18894	0.35037
17	-0.65297	-0.92954	-0.96386	-0.94166	-1.2124	-1.12979	-0.88189	-0.73808	-0.65909	-0.61267
18	-1.01077	-0.7037	-0.55413	-0.56475	-0.79239	-0.83155	-0.72271	-0.67362	-0.68541	-0.76046
19	0.06835	0.55675	0.37014	0.34899	0.41733	0.34975	0.24677	0.18527	0.1428	0.10365
20	1.0503	1.32607	0.95072	0.93099	1.21113	1.15964	0.93957	0.82567	0.79297	0.82984

Tingkat	Mode Shape									
	Mode 10									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	0.19042	0.13654	0.02563	-0.04113	-0.11482	-0.21092	-0.32639	-0.45247	-0.5843	-0.75415
3	-0.98098	-0.99408	-1.00189	-0.99411	-0.97467	-0.93218	-0.85549	-0.73977	-0.58305	-0.32735
4	-0.28842	-0.1796	0.04767	0.18353	0.32985	0.51063	0.70517	0.87794	1.00036	0.66745
5	0.95217	0.9863	0.99835	0.96782	0.9019	0.76801	0.54327	0.23483	-0.13078	0.50413
6	0.38354	0.22233	-0.12061	-0.32216	-0.52882	-0.75757	-0.94571	-1.013	-1.04899	-0.53394
7	-0.91385	-0.97667	-0.98959	-0.92167	-0.78523	-0.52443	-0.12454	0.3478	-0.25929	-0.64554
8	-0.47483	-0.26464	0.19307	0.45419	0.70206	0.92618	1.00085	1.17122	0.95257	0.36297
9	0.86642	0.96521	0.97533	0.85661	0.63035	0.22665	-0.3186	0.185	0.6135	0.74167
10	0.56138	0.30646	-0.2642	-0.57688	-0.84112	-0.99905	-1.17109	-1.08706	-0.72444	-0.16654
11	-0.75952	-0.92336	-0.98234	-0.83288	-0.53376	-0.01592	-0.38893	-0.75954	-0.93908	-0.79954
12	-0.706	-0.43253	0.23928	0.61115	0.90241	0.98833	0.93611	0.68563	0.3024	-0.11131
13	0.62508	0.8643	0.9882	0.80774	0.43015	0.68151	0.9545	1.12191	1.07499	0.76086
14	0.82503	0.55054	-0.21366	-0.64438	-0.58793	-0.52937	-0.35943	-0.09268	0.18072	0.37572
15	-0.46798	-0.78913	-0.99394	-0.78124	-0.85998	-1.03801	-1.17166	-1.17089	-0.99377	-0.6303
16	-0.96356	-0.7441	0.07384	-0.01716	-0.10449	-0.25004	-0.44389	-0.62671	-0.71726	-0.65554
17	0.18274	0.60661	1.00428	0.7667	0.77585	0.85026	0.86732	0.78585	0.60651	0.33927
18	1.01766	0.8929	0.81442	0.6664	0.72918	0.88848	1.03854	1.10953	1.04473	0.80616
19	0.11852	-0.38759	-0.28387	-0.2024	-0.18875	-0.18314	-0.15526	-0.10416	-0.04246	0.01862
20	-0.98258	-1.26002	-1.06548	-0.83779	-0.88115	-1.02599	-1.145	-1.17352	-1.06765	-0.79789

Tabel 4 Perbandingan Mode Shape Struktur Tingkat 20

Tingkat	Mode Shape									
	Mode 11									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	-0.11875	-0.17437	-0.29894	-0.40191	-0.49787	-0.60668	-0.74269	-0.90847	-1.06681	-1.18529
3	-0.97353	-0.95063	-0.87626	-0.79024	-0.68991	-0.55233	-0.34654	-0.04252	0.30176	0.59428
4	0.33823	0.44355	0.66166	0.81461	0.92756	1.01254	1.04769	0.95329	0.6986	1.17955
5	0.89686	0.82504	0.60237	0.36488	0.11221	-0.19264	-0.5754	-0.96222	-1.15421	-0.59946
6	-0.53948	-0.67715	-0.911	-1.00517	-0.99745	-0.87105	-0.54138	0.06088	-0.77693	-1.17859
7	-0.77608	-0.63331	-0.22527	0.16005	0.50903	0.83399	1.05182	0.89799	1.10149	0.61013
8	0.71492	0.85648	1.00425	0.92151	0.68042	0.25767	-0.38421	0.08979	0.85169	1.17246
9	0.61432	0.39079	-0.19043	-0.64113	-0.9328	-1.02515	-0.71371	-0.88315	-1.04369	-0.61703
10	-0.85229	-0.96713	-0.92542	-0.58676	-0.09945	0.49877	0.19007	-0.23756	-0.92251	-1.16793
11	-0.51393	-0.22215	0.46707	0.87698	0.98232	0.722	0.78103	0.8223	0.89617	0.51178
12	0.9144	1.00586	0.7858	0.23429	-0.38962	-0.18385	0.0867	0.4474	1.06581	1.21502
13	0.40451	0.04676	-0.70198	-0.9712	-0.78834	-0.80175	-0.75027	-0.70828	-0.72573	-0.40468
14	-0.96222	-1.01402	-0.57594	0.15614	-0.00555	-0.16581	-0.3526	-0.62813	-1.18187	-1.25121
15	-0.28978	0.13006	0.87415	0.90843	0.78555	0.72885	0.62535	0.54846	0.53674	0.29487
16	0.95991	1.00784	0.43191	0.4279	0.46804	0.55031	0.63423	0.82354	1.32534	1.3081
17	0.2958	-0.17792	-0.94532	-0.63333	-0.51	-0.43813	-0.33966	-0.25455	-0.18248	-0.03091
18	-0.96042	-0.99939	-1.0947	-0.83507	-0.7683	-0.78127	-0.78724	-0.91426	-1.37412	-1.31439
19	-0.29818	0.22536	0.17778	0.09645	0.05767	0.02542	-0.01487	-0.07184	-0.18482	-0.23425
20	0.95725	1.17327	1.21935	0.89708	0.80225	0.79463	0.78047	0.88889	1.32472	1.26992
Tingkat	Mode Shape									
	Mode 12									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	-0.42648	-0.47982	-0.59045	-0.72442	-0.84883	-0.96738	-1.08706	-1.20434	-1.41361	-1.68147
3	-0.76632	-0.71025	-0.57488	-0.37649	-0.15853	0.07942	0.34957	0.64349	1.23966	2.13521
4	0.8462	0.90872	1.00442	1.04847	1.00598	0.87879	0.65307	0.32622	-0.55047	1.00563
5	0.30286	0.1615	-0.14836	-0.52592	-0.83874	-1.06002	-1.16035	-1.08866	-0.36751	-2.46727
6	-1.01221	-1.00625	-0.8976	-0.5958	-0.17451	0.30403	0.78749	1.1594	0.60583	-0.20509
7	0.25176	0.44615	0.79463	1.03873	1.01173	0.72078	0.18269	-0.49351	0.27626	2.5229
8	0.87414	0.73683	0.32547	-0.29824	-0.82846	-1.10834	-1.0143	-1.15013	-0.64744	-0.59569
9	-0.73045	-0.8911	-1.02897	-0.78204	-0.19045	0.51598	1.07655	0.51511	-0.17875	-2.33243
10	-0.47416	-0.19872	0.41538	0.97133	1.01726	0.53256	1.07363	1.14046	0.67436	1.33479
11	0.9328	0.98645	0.78374	0.07839	-0.67303	-1.03115	-0.91791	-0.42684	0.14627	2.0652
12	0.07627	-0.2746	-0.87813	-1.02812	-0.44597	-0.75895	-1.20926	-1.17349	-0.6814	-1.78058
13	-0.96528	-0.8547	-0.26527	0.66639	1.05158	0.86451	0.73922	0.33602	-0.11345	-1.68186
14	0.33537	0.68471	1.03474	0.54537	0.75167	0.94876	1.3185	1.19949	0.68687	2.12775
15	0.82215	0.52616	-0.34568	-1.06147	-0.83307	-0.65619	-0.5444	-0.24318	0.08037	1.23425
16	-0.56923	-0.86102	-0.88286	-1.03444	-1.07695	-1.16102	-1.45779	-1.2456	-0.68113	-2.21919
17	-0.66043	-0.23763	0.73349	0.58484	0.41257	0.28064	0.17141	0.00702	-0.12898	-1.064
18	0.75781	0.94065	1.27632	1.30391	1.23804	1.25179	1.50164	1.24693	0.67193	2.30784
19	0.44413	-0.07758	-0.04882	0.01594	0.07083	0.12428	0.2128	0.22939	0.17694	0.88187
20	-0.88394	-0.98712	-1.30251	-1.29657	-1.21038	-1.21159	-1.4472	-1.20344	-0.6593	-2.3855

Tabel 4 Perbandingan Mode Shape Struktur Tingkat 20

Tingkat	Mode Shape									
	Mode 15									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	-1.23717	-1.3095	-1.41231	-1.49184	-1.62964	-1.72581	-1.93816	-2.50208	-2.88823	-3.19437
3	0.73101	0.93158	1.23569	1.48627	1.95159	2.30007	3.13824	5.82712	8.04822	10.0344
4	0.21425	-0.06464	-0.54379	-0.98546	-1.9051	-2.67222	-4.76239	-13.4011	-22.3252	-9.57537
5	-1.03053	-0.83624	-0.37487	0.15631	1.49894	2.8093	7.03018	30.7486	61.8919	2.15153
6	1.22733	1.29814	1.1372	0.72523	-0.8098	-2.69906	-10.24786	-70.5204	-44.498	6.83687
7	-0.68636	-1.07858	-1.42533	-1.3658	-0.03221	2.35126	14.85059	161.719	-13.8484	-10.8514
8	-0.26727	0.29282	1.11911	1.55248	0.86813	-1.79712	-21.46006	-64.9254	59.4494	6.97197
9	1.06043	0.64665	-0.34622	-1.22329	-1.54013	1.08617	30.96974	-107.339	-50.3378	1.97923
10	-1.21636	-1.24666	-0.57104	0.48787	1.92138	-0.28133	6.56123	154.824	-5.10089	-9.49045
11	0.44426	0.98586	1.15271	0.49442	-1.59104	-0.59955	-33.35064	-1.40214	55.0967	8.6179
12	0.66691	-0.04432	-1.05694	-1.22601	0.67146	0.42238	5.54129	-153.839	-46.302	-0.13232
13	-1.2695	-0.92781	0.34001	1.33666	0.49678	0.49981	31.33976	109.455	-11.8989	-8.47031
14	0.9038	1.2593	0.57674	-0.77067	-0.75978	-0.54063	-16.91392	76.9621	57.4036	9.59082
15	0.15132	-0.72124	-1.15455	-0.18526	-0.3617	-0.37121	-25.20182	-163.513	-41.6564	-2.23924
16	-1.06262	-0.45413	0.82392	0.76586	0.77811	0.57879	22.58413	12.1002	-25.6702	-7.49807
17	0.96309	1.22821	0.155	0.2052	0.32224	0.3109	20.12046	156.921	61.2115	9.2487
18	0.05224	-0.917	-0.81275	-0.76051	-0.79444	-0.61264	-27.11073	-97.5681	-20.96	-1.14754
19	-1.01679	-0.20451	-0.2136	-0.22502	-0.28196	-0.24498	-14.02095	-103.779	-45.2442	-8.17628
20	1.01254	0.89037	0.79735	0.75461	0.80874	0.63759	30.26532	154.091	55.4262	8.79094

Tingkat	Mode Shape									
	Mode 16									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	-1.45382	-1.50947	-1.61832	-1.69883	-1.77081	-2.09226	-2.69384	-3.28243	-3.40812	-3.60759
3	1.36477	1.54348	1.91189	2.20031	2.46979	3.80537	6.89748	10.2256	11.5378	13.0239
4	-0.7661	-1.09133	-1.82178	-2.44602	-3.06858	-6.64827	-17.50448	-31.3398	-39.0354	-16.3495
5	-0.11864	0.29543	1.36596	2.40747	3.54288	11.46405	44.37111	95.7407	132.061	12.0277
6	0.95908	0.59353	-0.63567	-2.08937	-3.87348	-19.68309	-112.462	-292.12	-146.802	-2.07786
7	-1.44139	-1.29554	-0.22286	1.5291	4.04697	33.7438	285.0211	890.901	74.5203	-8.84535
8	1.38548	1.58948	1.03772	-0.79224	-4.0563	-57.82138	-722.3539	-800.562	41.9359	15.6311
9	-0.81221	-1.38277	-1.64579	-0.03522	3.90109	99.05948	1830.689	91.3492	-133.533	-15.107
10	-0.06435	0.74051	1.92565	0.85718	-3.58761	-169.6995	-1030.245	687.082	145.973	7.51947
11	0.90577	0.265	-1.47324	-1.42012	2.45189	255.968	-989.5493	-825.587	-48.1874	4.85087
12	-1.25247	-1.14051	0.46172	1.55567	-0.75422	53.16567	1838.17	195.546	-85.9849	-14.141
13	0.91509	1.45655	0.72271	-1.22424	-1.11632	-280.1716	-511.2402	617.05	155.229	14.4452
14	-0.0779	-1.0581	-1.62822	0.52612	1.04725	74.38548	-1420.775	-856.438	-107.257	-5.56801
15	-0.80183	0.14062	1.9097	0.32914	0.84141	246.3063	1671.243	299.714	-21.7047	-6.84671
16	1.082	0.87464	-1.05718	-0.55575	-1.157	-151.2259	330.9636	590.005	130.167	13.5567
17	-0.5531	-1.28171	-0.42281	-0.27849	-0.69049	-199.1263	-1887.06	-826.805	-115.688	-8.97668
18	-0.38939	0.79755	1.07556	0.5809	1.24706	213.3455	899.5731	147.668	-8.05739	-3.07689
19	1.04071	0.24118	0.3757	0.22559	0.52781	132.569	1300.449	696.023	124.192	12.5699
20	-0.91383	-0.7934	-1.09193	-0.60136	-1.31591	-254.7051	-1747.575	-770.445	-123.028	-11.6028

Tabel 4 Perbandingan Mode Shape Struktur Tingkat 20

Tingkat	Mode Shape									
	Mode 17									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	-1.64308	-1.69599	-1.74337	-1.84039	-2.2636	-2.89824	-2.56486	-3.46637	-3.86636	-3.9771
3	1.99941	2.18999	2.36597	2.74059	4.60837	8.0988	7.21064	12.4729	15.0835	16.0116
4	-2.0069	-2.42318	-2.82472	-3.72991	-9.15685	-22.90529	-23.40032	-45.7064	-58.8791	-24.3547
5	1.66407	2.36778	3.08782	4.8404	18.08025	65.40409	78.5597	168.106	229.846	27.2364
6	-1.03059	-2.03037	-3.13695	-6.10838	-35.64819	-187.8995	-264.3985	-618.285	-330.924	-24.1286
7	0.21698	1.45112	2.9687	7.57486	70.262	539.9983	892.1841	2273.83	331.378	15.6223
8	0.63486	-0.69907	-2.59479	-9.28771	-138.4644	-1552.173	-3013.718	-2951.15	-231.067	-3.40566
9	-1.37643	-0.13623	2.0411	11.30236	272.8683	4461.033	10180.46	2359.28	60.4928	-9.80977
10	1.87864	0.9553	-1.34591	-13.68446	-537.7399	-12822.73	-11284.73	-753.004	128.476	20.8948
11	-1.71176	-1.48401	0.30538	13.88248	945.0145	33669.04	3837.063	-1305.21	-255.76	-23.6195
12	0.93515	1.56158	0.8135	-11.86486	-1602.532	-20314.66	6524.974	2580.42	260.241	17.1545
13	0.17441	-1.16443	-1.72375	7.95357	2684.398	-13675.03	-11954.51	-2307.19	-139.768	-4.16345
14	-1.22133	0.4133	2.19187	-2.7728	102.2742	33773.79	8339.669	649.291	-47.8161	-10.4179
15	1.83265	0.46344	-2.09768	-2.85052	-2741.551	-19565.92	1578.094	1398.21	212.443	20.8922
16	-1.4016	-1.09934	1.00703	3.25674	1020.494	-17924.59	-9986.935	-2329.06	-231.426	-18.4729
17	0.17437	1.16395	0.56195	2.29773	2323.612	34086	8927.044	1400.11	91.7512	4.56629
18	1.14994	-0.62369	-1.07161	-3.64683	-1972.097	-9686.708	597.7448	646.72	110.827	11.9918
19	-1.81708	-0.24067	-0.43869	-1.67867	-1515.952	-26239.81	-9567.541	-2177.17	-237.424	-20.8889
20	1.44735	0.64485	1.12205	3.93184	2592.949	30942.17	9487.761	1969.34	201.251	16.9469

Tingkat	Mode Shape									
	Mode 18									
	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	-1.74337	-1.81819	-1.87518	-2.5141	-0.88235	-1.92754	-10.85773	-2.2723	-4.18268	-4.2234
3	2.36928	2.65312	2.90921	5.84681	-0.10294	2.51765	55.0969	5.18962	17.7917	18.1236
4	-2.83939	-3.51243	-4.21945	-13.53759	3.41177	-1.23427	-229.9629	-18.7146	-75.7445	-30.4868
5	3.12116	4.40405	5.93268	31.33647	-14.58823	-7.06908	940.7505	77.8235	322.485	40.2511
6	-3.19436	-5.33617	-8.22646	-72.41542	55.70588	42.05097	-3851.2	-325.684	-535.519	-46.6039
7	3.05283	6.31742	11.37407	167.3553	-224.3824	-191.2312	15796.44	1367.42	692.58	49.0492
8	-2.70229	-7.35676	-15.74242	-386.6165	952.4705	845.7034	-64812.81	-2226.78	-777.255	-47.42
9	2.16434	8.46377	21.80395	892.8591	-4080.647	-3754.024	265955.3	2792.57	780.691	41.8779
10	-1.47193	-9.6486	-30.19933	-2062.203	17540.47	16713.98	-416113.5	-2986.27	-702.535	-32.9149
11	0.39369	9.07934	35.92282	4296.763	-69930.3	-69166.55	411022.9	2221.12	420.576	15.1682
12	0.79445	-6.85944	-38.46738	-8751.632	277524.1	109036.8	-252586.3	-735.425	-16.6127	6.5689
13	-1.79198	3.39245	37.5712	17729.08	-1101025	-129079.1	-75.8103	-987.48	-392.166	-26.4693
14	2.34739	0.69135	-33.27182	-35869.04	1628983	125641.6	252690.5	2384.26	687.183	39.2169
15	-2.31577	-4.64951	25.94632	72545.63	-1719663	-99342.48	-411000.3	-3008.05	-782.859	-41.4126
16	1.187	6.72637	-10.3404	-4169.865	974214.5	32834.43	328947.6	2020.06	481.939	23.4696
17	0.51918	-6.08153	-8.57416	-70243.99	244906.8	46957.98	-54516.55	50.3835	63.132	5.86864
18	-2.00227	2.97591	12.13569	42937.52	-1344938	-107749.9	-251827	-2101.26	-576.219	-32.3312
19	2.56347	1.3338	6.05459	46547.23	1791046	124944.3	410950.4	3043.13	797.386	43.0593
20	-1.93532	-3.18556	-13.40081	-68627.28	-1366332	-91573.23	-329795.7	-2373.92	-614.591	-32.8481

Tabel 5 Perbandingan Partisipasi Mode

Tingkat 7

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	0.282676942	0.307348386	0.325558132	0.316101581
2	0.254984577	0.265806609	0.261865124	0.323005654
3	0.205079511	0.198566136	0.2434896	0.178801883
4	0.142856602	0.131819286	0.107189442	0.163979211
5	0.080632195	0.073784954	0.061511781	0.017299521
6	0.030729199	0.022671601	0.000378781	0.000777673
7	0.003039682	2.29699E-07	3.44679E-06	3.08393E-05

Tingkat 10

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	0.197543475	0.210698942	0.224774728	0.2267461	0.21172433
2	0.187390925	0.1958519	0.185518021	0.207284024	0.262632655
3	0.165319925	0.168293667	0.177597182	0.190254461	0.188060111
4	0.142855641	0.139321485	0.160805024	0.141721785	0.121413663
5	0.112068886	0.108023727	0.110867312	0.129928624	0.144652551
6	0.087534874	0.085465409	0.071677788	0.058416777	0.064271238
7	0.057359615	0.055429509	0.051947243	0.045314943	0.006258138
8	0.035100591	0.031524653	0.016808953	0.000327089	0.00084959
9	0.01340029	0.005393494	3.48979E-06	2.89834E-06	0.000120659
10	0.001422507	9.07681E-10	1.72896E-09	1.14219E-07	1.22646E-05

Tingkat 15

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	0.134793536	0.140875137	0.148168466	0.15394639	0.156083168	0.152414638	0.144142089
2	0.131552736	0.136455782	0.137069242	0.13083606	0.136848869	0.164064937	0.184292327
3	0.123098385	0.12594428	0.121118078	0.133022795	0.149199189	0.121435442	0.14895966
4	0.114394254	0.11724358	0.118134665	0.133539255	0.111895836	0.151672839	0.107382777
5	0.102698513	0.101296215	0.108735191	0.099897354	0.120571694	0.090185648	0.119815929
6	0.09018416	0.088668197	0.097149494	0.088520118	0.089117052	0.116568414	0.121753542
7	0.079460829	0.078714519	0.084070781	0.089495832	0.080801581	0.065458765	0.059938033
8	0.065853027	0.062826408	0.059702801	0.067212715	0.073576056	0.078132826	0.063205622
9	0.054865608	0.055072009	0.04952042	0.044759108	0.037311929	0.03009228	0.047824877
10	0.043724302	0.043290816	0.03896612	0.031768976	0.032880312	0.029776298	0.002457199
11	0.029322747	0.026511243	0.026243042	0.024044853	0.01171166	0.000196545	0.000198349
12	0.022142926	0.019818592	0.010558653	0.002951887	7.03239E-06	1.51851E-06	3.00185E-05
13	0.007227466	0.003237674	0.000564277	6.32024E-08	5.49553E-09	6.46382E-08	3.67054E-06
14	0.000682689	3.96089E-05	1.22587E-10	6.43353E-12	5.95425E-11	4.48917E-09	5.04544E-07
15	2.76831E-06	7.25184E-13	1.22587E-10	5.104E-13	-5.69047E-13	3.06856E-10	6.17495E-09

Tabel 5 Perbandingan Partisipasi Mode

Tingkat 20

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	0.101594118	0.104962303	0.109096505	0.112944573	0.116116907	0.117564291	0.11656724	0.11307362	0.108246496	0.103870694
2	0.098958632	0.101937934	0.103981265	0.102193056	0.098496093	0.100813249	0.113302151	0.131821864	0.138612721	0.117754859
3	0.095472031	0.098060712	0.097144957	0.095563263	0.106161045	0.117737152	0.107848173	0.094472746	0.1215621	0.138237194
4	0.092953466	0.094157684	0.09136073	0.098379316	0.104958532	0.090271876	0.10422749	0.116511368	0.088097672	0.138161829
5	0.085689757	0.087557046	0.087255551	0.096640765	0.087043797	0.100354828	0.096093849	0.098005091	0.099337155	0.106219788
6	0.079968558	0.079914871	0.08273563	0.08429768	0.081998641	0.087447569	0.08716781	0.077993025	0.111242975	0.074645924
7	0.072661417	0.072195093	0.077114886	0.071121307	0.084629852	0.07081732	0.079501106	0.096877223	0.072463265	0.061088621
8	0.06839817	0.066935712	0.070398191	0.064672523	0.065791791	0.078019151	0.068862531	0.055598714	0.057430666	0.064890499
9	0.05864589	0.058626571	0.063070533	0.064978461	0.05700892	0.056627559	0.066800375	0.076599084	0.083705867	0.084219041
10	0.053630818	0.052197483	0.052504884	0.056146997	0.056606791	0.052362457	0.046374685	0.043597499	0.048183947	0.073306052
11	0.045777302	0.044889681	0.043821106	0.047838881	0.049507888	0.050044673	0.051751568	0.047365172	0.027940335	0.027210596
12	0.041762314	0.040981872	0.035321634	0.032907726	0.032817963	0.030815006	0.023756694	0.026263319	0.040444672	0.007001899
13	0.031544832	0.032446752	0.031899297	0.028001557	0.024256684	0.023117086	0.026749665	0.021175289	0.002625969	0.002159296
14	0.02766446	0.026199328	0.023778627	0.021334075	0.021960432	0.018041673	0.010949813	0.000643709	9.19363E-05	0.000726384
15	0.019573488	0.018698533	0.018487715	0.015378096	0.010508587	0.005964411	5.36894E-05	1.83401E-06	1.05418E-05	0.000310853
16	0.015588728	0.012754161	0.00850115	0.007355084	0.002139788	9.14743E-07	1.49419E-08	5.31504E-08	1.62688E-06	0.000130791
17	0.007167873	0.00703968	0.003499763	0.000261325	1.06447E-08	-3.44119E-11	2.06623E-10	6.26976E-09	3.98091E-07	5.02098E-05
18	0.002889911	0.000440633	3.16329E-05	1.93146E-12	4.91747E-13	2.93007E-13	4.43483E-12	4.50992E-09	4.90904E-08	1.25846E-05
19	1.18027E-07	-1.47758E-11	1.04712E-13	1.93146E-12	-6.79875E-13	1.09934E-08	1.74902E-10	6.90535E-11	2.0083E-09	3.32993E-07
20	1.18027E-07	-1.47758E-11	1.04712E-13	1.93146E-12	-6.79875E-13	1.09934E-08	1.74902E-10	6.90535E-11	2.56892E-11	1.31824E-10

Tabel 6 Perbandingan Effective Mass Dan Effective Weight

Perbandingan Effective Weight Struktur Tingkat 7

Mode Ke	Tipikal		Setback 1		Setback 2		Setback 3	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
7	0.4718	100	1.7557	100	0.2269	100	0.5252	100
6	0.2668	99.5282	0.2143	98.2443	0.1227	99.7731	0.0776	99.4748
5	2.2653	99.2615	2.7717	98.0299	4.1963	99.6504	0.3302	99.3973
4	0.0051	96.9961	0.1199	95.2582	1.9116	95.4541	0.0027	99.0670
3	5.9442	96.9911	7.6019	95.1383	11.9603	93.5424	11.2415	99.0643
2	3.2441	91.0468	1.3856	87.5364	0.0097	81.5821	1.2061	87.8229
1	87.8027	87.8027	86.1508	86.1508	81.5725	81.5725	86.6168	86.6168

Perbandingan Effective Massa Struktur Tingkat 7

Mode Ke	Tipikal		Setback 1		Setback 2		Setback 3	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
7	0.4718	100	1.7557	100	0.2269	100	0.5252	100
6	0.2668	99.5282	0.2143	98.2443	0.1227	99.7731	0.0776	99.4748
5	2.2653	99.2615	2.7717	98.0299	4.1963	99.6504	0.3302	99.3973
4	0.0051	96.9961	0.1199	95.2582	1.9116	95.4541	0.0027	99.0670
3	5.9442	96.9911	7.6019	95.1383	11.9603	93.5424	11.2415	99.0643
2	3.2441	91.0468	1.3856	87.5364	0.0097	81.5821	1.2061	87.8229
1	87.8027	87.8027	86.1508	86.1508	81.5725	81.5725	86.6168	86.6168

Perbandingan Effective Weight Struktur Tingkat 10

Mode Ke	Tipikal		Setback 1		Setback 2		Setback 3		Setback 4	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
10	0.0247	100	0.0734	100	0.0511	100	0.0309	100	0.0226	100
9	0.3608	99.9753	0.0874	99.9266	0.7148	99.9489	0.3922	99.9691	0.2496	99.9774
8	0.0106	99.6145	0.0047	99.8392	0.0008	99.2341	0.0189	99.5769	0.0273	99.7278
7	0.8516	99.6039	1.1650	99.8345	0.2131	99.2333	0.3831	99.5580	0.5927	99.7005
6	0.0222	98.7523	0.1328	98.6694	0.1545	99.0202	0.2434	99.1749	0.0324	99.1079
5	1.8610	98.7301	3.9395	98.5366	0.6225	98.8657	1.3044	98.9315	0.6496	99.0755
4	0.4210	96.8691	0.1275	94.5971	0.4434	98.2432	0.9748	97.6271	0.0904	98.4259
3	4.5805	96.4481	8.0817	94.4697	7.7489	97.7998	1.7406	96.6523	0.8099	98.3355
2	5.4262	91.8676	1.2905	86.3879	0.0053	90.0508	0.3945	94.9117	4.3268	97.5255
1	86.4414	86.4414	85.0974	85.0974	90.0455	90.0455	94.5172	94.5172	93.1988	93.1988

Perbandingan Effective Massa Struktur Tingkat 10

Mode Ke	Tipikal		Setback 1		Setback 2		Setback 3		Setback 4	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
10	0.0247	100	0.0734	100	0.0511	100	0.0309	100	0.0226	100
9	0.3608	99.9753	0.0874	99.9266	0.7148	99.9489	0.3922	99.9691	0.2496	99.9774
8	0.0106	99.6145	0.0047	99.8392	0.0008	99.2341	0.0189	99.5769	0.0273	99.7278
7	0.8516	99.6039	1.1650	99.8345	0.2131	99.2333	0.3831	99.5580	0.5927	99.7005
6	0.0222	98.7523	0.1328	98.6694	0.1545	99.0202	0.2434	99.1749	0.0324	99.1079
5	1.8610	98.7301	3.9395	98.5366	0.6225	98.8657	1.3044	98.9315	0.6496	99.0755
4	0.4210	96.8691	0.1275	94.5971	0.4434	98.2432	0.9748	97.6271	0.0904	98.4259
3	4.5805	96.4481	8.0817	94.4697	7.7489	97.7998	1.7406	96.6523	0.8099	98.3355
2	5.4262	91.8676	1.2905	86.3879	0.0053	90.0508	0.3945	94.9117	4.3268	97.5255
1	86.4414	86.4414	85.0974	85.0974	90.0455	90.0455	94.5172	94.5172	93.1988	93.1988

Tabel 6 Perbandingan Effective Mass Dan Effective Weight

Perbandingan Effective Weight Struktur Tingkat 15

Mode Ke	Tipikal		Setback 1		Setback 2		Setback 3		Setback 4		Setback 5		Setback 6	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
15	0.0179	100	0.0256	100	0.2527	100	0.0097	100	0.0090	100	0.0099	100	0.0106	100
14	0.0419	99.9821	0.0254	99.9744	0.3843	99.7473	0.1961	99.9903	0.1246	99.9910	0.0838	99.9901	0.0571	99.9894
13	0.1275	99.9401	0.0543	99.9490	0.0081	99.3630	0.0047	99.7942	0.0101	99.8665	0.0158	99.9064	0.0228	99.9323
12	0.0000	99.8126	0.0000	99.8947	0.0011	99.3549	0.0046	99.7895	0.2425	99.8564	0.1594	99.8906	0.1130	99.9095
11	0.2848	99.8126	0.3571	99.8947	0.1131	99.3538	0.1405	99.7849	0.0499	99.6139	0.0018	99.7311	0.0057	99.7966
10	0.0086	99.5278	0.0081	99.5376	0.0701	99.2407	0.0503	99.6444	0.0165	99.5639	0.0011	99.7293	0.1374	99.7909
9	0.4469	99.5192	0.9324	99.5295	0.1375	99.1706	1.0664	99.5941	0.0881	99.5475	0.5337	99.7282	0.1368	99.6535
8	0.0157	99.0723	0.1356	98.5972	0.1200	99.0331	0.0130	98.5277	0.0268	99.4594	0.0000	99.1945	0.0182	99.5166
7	0.8977	99.0566	2.0042	98.4616	0.3789	98.9131	0.5578	98.5147	1.2064	99.4326	0.0889	99.1945	0.6389	99.4984
6	0.1933	98.1589	0.0454	96.4574	0.2404	98.5342	0.5553	97.9569	0.0113	98.2262	0.1398	99.1057	0.1519	98.8595
5	1.4732	97.9655	3.1632	96.4120	2.0443	98.2938	0.3192	97.4016	1.0104	98.2149	2.2297	98.9659	0.3134	98.7076
4	0.8130	96.4923	0.0275	93.2488	0.0055	96.2495	0.8887	97.0824	1.7053	97.2046	0.7624	96.7361	0.0050	98.3941
3	3.9922	95.6793	6.2937	93.2213	8.7611	96.2441	6.9362	96.1937	2.6659	95.4993	0.5626	95.9737	1.2592	98.3891
2	5.6752	91.6871	2.3710	86.9276	0.3822	87.4830	0.0047	89.2574	0.0903	92.8334	1.4555	95.4111	4.6665	97.1300
1	86.0119	86.0119	84.5566	84.5566	87.1008	87.1008	89.2527	89.2527	92.7431	92.7431	93.9557	93.9557	92.4635	92.4635

Perbandingan Effective Massa Struktur Tingkat 15

Mode Ke	Tipikal		Setback 1		Setback 2		Setback 3		Setback 4		Setback 5		Setback 6	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
15	0.0179	100	0.0256	100	0.2527	100	0.0097	100	0.0090	100	0.0099	100	0.0106	100
14	0.0419	99.9821	0.0254	99.9744	0.3843	99.7473	0.1961	99.9903	0.1246	99.9910	0.0838	99.9901	0.0571	99.9894
13	0.1275	99.9401	0.0543	99.9490	0.0081	99.3630	0.0047	99.7942	0.0101	99.8665	0.0158	99.9064	0.0228	99.9323
12	0.0000	99.8126	0.0000	99.8947	0.0011	99.3549	0.0046	99.7895	0.2425	99.8564	0.1594	99.8906	0.1130	99.9095
11	0.2848	99.8126	0.3571	99.8947	0.1131	99.3538	0.1405	99.7849	0.0499	99.6139	0.0018	99.7311	0.0057	99.7966
10	0.0086	99.5278	0.0081	99.5376	0.0701	99.2407	0.0503	99.6444	0.0165	99.5639	0.0011	99.7293	0.1374	99.7909
9	0.4469	99.5192	0.9324	99.5295	0.1375	99.1706	1.0664	99.5941	0.0881	99.5475	0.5337	99.7282	0.1368	99.6535
8	0.0157	99.0723	0.1356	98.5972	0.1200	99.0331	0.0130	98.5277	0.0268	99.4594	0.0000	99.1945	0.0182	99.5166
7	0.8977	99.0566	2.0042	98.4616	0.3789	98.9131	0.5578	98.5147	1.2064	99.4326	0.0889	99.1945	0.6389	99.4984
6	0.1933	98.1589	0.0454	96.4574	0.2404	98.5342	0.5553	97.9569	0.0113	98.2262	0.1398	99.1057	0.1519	98.8595
5	1.4732	97.9655	3.1632	96.4120	2.0443	98.2938	0.3192	97.4016	1.0104	98.2149	2.2297	98.9659	0.3134	98.7076
4	0.8130	96.4923	0.0275	93.2488	0.0055	96.2495	0.8887	97.0824	1.7053	97.2046	0.7624	96.7361	0.0050	98.3941
3	3.9922	95.6793	6.2937	93.2213	8.7611	96.2441	6.9362	96.1937	2.6659	95.4993	0.5626	95.9737	1.2592	98.3891
2	5.6752	91.6871	2.3710	86.9276	0.3822	87.4830	0.0047	89.2574	0.0903	92.8334	1.4555	95.4111	4.6665	97.1300
1	86.0119	86.0119	84.5566	84.5566	87.1008	87.1008	89.2527	89.2527	92.7431	92.7431	93.9557	93.9557	92.4635	92.4635

Tabel 6 Perbandingan Effective Mass Dan Effective Weight

Perbandingan Effective Weight Struktur Tingkat 20

Mode Ke	Tipikal		Setback 1		Setback 2		Setback 3		Setback 4	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
20	0.0129	100	0.0191	100	0.1878	100	0.0023	100	0.0065	100
19	0.0196	99.9871	0.0291	99.9809	0.2856	99.8122	0.0036	99.9977	0.0099	99.9935
18	0.0122	99.9675	0.0157	99.9518	0.0046	99.5265	0.0036	99.9941	0.0900	99.9836
17	0.0999	99.9553	0.0471	99.9361	0.0090	99.5220	0.0050	99.9905	0.1709	99.8936
16	0.0000	99.8554	0.0000	99.8890	0.0041	99.5129	0.0004	99.9855	0.0024	99.7227
15	0.1228	99.8554	0.1508	99.8889	0.0533	99.5088	0.0817	99.9851	0.0413	99.7203
14	0.0022	99.7326	0.0055	99.7381	0.0200	99.4555	0.0363	99.9034	0.0064	99.6791
13	0.2301	99.7304	0.3978	99.7326	0.0838	99.4355	0.5372	99.8671	0.0400	99.6727
12	0.0121	99.5003	0.0169	99.3348	0.0649	99.3517	0.0819	99.3299	0.0303	99.6327
11	0.3166	99.4881	0.7483	99.3179	0.0997	99.2868	0.5095	99.2480	0.2357	99.6024
10	0.0165	99.1715	0.0782	98.5695	0.0911	99.1871	0.0107	98.7385	0.0000	99.3667
9	0.5756	99.1550	1.3165	98.4913	0.2901	99.0960	0.2893	98.7278	0.9064	99.3667
8	0.0998	98.5794	0.0293	97.1749	0.1414	98.8059	0.3505	98.4385	0.0009	98.4603
7	0.6640	98.4796	1.5963	97.1456	0.8058	98.6644	0.1190	98.0881	0.6133	98.4594
6	0.3053	97.8156	0.0001	95.5493	0.0237	97.8586	0.5157	97.9691	0.6177	97.8461
5	1.4264	97.5103	2.6589	95.5492	3.0976	97.8349	1.3613	97.4534	0.2850	97.2283
4	1.0641	96.0839	0.2113	92.8903	0.0000	94.7373	0.1720	96.0921	1.1593	96.9433
3	4.1069	95.0198	5.8093	92.6790	8.1470	94.7372	8.8296	95.9200	6.8333	95.7840
2	5.8602	90.9129	3.2031	86.8697	1.1778	86.5902	0.2196	87.0904	0.0143	88.9507
1	85.0528	85.0528	83.6666	83.6666	85.4124	85.4124	86.8708	86.8708	88.9364	88.9364

Perbandingan Effective Weight Struktur Tingkat 20

Mode Ke	Setback 5		Setback 6		Setback 7		Setback 8		Setback 9	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
20	0.0073	100	0.0082	100	0.0086	100	0.0089	100	0.0088	100
19	0.0111	99.9927	0.0125	99.9918	0.0131	99.9914	0.0179	99.9911	0.0176	99.9912
18	0.0596	99.9816	0.0258	99.9792	0.0295	99.9783	0.0251	99.9732	0.0175	99.9736
17	0.1105	99.9220	0.0674	99.9534	0.0553	99.9488	0.0481	99.9481	0.0447	99.9561
16	0.0018	99.8115	0.0071	99.8860	0.0037	99.8935	0.0041	99.9000	0.0033	99.9114
15	0.0141	99.8097	0.1369	99.8789	0.1074	99.8899	0.0777	99.8959	0.0577	99.9081
14	0.0001	99.7956	0.0000	99.7420	0.0000	99.7825	0.0024	99.8182	0.0027	99.8504
13	0.2306	99.7955	0.0578	99.7420	0.0488	99.7824	0.1386	99.8158	0.1167	99.8477
12	0.0460	99.5649	0.0088	99.6842	0.0366	99.7336	0.0070	99.6772	0.0021	99.7310
11	0.2319	99.5189	0.1609	99.6754	0.2882	99.6970	0.0433	99.6702	0.2468	99.7289
10	0.0684	99.2871	0.0334	99.5145	0.0219	99.4089	0.0273	99.6269	0.0105	99.4821
9	0.1138	99.2186	0.3926	99.4811	0.1871	99.3870	0.3269	99.5996	0.1872	99.4716
8	0.1014	99.1048	0.2441	99.0886	0.0124	99.1999	0.1059	99.2727	0.0064	99.2845
7	1.2145	99.0034	0.2203	98.8444	0.2947	99.1875	0.5476	99.1668	0.0436	99.2780
6	0.0157	97.7889	0.0055	98.6242	0.4297	98.8929	0.1287	98.6192	0.0047	99.2345
5	0.6833	97.7732	2.0132	98.6187	2.0099	98.4632	0.2302	98.4904	0.2620	99.2298
4	1.8864	97.0899	1.6368	96.6055	0.2786	96.4533	0.0003	98.2602	0.2917	98.9678
3	3.6319	95.2035	1.1812	94.9687	0.5757	96.1747	1.5355	98.2599	2.3233	98.6761
2	0.0589	91.5716	0.6619	93.7876	2.6007	95.5990	5.0592	96.7244	6.1204	96.3528
1	91.5128	91.5128	93.1257	93.1257	92.9983	92.9983	91.6653	91.6653	90.2324	90.2324

Tabel 6 Perbandingan Effective Mass Dan Effective Weight

Perbandingan Effective Mass Struktur Tingkat 20

Mode Ke	Tipikal		Setback 1		Setback 2		Setback 3		Setback 4	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
20	0.0129	100	0.0191	100	0.1878	100	0.0023	100	0.0065	100
19	0.0196	99.9871	0.0291	99.9809	0.2856	99.8122	0.0036	99.9977	0.0099	99.9935
18	0.0122	99.9675	0.0157	99.9518	0.0046	99.5265	0.0036	99.9941	0.0900	99.9836
17	0.0999	99.9553	0.0471	99.9361	0.0090	99.5220	0.0050	99.9905	0.1709	99.8936
16	0.0000	99.8554	0.0000	99.8890	0.0041	99.5129	0.0004	99.9855	0.0024	99.7227
15	0.1228	99.8554	0.1508	99.8889	0.0533	99.5088	0.0817	99.9851	0.0413	99.7203
14	0.0022	99.7326	0.0055	99.7381	0.0200	99.4555	0.0363	99.9034	0.0064	99.6791
13	0.2301	99.7304	0.3978	99.7326	0.0838	99.4355	0.5372	99.8671	0.0400	99.6727
12	0.0121	99.5003	0.0169	99.3348	0.0649	99.3517	0.0819	99.3299	0.0303	99.6327
11	0.3166	99.4881	0.7483	99.3179	0.0997	99.2868	0.5095	99.2480	0.2357	99.6024
10	0.0165	99.1715	0.0782	98.5695	0.0911	99.1871	0.0107	98.7385	0.0000	99.3667
9	0.5756	99.1550	1.3165	98.4913	0.2901	99.0960	0.2893	98.7278	0.9064	99.3667
8	0.0998	98.5794	0.0293	97.1749	0.1414	98.8059	0.3505	98.4385	0.0009	98.4603
7	0.6640	98.4796	1.5963	97.1456	0.8058	98.6644	0.1190	98.0881	0.6133	98.4594
6	0.3053	97.8156	0.0001	95.5493	0.0237	97.8586	0.5157	97.9691	0.6177	97.8461
5	1.4264	97.5103	2.6589	95.5492	3.0976	97.8349	1.3613	97.4534	0.2850	97.2283
4	1.0641	96.0839	0.2113	92.8903	0.0000	94.7373	0.1720	96.0921	1.1593	96.9433
3	4.1069	95.0198	5.8093	92.6790	8.1470	94.7372	8.8296	95.9200	6.8333	95.7840
2	5.8602	90.9129	3.2031	86.8697	1.1778	86.5902	0.2196	87.0904	0.0143	88.9507
1	85.0528	85.0528	83.6666	83.6666	85.4124	85.4124	86.8708	86.8708	88.9364	88.9364

Perbandingan Effective Mass Struktur Tingkat 20

Mode Ke	Setback 5		Setback 6		Setback 7		Setback 8		Setback 9	
	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi	% Jumlah	Akumulasi
20	0.0073	100	0.0082	100	0.0086	100	0.0089	100	0.0088	100
19	0.0111	99.9927	0.0125	99.9918	0.0131	99.9914	0.0179	99.9911	0.0176	99.9912
18	0.0596	99.9816	0.0258	99.9792	0.0295	99.9783	0.0251	99.9732	0.0175	99.9736
17	0.1105	99.9220	0.0674	99.9534	0.0553	99.9488	0.0481	99.9481	0.0447	99.9561
16	0.0018	99.8115	0.0071	99.8860	0.0037	99.8935	0.0041	99.9000	0.0033	99.9114
15	0.0141	99.8097	0.1369	99.8789	0.1074	99.8899	0.0777	99.8959	0.0577	99.9081
14	0.0001	99.7956	0.0000	99.7420	0.0000	99.7825	0.0024	99.8182	0.0027	99.8504
13	0.2306	99.7955	0.0578	99.7420	0.0488	99.7824	0.1386	99.8158	0.1167	99.8477
12	0.0460	99.5649	0.0088	99.6842	0.0366	99.7336	0.0070	99.6772	0.0021	99.7310
11	0.2319	99.5189	0.1609	99.6754	0.2882	99.6970	0.0433	99.6702	0.2468	99.7289
10	0.0684	99.2871	0.0334	99.5145	0.0219	99.4089	0.0273	99.6269	0.0105	99.4821
9	0.1138	99.2186	0.3926	99.4811	0.1871	99.3870	0.3269	99.5996	0.1872	99.4716
8	0.1014	99.1048	0.2441	99.0886	0.0124	99.1999	0.1059	99.2727	0.0064	99.2845
7	1.2145	99.0034	0.2203	98.8444	0.2947	99.1875	0.5476	99.1668	0.0436	99.2780
6	0.0157	97.7889	0.0055	98.6242	0.4297	98.8929	0.1287	98.6192	0.0047	99.2345
5	0.6833	97.7732	2.0132	98.6187	2.0099	98.4632	0.2302	98.4904	0.2620	99.2298
4	1.8864	97.0899	1.6368	96.6055	0.2786	96.4533	0.0003	98.2602	0.2917	98.9678
3	3.6319	95.2035	1.1812	94.9687	0.5757	96.1747	1.5355	98.2599	2.3233	98.6761
2	0.0589	91.5716	0.6619	93.7876	2.6007	95.5990	5.0592	96.7244	6.1204	96.3528
1	91.5128	91.5128	93.1257	93.1257	92.9983	92.9983	91.6653	91.6653	90.2324	90.2324

Tabel 7 Perbandingan Simpangan Maksimum Struktur Tingkat 10

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	2.58272346	2.01815459	1.5332019	1.22880473	1.53738634
2	5.01866027	3.9035919	2.94100747	2.33584392	2.91838767
3	7.26520975	5.6234763	4.19758446	3.30117415	4.11005613
4	9.29637295	7.1521894	5.28055145	4.10943338	5.17305208
5	11.0764659	8.46324822	6.17525772	4.74823461	6.09856854
6	12.5878579	9.55019793	6.87313434	5.28211479	6.87694118
7	13.8106777	10.3853245	7.36287418	5.70665072	7.49906469
8	14.7137078	10.9506655	7.72235153	6.0178734	7.9567705
9	15.2790959	11.2380787	7.94698594	6.21227285	8.24331424
10	15.4973304	11.3492865	8.03369399	6.28730351	8.35403394

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	0.50433813	0.44417752	0.45570141	0.46917316	0.46424298
2	0.97867025	0.85018629	0.88507229	0.92005801	0.85665573
3	1.39902683	1.23864436	1.26023019	1.32065077	1.19795583
4	1.75854185	1.60247164	1.57793035	1.63658592	1.49360995
5	2.04964813	1.94815882	1.83825274	1.86090739	1.73987207
6	2.25320584	2.26656876	2.02439991	2.03808645	1.9420698
7	2.36507694	2.55390752	2.1398313	2.17032821	2.09336114
8	2.57597341	2.77457763	2.21898559	2.25413648	2.19104113
9	2.79675329	2.89491447	2.26637276	2.30220805	2.2500233
10	2.88188144	2.94293684	2.28537154	2.32621761	2.27275979

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	0.56394016	0.60538325	0.64997357	0.66035463	0.62471782
2	1.12741954	1.22400746	1.29842981	1.30724228	1.24365167
3	1.70769928	1.81720759	1.90719343	1.89776373	1.80400587
4	2.25490336	2.35562493	2.44457695	2.39958769	2.31194365
5	2.74183439	2.80952816	2.87734877	2.78338045	2.74208804
6	3.14494693	3.17049022	3.20903618	3.10452933	3.09773551
7	3.45994043	3.44139415	3.43386427	3.35321808	3.37451975
8	3.69046639	3.61751338	3.59385741	3.53073797	3.57045823
9	3.83382791	3.70194047	3.69112129	3.63954803	3.69040595
10	3.88798326	3.73381114	3.72892501	3.68114715	3.73709483

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	0.48139161	0.40716119	0.40383494	0.38336199	0.4462823
2	0.94586584	0.78948459	0.79738107	0.75266084	0.78407355
3	1.32767538	1.1747412	1.15754437	1.07464188	1.12388028
4	1.57169085	1.48717242	1.45862171	1.34605652	1.41321428
5	1.69321019	1.7169077	1.72297429	1.61183442	1.66343214
6	1.80861147	1.90459623	1.9345849	1.82815856	1.8787224
7	2.03044352	2.03050161	2.05520022	1.98107669	2.02950418
8	2.32125697	2.29922575	2.12454408	2.07807269	2.11392623
9	2.51519497	2.47155567	2.15588465	2.13376564	2.14986153
10	2.59503189	2.54646333	2.1673763	2.15629106	2.15903563

Tabel 7 Perbandingan Simpangan Maksimum Struktur Tingkat 15

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	0.42191543	0.39176316	0.41958842	0.43729711	0.44952482	0.44627009	0.43528715
2	0.81833295	0.79756252	0.84964189	0.88245389	0.90243543	0.8926882	0.86339396
3	1.16937454	1.20936132	1.27934625	1.32236764	1.34623911	1.32310164	1.26683371
4	1.53136633	1.616019	1.69459169	1.74652872	1.7642927	1.72234245	1.62999055
5	1.92027096	2.00556838	2.08435132	2.14003597	2.14385156	2.0802865	1.9695027
6	2.29308391	2.36729833	2.44266978	2.49172525	2.48094659	2.38821552	2.27716208
7	2.63812811	2.69417641	2.75877594	2.79706121	2.7683419	2.6628659	2.55200253
8	2.94728946	2.98420821	3.02711664	3.05675627	3.0015843	2.90488777	2.79753784
9	3.21684135	3.22924414	3.24961773	3.26283212	3.20239392	3.11665398	3.0058059
10	3.44648432	3.42855377	3.42664725	3.41621935	3.37137591	3.29296499	3.17773434
11	3.63947122	3.58542347	3.55847793	3.54082911	3.512757	3.43642569	3.32106652
12	3.7919419	3.7012532	3.64698937	3.63759587	3.62328101	3.54775857	3.43282397
13	3.90342795	3.77749276	3.71043803	3.70943091	3.70324475	3.62782222	3.51283444
14	3.97323538	3.8151249	3.74961788	3.75464773	3.75295247	3.67738503	3.56212057
15	4.00094044	3.82997989	3.76507214	3.77259412	3.77263923	3.69696931	3.58151492

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	0.36172956	0.31775492	0.28157454	0.28824729	0.28444443	0.2524839	0.26097185
2	0.6962727	0.62957703	0.55481219	0.57085773	0.56280489	0.50337639	0.52142455
3	1.01162926	0.9149948	0.83137006	0.843726	0.83112542	0.74806548	0.76128579
4	1.29517691	1.1503713	1.09945191	1.10198478	1.07951876	0.97479632	0.96457402
5	1.51865549	1.32275575	1.346907	1.33599119	1.29359	1.16627165	1.14001285
6	1.67173977	1.4991959	1.54760815	1.53343741	1.47092909	1.33532614	1.29403443
7	1.76626153	1.65880214	1.70906051	1.70339497	1.63634638	1.52011325	1.44222152
8	1.82230783	1.77240648	1.84400262	1.85396462	1.78285011	1.69151067	1.60751093
9	1.89273058	1.86029687	1.96063304	1.97985329	1.90427996	1.83190693	1.75766625
10	1.99070244	2.04480701	2.04951268	2.05480281	1.99459391	1.94116023	1.87643545
11	2.1495071	2.27372724	2.10548788	2.102666	2.05699705	2.02617764	1.97474598
12	2.33406418	2.44845453	2.26571487	2.13058618	2.10291984	2.09084711	2.07739701
13	2.46454657	2.56498143	2.3927889	2.14628754	2.13256173	2.13877	2.16509679
14	2.54692115	2.62833035	2.47726081	2.15467666	2.14825275	2.16529315	2.2298279
15	2.57852149	2.6551927	2.51200975	2.15779926	2.15354891	2.17427649	2.25798926

Tabel 7 Perbandingan Simpangan Maksimum Struktur Tingkat 15

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	1.90427688	1.63361566	1.33007426	1.12479743	0.96489822	0.84112029	0.76249585
2	3.74276977	3.20525974	2.60221279	2.19205651	1.8714733	1.62587535	1.4682504
3	5.49867205	4.6996053	3.80538665	3.19093483	2.71102125	2.34744455	2.10835423
4	7.15949156	6.10535096	4.92938073	4.11403852	3.47753411	3.00003055	2.67821188
5	8.71338902	7.41322615	5.96517446	4.95336047	4.16376113	3.57740513	3.20288327
6	10.1518002	8.61757018	6.91027961	5.70465585	4.76610268	4.07639569	3.67907309
7	11.4719761	9.71094759	7.75738691	6.36377397	5.2854065	4.5282546	4.10693658
8	12.660816	10.6842733	8.49917944	6.92602999	5.7168359	4.93057443	4.48513597
9	13.7085433	11.5343378	9.13310022	7.38778171	6.09395869	5.28188115	4.81287623
10	14.608829	12.2508758	9.65130251	7.74572543	6.41523506	5.58077562	5.10012388
11	15.3655028	12.8325811	10.0531755	8.04330921	6.68246538	5.82908919	5.34712093
12	15.9667112	13.2736177	10.3337925	8.27895117	6.89423949	6.02565174	5.54279084
13	16.4073635	13.569469	10.5394597	8.45129459	7.04927328	6.16943126	5.68831972
14	16.6838444	13.717492	10.6685381	8.55928093	7.14648839	6.25954522	5.78005045
15	16.7938933	13.7762735	10.7199262	8.60230043	7.1851784	6.29761195	5.81652079

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	0.37527464	0.32549023	0.3302177	0.3128841	0.3171286	0.32487145	0.31419815
2	0.74387884	0.63823737	0.6449069	0.60992616	0.61981899	0.64336023	0.61553414
3	1.09376817	0.9281177	0.93013405	0.88506475	0.91517059	0.94190522	0.88369778
4	1.41028778	1.19499717	1.1951668	1.14240302	1.18685456	1.21387324	1.11306213
5	1.69239612	1.43649106	1.44884688	1.36933313	1.43406345	1.45032959	1.32367571
6	1.93877511	1.64371056	1.68701929	1.57122136	1.64439585	1.63659483	1.51079157
7	2.14523563	1.82161345	1.9049374	1.75583088	1.815909	1.79671915	1.67593908
8	2.31491791	2.01495622	2.10710659	1.90844016	1.95068395	1.93377481	1.82141374
9	2.44289087	2.22479903	2.29452018	2.02229693	2.06244582	2.04831296	1.95987723
10	2.5228645	2.47088735	2.45949681	2.1035302	2.1504833	2.14106572	2.08356642
11	2.55954712	2.69204055	2.59959732	2.16980465	2.22388085	2.21564658	2.18789988
12	2.59990682	2.8700643	2.70959794	2.22049623	2.27525449	2.26560159	2.26826696
13	2.69461141	2.99062199	2.79127042	2.26104283	2.32919034	2.2962297	2.3327497
14	2.75533378	3.05515469	2.84370437	2.29992939	2.37944348	2.31310349	2.37745418
15	2.7815048	3.08097383	2.86574027	2.31525301	2.4032215	2.32202945	2.39811809

Tabel 7 Perbandingan Simpangan Maksimum Struktur Tingkat 20

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	3.68962	3.65542	3.58756	3.48475	3.31841	3.11177	2.87399	2.64024	2.44094	3.04430
2	7.31799	7.24884	7.11291	6.90746	6.57428	6.15707	5.67900	5.21069	4.81180	6.01175
3	10.86411	10.75731	10.55121	10.24216	9.73909	9.10767	8.38779	7.68513	7.08722	8.86788
4	14.31072	14.16189	13.88122	13.46498	12.78827	11.94019	10.97779	10.04223	9.24713	11.64011
5	17.64102	17.44434	17.08253	16.55244	15.69848	14.63234	13.42826	12.26185	11.27213	14.31242
6	20.84053	20.58737	20.13633	19.48252	18.44778	17.16322	15.71934	14.32429	13.20551	16.86980
7	23.89209	23.57474	23.02420	22.23541	21.01559	19.51318	17.83204	16.21214	15.03764	19.29839
8	26.77978	26.39214	25.72860	24.79347	23.38342	21.66338	19.74943	17.98639	16.75986	21.58568
9	29.48861	29.02293	28.23350	27.14078	25.53453	23.59681	21.45713	19.63900	18.36432	23.72055
10	32.00470	31.45116	30.52405	29.26325	27.45375	25.29940	23.03177	21.16263	19.84386	25.69425
11	34.32400	33.67278	32.59715	31.15882	29.13979	26.77181	24.47353	22.55728	21.19824	27.50747
12	36.43392	35.67514	34.44058	32.81547	30.58239	28.10103	25.77685	23.81747	22.42208	29.14889
13	38.32238	37.44646	36.04326	34.22643	31.77337	29.28246	26.93676	24.93838	23.51065	30.61073
14	39.97862	38.97600	37.39483	35.38061	32.80949	30.31189	27.94861	25.91577	24.45979	31.88649
15	41.39257	40.25433	38.48588	36.26964	33.68751	31.18547	28.80827	26.74576	25.26582	32.97064
16	42.57004	41.28813	39.32439	37.00585	34.41398	31.90923	29.52108	27.43375	25.93396	33.87003
17	43.50384	42.07025	39.90488	37.58674	34.98680	32.48048	30.08408	27.97702	26.46156	34.58081
18	44.18785	42.59475	40.32833	38.01038	35.40427	32.89722	30.49499	28.37339	26.84655	35.09986
19	44.61716	42.85751	40.59312	38.27529	35.66516	33.15783	30.75209	28.62132	27.08738	35.42476
20	44.78806	42.96197	40.69831	38.38055	35.76878	33.26139	30.85427	28.71984	27.18312	35.55391

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	0.51791	0.55066	0.55456	0.57235	0.58021	0.60252	0.57000	0.53978	0.48187	0.53000
2	1.04117	1.09376	1.12141	1.15017	1.16862	1.19573	1.12591	1.06767	0.95259	1.04601
3	1.55422	1.60795	1.68983	1.72095	1.73848	1.76147	1.68531	1.56587	1.40763	1.57587
4	2.03478	2.07160	2.23520	2.27319	2.29108	2.31089	2.20187	2.01532	1.83301	2.08826
5	2.47003	2.53733	2.75197	2.81673	2.83246	2.81037	2.65715	2.42024	2.21677	2.55922
6	2.84472	3.02096	3.23636	3.31618	3.31996	3.23893	3.05443	2.77226	2.57184	2.98232
7	3.15056	3.46067	3.66032	3.75432	3.74428	3.60685	3.38721	3.07406	2.89308	3.36147
8	3.44370	3.85807	4.01327	4.12704	4.10707	3.91163	3.63996	3.33894	3.17361	3.69491
9	3.79131	4.21429	4.30668	4.44017	4.39927	4.14026	3.81973	3.56492	3.40865	3.97564
10	4.10676	4.53284	4.54825	4.68983	4.61317	4.30061	3.95898	3.74460	3.59735	4.21045
11	4.38789	4.82361	4.74927	4.88154	4.76548	4.41062	4.05998	3.88717	3.74366	4.40697
12	4.64108	5.07548	4.95337	5.04455	4.88753	4.50960	4.20594	3.99776	3.85137	4.59891
13	4.85379	5.29426	5.21963	5.21373	5.00553	4.61339	4.34020	4.08584	3.92698	4.81878
14	5.07626	5.47438	5.52463	5.43978	5.14155	4.72113	4.47166	4.17230	3.97860	5.05640
15	5.32564	5.61887	5.79104	5.67961	5.31229	4.83724	4.60328	4.27029	4.01458	5.31567
16	5.53547	5.82023	6.00077	5.89451	5.48856	4.96153	4.72633	4.36980	4.10766	5.56285
17	5.70670	5.98287	6.15173	6.07067	5.63776	5.07134	4.83471	4.46886	4.26319	5.77035
18	5.83325	6.09250	6.26637	6.20398	5.74666	5.15652	4.92346	4.55304	4.38297	5.92626
19	5.91099	6.14738	6.34135	6.29004	5.81857	5.20799	4.98676	4.61164	4.45988	6.02345
20	5.94066	6.17004	6.37213	6.32492	5.84744	5.22770	5.01307	4.63521	4.48966	6.06217

Tabel 8 Perbandingan Interstorey Drift Maksimum Struktur Tingkat 7

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	0.28936461	0.28962969	0.26998808	0.30727531
2	0.25347003	0.26680542	0.24590249	0.27930822
3	0.2126478	0.22770062	0.20923934	0.2266449
4	0.16846613	0.17855679	0.15794447	0.18480466
5	0.12228538	0.12283003	0.11950171	0.13555954
6	0.074297	0.05944122	0.07530004	0.08278569
7	0.02509508	0.01959291	0.02542851	0.02756667

Gemoa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	0.09837747	0.10789101	0.10546723	0.10895553
2	0.0961123	0.09842169	0.10167389	0.09342494
3	0.09429363	0.09070946	0.09646314	0.09444416
4	0.09314669	0.08744551	0.08981627	0.09219655
5	0.086363	0.07541333	0.07573868	0.08203568
6	0.06364931	0.043963	0.05265864	0.05821982
7	0.02369683	0.01708943	0.01999057	0.02098516

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	0.19393645	0.18697448	0.22857286	0.19299286
2	0.17934404	0.17255907	0.21415566	0.17648813
3	0.15889537	0.17516549	0.19880024	0.19109389
4	0.13779197	0.16773957	0.168616	0.1845289
5	0.12772043	0.13064796	0.13484391	0.15587651
6	0.09188161	0.06876623	0.08696808	0.10454893
7	0.0332966	0.02338256	0.02946717	0.03624152

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	0.12644477	0.12156854	0.12768725	0.13103862
2	0.11862317	0.11284029	0.12187785	0.12556481
3	0.10749611	0.10810049	0.11613064	0.11030793
4	0.09737467	0.09308695	0.09324616	0.09072769
5	0.08653682	0.07679773	0.06919723	0.07463596
6	0.06838458	0.05055488	0.04643898	0.05835232
7	0.02590706	0.01884938	0.01653285	0.02202166

Tabel 8 Perbandingan Interstorey Druft Maksimum Struktur Tingkat 10

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	0.64568087	0.50453865	0.38330047	0.30720118	0.38434658
2	0.6089842	0.47155991	0.35195139	0.27685587	0.34530093
3	0.56267202	0.43059738	0.31431192	0.24184523	0.29840567
4	0.50864768	0.38353981	0.27147174	0.20287044	0.26676242
5	0.44754339	0.33080044	0.22407561	0.16333832	0.23179199
6	0.38161187	0.27416639	0.17630041	0.13909054	0.19748618
7	0.30894938	0.21201094	0.12603134	0.11279071	0.16024322
8	0.22986909	0.14487348	0.09354407	0.08431708	0.11953618
9	0.14516128	0.073115	0.05894295	0.05347473	0.07566508
10	0.05642563	0.02833289	0.02285654	0.0208208	0.02942535

Gempa El Centro

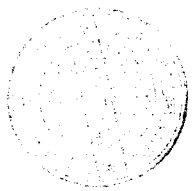
Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	0.12608453	0.11104438	0.11392535	0.11729329	0.11606074
2	0.11877258	0.10713218	0.10760572	0.11296723	0.1016684
3	0.10594663	0.10548249	0.10002474	0.10061579	0.09270443
4	0.09333406	0.10615503	0.08978458	0.07904046	0.08507769
5	0.09358071	0.10604063	0.07469409	0.07610574	0.07361502
6	0.09860322	0.10279763	0.07635663	0.07877773	0.08059401
7	0.09591976	0.09015379	0.07108559	0.07488701	0.08117649
8	0.08221342	0.06678581	0.05984323	0.06163241	0.07096019
9	0.05578385	0.03668769	0.04134781	0.04159218	0.05052327
10	0.02214359	0.01527809	0.01696526	0.01681678	0.02121834

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	0.14098504	0.15134581	0.16249339	0.16508866	0.15617945
2	0.14505388	0.15470357	0.16242492	0.16200548	0.15483666
3	0.14571451	0.14916957	0.15323242	0.14955345	0.1422061
4	0.13804773	0.13605972	0.13600503	0.12863485	0.12921673
5	0.12331712	0.11846158	0.11453271	0.10307922	0.1136674
6	0.12414033	0.11277251	0.10140636	0.10713983	0.10896778
7	0.12400245	0.1019944	0.09246428	0.10676758	0.10133304
8	0.10844919	0.07977437	0.08400019	0.09431962	0.09759938
9	0.07698934	0.05318322	0.0616177	0.06908961	0.07452229
10	0.03576542	0.02310493	0.02629234	0.0294082	0.03238846

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	0.1203479	0.1017903	0.10095873	0.0958405	0.11157057
2	0.11661918	0.10201891	0.10093451	0.09483104	0.10199698
3	0.09660515	0.10107958	0.09549216	0.0831909	0.08889447
4	0.08709062	0.08488562	0.07843915	0.08170089	0.07410227
5	0.08640819	0.0957229	0.07100571	0.06787409	0.07275855
6	0.09386791	0.09490479	0.06842908	0.06775832	0.07759698
7	0.09345611	0.08741063	0.06461697	0.06343094	0.07699659
8	0.07797551	0.07121894	0.05547812	0.0534686	0.06762007
9	0.05859977	0.04464424	0.03950841	0.03826042	0.05002309
10	0.02615577	0.01931838	0.01667775	0.01631617	0.02168782



Tabel 8 Perbandingan Interstorey Druft Maksimum Struktur Tingkat 15

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	0.47606922	0.40840391	0.33251856	0.28119936	0.24122456	0.21028007	0.19062396
2	0.45962322	0.39291102	0.31818004	0.26681477	0.22671708	0.19628171	0.17643864
3	0.43897557	0.37359917	0.30079347	0.24971958	0.20998414	0.1803923	0.16013794
4	0.41550717	0.35200573	0.28154234	0.23097965	0.19186193	0.1633439	0.14253792
5	0.38932213	0.32807459	0.26035318	0.21041213	0.17238046	0.14487412	0.13136024
6	0.36080554	0.30194072	0.23722651	0.18814278	0.15155779	0.12600575	0.12082474
7	0.33113874	0.27511516	0.21345595	0.16541628	0.13116275	0.11532374	0.11043775
8	0.29918919	0.24599419	0.18784531	0.14302853	0.11138687	0.10404957	0.0995961
9	0.26471619	0.21478458	0.16044391	0.11910642	0.09870335	0.09208026	0.08815196
10	0.22803141	0.18133157	0.13116599	0.09374807	0.0851678	0.07935255	0.07603427
11	0.19122378	0.14800872	0.10212078	0.07864217	0.0716582	0.0667619	0.06391262
12	0.15261447	0.11281857	0.07173587	0.06280002	0.0574154	0.05351523	0.0512187
13	0.11220546	0.07614633	0.05278779	0.04626881	0.04245837	0.03959892	0.03790787
14	0.07048907	0.03840513	0.03323482	0.0291505	0.02684086	0.02505063	0.0239923
15	0.02809922	0.01531162	0.01325525	0.01163173	0.01073533	0.01002409	0.00960479

Interstorey Drift Maksimum Struktur Tingkat 15 Akibat Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	0.09381866	0.08137256	0.08255442	0.07822102	0.07928215	0.08121786	0.07854954
2	0.09215105	0.0784745	0.07875226	0.07448373	0.07686415	0.07998121	0.07537857
3	0.08747233	0.07275382	0.07597371	0.0702625	0.07461104	0.07463625	0.06805635
4	0.07943628	0.06784154	0.07365935	0.06780528	0.06916634	0.06920344	0.06118647
5	0.07225414	0.06607559	0.0727184	0.06429419	0.06258834	0.05932025	0.05664897
6	0.06333948	0.06888614	0.07113932	0.05878638	0.0540742	0.05215074	0.05418446
7	0.06110698	0.07138213	0.0708857	0.05241128	0.04891482	0.05195649	0.05208352
8	0.06022351	0.07260295	0.06874628	0.0506391	0.05299173	0.05482818	0.0546665
9	0.06096086	0.07214296	0.06523755	0.05264924	0.0536539	0.05546298	0.05506722
10	0.05971156	0.06848963	0.05844709	0.0503519	0.05162917	0.05350459	0.05330259
11	0.05585949	0.0606593	0.04805632	0.04593044	0.04662181	0.04832294	0.04851588
12	0.0486902	0.04891141	0.03631559	0.03873921	0.03894441	0.04018167	0.04187028
13	0.03830605	0.03441104	0.02828659	0.02972741	0.02963999	0.03039318	0.03343209
14	0.02510258	0.01778982	0.01852398	0.01935324	0.01927548	0.01962758	0.02318228
15	0.01029474	0.00714532	0.00763488	0.00790066	0.00786088	0.00800904	0.00988152

Tabel 8 Perbandingan Interstorey Druft Maksimum Struktur Tingkat 15

Interstorey Drift Maksimum Struktur Tingkat 15 Akibat Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	0.10547886	0.09794079	0.10489711	0.10932428	0.1123812	0.11156752	0.10882179
2	0.09910438	0.10175677	0.1077382	0.11145847	0.11356726	0.11165488	0.10707195
3	0.09872644	0.10320387	0.10778127	0.11067369	0.11102087	0.10786121	0.10109795
4	0.09973187	0.10189628	0.10447171	0.10628464	0.10521936	0.10073107	0.09287958
5	0.09781145	0.09775565	0.09830887	0.09895797	0.09666207	0.09113282	0.08739562
6	0.0933901	0.09135575	0.0902747	0.08967782	0.08636007	0.08019667	0.08119933
7	0.08710161	0.08380812	0.0817928	0.07964155	0.07506683	0.07333141	0.07467402
8	0.08653878	0.0786996	0.07962645	0.07691657	0.06913722	0.07239296	0.0676582
9	0.09181095	0.08135344	0.07763301	0.07170503	0.07288214	0.07578386	0.06625002
10	0.09131273	0.07881049	0.07008822	0.06559323	0.0730197	0.0759332	0.06789852
11	0.08534856	0.07063798	0.0600611	0.06327895	0.06927891	0.07195713	0.06576674
12	0.07433606	0.05913038	0.05160701	0.05664496	0.06059934	0.06311565	0.05892104
13	0.05923819	0.0459703	0.04197442	0.04522849	0.04820731	0.05026587	0.04714321
14	0.03961296	0.02577873	0.02852466	0.03018289	0.0318939	0.03329136	0.03178801
15	0.01678845	0.01084939	0.01188072	0.01256614	0.01315496	0.01380101	0.0132524

Interstorey Drift Maksimum Struktur Tingkat 15 Akibat Gempa Kovna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	0.09043239	0.07943873	0.07039363	0.07206182	0.07111111	0.06312098	0.06524296
2	0.08496668	0.07825442	0.07020665	0.07139549	0.07034804	0.06349021	0.06511318
3	0.08163881	0.07176665	0.07158135	0.0703829	0.06905983	0.06225791	0.06062621
4	0.07175298	0.06894761	0.07031977	0.0684471	0.06469297	0.05769115	0.05120879
5	0.06230555	0.06419562	0.06471556	0.06234929	0.054755	0.05443356	0.05424083
6	0.05629052	0.05723832	0.05998386	0.05191512	0.05351126	0.05291043	0.05471699
7	0.06018589	0.06084037	0.06225241	0.04928101	0.04864104	0.04937442	0.05182646
8	0.06021754	0.06575085	0.06359766	0.0538607	0.04339542	0.04744311	0.04923282
9	0.06506149	0.06963491	0.06458298	0.053953	0.04393794	0.04783518	0.04888073
10	0.06628411	0.06669141	0.05919974	0.04795295	0.04227968	0.04655201	0.046936
11	0.06076992	0.05723006	0.04992641	0.04349562	0.03875506	0.04208331	0.04185026
12	0.05045009	0.04578207	0.0401152	0.03744808	0.03198444	0.03486067	0.03414195
13	0.04159684	0.0343146	0.03203335	0.02915177	0.02566754	0.02653898	0.02634798
14	0.02970578	0.01856036	0.02126488	0.01902178	0.01741471	0.01787031	0.01808234
15	0.01271844	0.00759699	0.00871515	0.00772549	0.00728618	0.00753174	0.00763894

Tabel 8 Perbandingan Interstorey Druft Maksimum Struktur Tingkat 20

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	0.9224052	0.9138543	0.8968896	0.8711879	0.8296034	0.7779428	0.7184968	0.660059	0.6102345	0.7610754
2	0.9070928	0.8983556	0.8813537	0.8556771	0.8139676	0.7613258	0.7012537	0.6426137	0.5927152	0.7418614
3	0.8865304	0.8771177	0.859577	0.8336754	0.7912011	0.7376489	0.6771967	0.6186097	0.5688563	0.714032
4	0.8617639	0.8511461	0.8325022	0.8057033	0.7622965	0.7081309	0.6474999	0.5892761	0.5399757	0.6930593
5	0.8328577	0.820707	0.8003895	0.771867	0.7275522	0.6730378	0.612618	0.554905	0.5062515	0.6680797
6	0.7999144	0.7860244	0.7634891	0.7325183	0.6873245	0.6327194	0.5727692	0.5156085	0.4833454	0.639524
7	0.7628908	0.7472377	0.7219664	0.6882244	0.6419531	0.5874901	0.5281756	0.4719625	0.4580316	0.607514
8	0.721921	0.704468	0.6760992	0.6396839	0.591957	0.5375506	0.4793477	0.4435618	0.4306835	0.5723884
9	0.6772084	0.6576985	0.6263235	0.5872612	0.5377765	0.4833563	0.426926	0.4133436	0.4014576	0.5345109
10	0.6290225	0.6070572	0.5729232	0.5312644	0.4798067	0.4256465	0.3937069	0.3812954	0.3703663	0.4942241
11	0.5798252	0.5554041	0.5186982	0.4747556	0.4217864	0.3681036	0.3605633	0.3491493	0.3391175	0.4537045
12	0.5274794	0.5005898	0.4613517	0.4155421	0.3611239	0.3323052	0.3259516	0.315541	0.3064375	0.4109778
13	0.4721152	0.442829	0.4011935	0.3536279	0.2983402	0.295357	0.2900563	0.2806413	0.2725144	0.3662514
14	0.4140593	0.382385	0.3384659	0.2893966	0.2597302	0.2573575	0.2529939	0.244636	0.2375246	0.3198706
15	0.3534882	0.3195837	0.273404	0.2232447	0.220247	0.2183951	0.2149132	0.2076541	0.2016301	0.2719041
16	0.2943668	0.25845	0.2103559	0.1849918	0.1823416	0.1809885	0.1782021	0.1720592	0.1670864	0.2255442
17	0.2334511	0.1955302	0.1457687	0.1460258	0.1438555	0.1428981	0.1407505	0.1358186	0.1319065	0.1782069
18	0.1710517	0.1311353	0.1063861	0.106519	0.1048921	0.104275	0.1027278	0.0990919	0.0962473	0.1301071
19	0.1073829	0.065716	0.0665491	0.0666123	0.0655827	0.065219	0.0642758	0.0619827	0.0602077	0.0814307
20	0.042747	0.0261274	0.0264444	0.0264676	0.0260598	0.0259194	0.0255439	0.0246295	0.0239327	0.0323667

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	0.1294776	0.1376653	0.1386409	0.1430866	0.1450535	0.1506294	0.1424993	0.1349442	0.1204668	0.1324991
2	0.1314021	0.1362232	0.1426737	0.145419	0.1472588	0.1486838	0.1422539	0.1340149	0.1182305	0.1337905
3	0.1292441	0.1308979	0.1431974	0.1434734	0.1431557	0.1451308	0.139884	0.1261566	0.1137886	0.1331518
4	0.1229831	0.1299612	0.1363783	0.1411989	0.1438695	0.1396388	0.1294652	0.1155515	0.1063932	0.1282632
5	0.1156216	0.1280183	0.1314724	0.136578	0.1357829	0.1250461	0.1143677	0.1048142	0.0960698	0.1184235
6	0.1130256	0.1221148	0.1210998	0.1256932	0.1218751	0.112077	0.1010127	0.0916475	0.0890095	0.1065746
7	0.10761	0.113762	0.1071921	0.1114906	0.1079673	0.0978252	0.0914421	0.0789146	0.0808737	0.0958469
8	0.1020329	0.1093658	0.1107299	0.1051837	0.0949092	0.0881159	0.0825645	0.0717078	0.0708418	0.0965386
9	0.1056513	0.11249	0.1116337	0.1061414	0.0955646	0.0857794	0.0790606	0.0741136	0.067723	0.1007472
10	0.1097861	0.1125687	0.1133055	0.108478	0.0942087	0.0839385	0.0798695	0.0783609	0.0710924	0.103032
11	0.1097524	0.1087277	0.11028	0.1071978	0.0944192	0.0810296	0.0790024	0.0792702	0.0722237	0.1061367
12	0.1047399	0.1005643	0.1064496	0.1051099	0.0894574	0.0759311	0.0771723	0.0761472	0.0703843	0.104894
13	0.0970824	0.0926422	0.0977523	0.0947344	0.0784459	0.0701439	0.0744633	0.0718527	0.0694269	0.0977868
14	0.0882475	0.0829863	0.082848	0.0800087	0.0711615	0.0661961	0.0705893	0.0673892	0.0675712	0.0881574
15	0.0778526	0.0702637	0.0673091	0.0642514	0.0623597	0.0605296	0.064744	0.0611925	0.0620749	0.0774474
16	0.0653948	0.0558354	0.0525538	0.0542809	0.0533135	0.0530275	0.0567454	0.0537895	0.0541206	0.0648369
17	0.0531456	0.0446993	0.0383137	0.0440615	0.0432181	0.043147	0.0462782	0.0450087	0.0448414	0.0519932
18	0.0420134	0.0324369	0.0290713	0.0335007	0.0327064	0.0319694	0.0348248	0.0351248	0.0341158	0.039129
19	0.028031	0.0170534	0.0189326	0.0218958	0.0209586	0.0200091	0.0227175	0.0234135	0.022343	0.0253257
20	0.0117524	0.0069818	0.0077305	0.008979	0.0084831	0.0081215	0.0093982	0.0096911	0.0092735	0.0104207

Tabel 9 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 7

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	12072.3457	12052.4626	11439.0961	12071.2643
2	13443.3082	13159.9959	12303.7276	13439.3396
3	14402.7826	15825.5177	16375.4958	10599.3211
4	14919.9396	17955.3952	12435.9248	12311.2787
5	15186.7983	19809.004	14233.66	13341.2844
6	15562.6077	12452.596	15584.8541	13804.7562
7	7842.21098	6122.78498	7946.40943	6891.66732

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	10874.0136	11031.7658	12143.3035	10956.736
2	14876.53	13635.1866	14980.6056	15331.2862
3	14439.5931	13399.5984	16278.2142	8975.69978
4	11208.9011	9791.76607	6905.00193	6728.981
5	7988.36543	10848.0644	8603.7784	6101.40201
6	12510.2525	8583.00853	10400.2647	9308.66352
7	7405.2588	5340.44536	6247.05252	5246.29076

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	13498.1391	11382.4399	15531.0839	12060.1462
2	12255.5278	12723.6975	17161.7224	14752.6054
3	12882.1248	13869.1627	17188.4886	8946.46685
4	14105.4488	14322.5759	11398.8196	9078.97324
5	12463.2204	19609.6415	15179.2968	13150.7226
6	18458.8496	14182.3957	17969.0337	17076.8509
7	10405.1888	7307.04985	9208.49203	9060.38114

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	10419.8644	8965.49	9283.39988	10425.567
2	10732.3648	10107.8157	9886.77328	12613.4141
3	14646.4107	10521.2385	11165.3417	6245.8119
4	9908.10192	12065.2094	7515.28874	7782.06132
5	10269.9679	13446.9696	8611.16916	8098.52299
6	13358.2436	9907.96957	9345.66558	9082.66517
7	8095.95503	5890.43	5166.51579	5505.41577

Tabel 9 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 15

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	24880.463	24459.0612	24170.9091	23861.7477	23574.7888	23095.6796	22397.6144
2	31905.8388	30765.9395	28601.1481	27684.9268	27181.9788	25972.1201	25285.0992
3	37443.4643	35396.3334	32174.0963	30126.1349	29210.7085	27342.0651	27223.0747
4	42478.1542	39562.5327	35248.3316	32440.7381	30829.3971	28655.524	17328.8891
5	46753.6816	43120.9407	37830.1613	34469.2369	32155.3417	30362.7444	18234.922
6	47953.1054	43866.5939	38126.9018	34672.5985	31843.2332	17963.532	18129.9256
7	50905.4743	46292.0344	40073.3113	36338.4237	33132.5237	18704.2243	18777.4561
8	53663.2833	48646.9796	42089.2157	37792.8633	20605.5946	19401.5441	19247.8628
9	56454.0725	51142.0319	44192.2316	39073.0896	21253.8981	19996.7971	19488.163
10	55796.375	50583.2978	43732.7712	22746.219	20542.9526	19291.6639	18560.66
11	58395.8059	52991.8594	45671.6487	23773.12	21411.7522	20127.1032	19323.3963
12	60751.0577	55139.1929	28433.9644	24807.1482	22444.8989	20935.9082	20101.2034
13	62600.6528	56716.5105	29341.6713	25688.174	23437.9256	21831.5273	20882.0514
14	63662.0248	34654.6911	29981.845	26289.0989	24168.3624	22549.2038	21590.2657
15	42166.3912	22977.003	19891.1603	17454.8645	16109.7021	15042.4028	14413.1853

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	17988.9454	18470.8153	19514.3928	20586.8851	21674.0768	25787.4122	21937.995
2	21653.8272	24206.4714	25839.7933	27517.8825	28634.0588	31650.9824	27658.8762
3	26704.8613	29464.7485	29232.9961	27913.1861	29166.4456	27856.519	32171.6539
4	29424.414	28632.5862	25224.0289	24082.889	25835.5865	25764.7219	21413.3391
5	26808.8973	24304.0659	21806.1682	24868.3394	25718.65	32555.2868	23075.6522
6	21921.4184	22839.6032	26054.8059	26415.7305	26914.0151	18124.7854	21279.4329
7	22638.0454	25200.8501	25624.0321	24381.0235	26312.9058	16991.4758	19767.9241
8	23318.9712	22994.9288	21718.6046	22296.4944	13944.4998	15158.3181	17480.2167
9	20741.6985	18967.8763	16524.057	17631.8087	11019.8897	12215.9457	13520.2109
10	16240.8964	19614.0633	19698.6671	12345.7253	12868.8517	13128.0898	12727.4934
11	20911.2744	20900.9777	20808.0273	12432.0938	12939.1696	12876.2579	12339.5128
12	18940.2739	22738.8408	13452.008	14069.1486	14604.3177	15195.6488	16069.7133
13	20277.1341	25228.2698	14805.6989	15929.4987	16054.1912	16637.0143	17888.828
14	22486.2505	15990.5454	16462.2864	17249.4243	17129.04	17482.9862	19959.4551
15	15448.5493	10722.4416	11457.0943	11855.9276	11796.2285	12018.573	14828.4532

Tabel 9 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 20

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	19704.7856	19948.2912	20270.701	21493.6167	22613.4507	23149.4589	23026.1902	23183.8786	23168.9518	21627.3347
2	26579.1236	27317.2582	28010.2362	28611.0157	29476.9588	30454.4593	30943.2826	30875.0534	30688.5612	29256.5123
3	32275.9538	33532.2151	34827.9373	36122.4261	37178.6122	38037.7134	38218.2771	37797.3444	37147.5875	21754.834
4	37865.7474	39494.6079	41527.6115	43625.3709	44714.2698	45307.8033	45059.5266	44333.2648	43377.7613	25796.4912
5	43074.6695	45006.7607	48150.635	50685.585	51785.5727	52145.5563	51453.7913	50650.6305	29478.4634	29633.3874
6	47961.6713	50496.9132	54278.2414	57035.4627	58358.8901	58341.9506	57458.7786	56416.7124	32681.1158	33189.9322
7	52750.895	55666.8722	59741.7928	62807.2394	64307.5779	64234.7638	63010.3031	36810.6648	35549.4204	36430.8535
8	57511.5411	60557.7757	64649.5723	67982.3669	69935.1971	69707.3152	67690.7025	39380.2359	38052.2811	39408.3577
9	61979.1073	65339.6261	69165.4041	72684.0393	75041.7778	74229.3294	42879.6854	41602.1868	40235.1615	42173.5457
10	63281.4158	66494.4201	69994.0075	73360.4213	75258.9971	74014.5015	42724.0005	41488.2811	40246.7467	42415.3016
11	67329.8637	70504.8075	73849.8462	77026.587	78335.7191	46045.7437	44519.8429	43235.7512	42034.6968	44365.2504
12	71212.1541	74294.9317	77418.2702	80248.7995	80911.2288	47524.6126	46170.3271	44889.7307	43660.4488	46206.2557
13	74714.22	77748.882	80747.1613	82988.9774	49795.7779	48876.8438	47671.4634	46386.9903	45086.5419	47869.0463
14	77956.7997	80819.8841	83773.5598	85274.6843	50854.6969	50115.4169	48987.3002	47652.2752	46244.0885	49375.4773
15	76097.5424	78649.6729	81236.9553	49224.6446	48782.7196	48175.9322	47233.5687	45824.5233	44453.6363	47704.3272
16	78400.7618	80930.6609	83120.3251	50119.9523	49502.7164	49042.4019	48172.174	46618.025	45250.128	48710.0996
17	80326.5466	82841.9972	50655.859	50815.6039	50116.7238	49685.9314	48906.7026	47287.9624	45894.7965	49494.6842
18	81897.7763	84163.4591	51240.396	51330.0259	50567.3833	50235.723	49459.9712	47744.4012	46369.4797	50087.9821
19	83137.9162	50920.7813	51584.6246	51636.1509	50837.2446	50549.2113	49818.9718	48045.5242	46658.721	50486.8555
20	54983.3927	33606.3935	34014.117	34043.9482	33519.4431	33338.7784	32855.836	31679.668	30783.4447	33305.3555

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	18777.3571	19140.3011	19372.4678	19668.8302	19538.5968	20222.8812	19093.2216	18068.3171	19430.3279	20849.6737
2	20180.5954	20297.7314	20561.2764	21097.8567	23422.1775	22246.5378	19412.4036	18866.9774	20321.8943	26364.3537
3	21764.2938	20901.8336	23379.9025	24454.9737	24288.0667	21319.9205	20146.3706	19629.7301	23152.6984	13949.0086
4	20174.4982	23594.5307	23850.6911	23710.1099	23122.4403	19937.3954	25087.8255	26095.3249	28599.9152	13562.0367
5	23171.4961	24580.6819	22759.0338	23813.5131	22801.2597	25695.7916	26281.4653	28063.1889	16130.4464	16157.6005
6	25005.3302	23372.8109	22848.8851	25012.5794	23544.2348	24168.9514	25321.4328	24844.7859	14067.4172	16322.393
7	22848.8589	22781.4582	25065.2824	24965.0253	22358.1218	24834.4286	25757.4811	15208.3832	14812.5436	14727.5107
8	21163.3101	23060.9542	23856.8803	22280.8937	25512.8113	24490.6261	24927.3624	16533.0519	15882.5762	14709.5344
9	19497.0362	21317.1961	21387.0166	22508.3755	25718.1033	25532.7451	15181.2196	16351.7012	15593.9491	15698.5789
10	18746.6594	21031.4928	22016.1472	22890.2679	25636.4621	24045.0757	14525.8434	15057.6451	15277.7201	15626.6379
11	18814.379	21525.3219	22020.1539	23146.7738	25504.3149	14605.5045	15342.5292	14962.636	16172.2144	14996.8749
12	18585.8714	19945.6321	21044.8219	22289.4199	23050.8595	14835.2477	16948.1045	15007.0271	15239.8913	16054.1191
13	19969.8539	20300.5059	21170.6864	21451.2596	12999.11	14211.2126	16227.9082	15062.1724	15396.0735	15573.2685
14	18803.0195	19101.0082	21531.3529	21812.129	12656.402	12090.3622	12221.352	11822.0207	12363.2831	14769.0395
15	18426.2809	20089.2641	21682.9705	13363.6626	12919.2292	12141.4941	11258.8188	11406.8844	11725.3102	12976.1906
16	20667.3799	21171.456	20943.561	13956.6434	13603.1625	12761.111	13939.4328	12798.5408	12209.5974	14090.6929
17	19929.6243	19030.9553	13130.4402	15090.4268	15250.985	14777.4473	15863.2508	14761.341	14520.2289	14630.9682
18	19090.7688	20078.1643	13526.0309	15425.9397	15644.5144	15498.0149	16618.974	15714.822	16072.4422	15104.7173
19	21286.2339	13054.1934	14408.6851	16614.2857	16091.039	15554.0059	17289.0163	17659.9648	16942.9355	15404.3842
20	15116.4886	8980.28225	9943.32656	11549.1789	10911.4338	10446.2521	12088.4643	12465.1946	11928.0436	10722.8696

Tabel 9 Perbandingan Gaya Horisontal Tingkat Struktur Tingkat 20

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	21529.335	22969.5987	23634.6924	23236.5695	21502.751	21373.4937	20972.3639	21394.4209	22312.4107	21729.4451
2	25010.0488	25022.2958	25304.4056	23920.6025	22513.364	23628.6713	25597.4182	26924.7215	28921.3298	27573.9348
3	24282.872	23330.3827	22990.8959	22679.071	23945.6139	28780.2531	30549.0315	31980.5677	34689.4108	19463.4251
4	22178.5084	23085.5947	26105.0032	26399.9801	29156.7977	33167.5812	33863.5589	34951.7798	35965.2126	21781.1612
5	24319.5754	27760.8916	29767.4366	30835.822	32400.1338	35203.6484	33802.2818	35535.4127	21390.1824	22746.2075
6	28343.0752	30650.666	31695.1798	32511.3493	31781.3701	32036.5055	32854.3814	38635.5572	23037.6184	21670.5554
7	30144.4201	30329.6488	32172.941	33577.7019	31875.2445	31102.3196	35181.6247	24274.0296	24623.8534	24439.2608
8	30233.4135	34367.3397	37953.9767	38782.6305	36896.5783	35220.9057	37116.2157	23691.6793	24218.113	27138.2315
9	36176.6861	40280.4147	42900.9292	41434.4737	37818.8652	34776.4538	19570.6381	21888.0858	23059.4227	27809.3293
10	38535.8068	39786.8628	39980.1956	36528.4727	32358.9634	29663.2139	18020.1649	18691.2264	21233.6476	24131.1421
11	37997.3915	36869.8955	34016.4516	30087.8765	27591.5739	16058.5482	16950.7717	16856.5199	18707.3229	19866.9646
12	34200.443	31638.5503	27009.5231	23278.7027	22461.8905	14734.4778	15188.4249	15484.2855	15940.5494	16225.2816
13	29824.4364	26063.0034	20128.1194	22490.8669	13066.6385	13455.5167	13384.0209	14028.3255	14525.0445	14972.1201
14	24213.7598	19394.9002	23151.7556	26173.1213	14856.1738	13604.2774	13193.8421	12833.348	12686.029	13811.0925
15	17364.3231	20745.2756	23396.0526	15736.391	15709.0071	14678.0608	15133.6279	14069.5437	14168.6574	14349.855
16	23679.5435	27358.7773	29461.8517	18209.2269	18640.3137	17943.948	17251.5628	17432.6156	18506.134	16842.0862
17	29190.2942	32296.502	20749.8654	21441.2782	21640.7615	21399.9995	20701.2289	20366.6701	21977.5745	18665.9289
18	33094.7669	36860.4789	24026.3076	24568.0525	24290.7601	24701.2835	24265.2656	23403.2859	24368.334	23010.05
19	37294.5371	23999.7416	26447.9229	26861.0105	26435.9325	27328.2516	26841.2589	26417.7989	25806.7646	26329.4464
20	25826.4361	16342.6156	18075.9181	18302.0847	17993.1431	18712.6337	18371.7708	18241.0472	17339.3495	18271.4932

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	18371.7146	17663.1874	18040.9712	17752.8375	18526.6047	20796.2252	17025.148	16440.2142	15127.2361	19642.0153
2	18099.4456	19273.6071	19105.0845	20324.708	20057.3057	19735.978	13830.4782	15654.4347	13431.1344	17539.4553
3	19401.6431	20603.2364	20591.6698	20265.2986	17958.8042	14478.0996	13383.3609	15045.3576	14903.7406	7680.92155
4	20611.8373	20087.4673	18281.8172	16092.3979	15029.3445	14171.0213	14863.4776	14489.8977	18003.9638	7415.77608
5	18961.2887	16689.1377	14469.5408	14757.0305	13856.9988	15915.2764	15432.6582	17803.3615	8722.41721	9373.34259
6	15848.5639	14911.8292	13183.093	15032.1336	17283.5447	16562.0141	14249.0383	15149.9201	7753.6535	9864.59568
7	15475.9929	13746.3528	14905.6261	16376.541	15984.4015	14667.6669	13492.1007	7550.01479	8601.14861	9408.0352
8	14128.9933	15752.8821	15140.8924	14585.1737	13859.111	12688.6638	15167.6242	7485.56642	8022.27437	8500.38224
9	15563.9565	13553.8998	13194.847	13048.4136	12313.7038	13952.5282	7319.86907	7357.25268	7042.42758	7505.00086
10	13119.4901	12452.9245	12439.9934	12831.6756	13267.6042	14911.3128	6829.91082	7130.69545	6711.89744	8028.00432
11	13498.722	11677.2015	13118.0943	15046.0507	15006.1668	7460.86746	6661.8418	6721.83651	6879.0879	7794.24212
12	11751.3754	13080.586	13855.2497	14717.9897	13962.5189	6672.72305	6683.72423	6333.72351	6995.86572	7755.02613
13	12563.6239	13164.4898	12890.3252	11845.0937	6559.03824	6956.17165	7687.71009	7832.86059	8005.85666	7443.96602
14	12377.5499	11452.2355	10405.6127	12241.609	6137.63727	7433.65929	7559.46528	7899.16777	7710.03746	6910.38209
15	11311.4388	11873.5362	10037.8886	5258.30062	5841.08816	6347.42924	7126.45811	7303.2908	6637.16445	6832.1268
16	12173.4745	9474.63645	10935.7293	5491.69823	5937.54841	6093.07965	7066.44531	6925.81622	6259.85278	5756.55072
17	8952.67738	11107.4911	5946.95992	5380.95448	4816.72882	4725.44278	4950.7022	5512.51465	5909.39975	4915.84273
18	10014.0029	12704.0645	6820.78638	6465.74817	5843.87028	5437.95854	5181.99262	5429.03334	6834.61142	5590.85805
19	13173.6849	7598.27703	7956.20478	8299.96478	7504.24163	6743.31561	6268.27329	6384.92015	7011.59346	7453.62814
20	15958.9394	8430.49214	9323.81512	9545.26193	8789.41408	8853.70951	8605.58005	8277.89931	8870.35045	9965.36793

Tabel 10 Perbandingan Gaya Geser Struktur Tingkat 7

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	90426.4408	90509.2781	84371.2736	76818.8263
2	79209.3844	83376.6946	76844.5277	69827.0546
3	66452.4366	71156.4426	65387.2923	56661.2246
4	52645.6669	55798.9973	49357.646	46201.1641
5	38214.1801	38384.3849	37344.2857	33889.8853
6	23217.812	18575.381	23531.2635	20696.4235
7	7842.21098	6122.78498	7946.40943	6891.66732

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	30742.959	33715.9413	32958.5096	27238.883
2	30035.0926	30756.7773	31773.0912	23356.2359
3	29466.7598	28346.7078	30144.731	23611.0393
4	29108.3407	27326.7211	28067.5844	23049.1376
5	26988.4385	23566.6654	23668.3373	20508.9212
6	19890.4091	13738.4389	16455.8244	14554.9543
7	7405.2588	5340.44536	6247.05252	5246.29076

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	60605.1411	58429.5264	71429.0189	48248.2155
2	56045.0125	53924.7092	66923.6438	44122.0336
3	49654.804	54739.2142	62125.0741	47773.4721
4	43059.9901	52418.6163	52692.5009	46132.2261
5	39912.6328	40827.4872	42138.722	38969.1281
6	28713.0045	21489.4456	27177.5257	26137.2321
7	10405.1888	7307.04985	9208.49203	9060.38114

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	39513.9909	37990.1692	39902.2658	32759.6553
2	37069.7419	35262.5909	38086.8291	31391.2013
3	33592.5341	33781.403	36290.824	27576.9814
4	30429.5859	29089.6723	29139.4238	22681.9236
5	27042.7551	23999.2894	21624.135	18658.9899
6	21370.1806	15798.3996	14512.1814	14588.0809
7	8095.95503	5890.43	5166.51579	5505.41577

Tabel 10 Perbandingan Gaya Geser Struktur Tingkat 10

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	348667.667	272450.87	206982.256	165888.638	166037.725
2	328851.469	254642.352	190053.753	149502.172	149170.004
3	303842.893	232522.585	169728.439	130596.426	128911.248
4	274669.746	207111.498	146594.737	109550.038	115241.364
5	241673.429	178632.236	121000.832	88202.6918	100134.138
6	206070.408	148049.852	95202.2199	75108.8934	85314.0285
7	166832.665	114485.908	68056.923	60906.9831	69225.0691
8	124129.309	78231.6817	50513.7971	45531.2218	51639.6301
9	78387.0911	39482.1026	31829.1908	28876.353	32687.315
10	30469.839	15299.7625	12342.5292	11243.2293	12711.7512

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	68085.6474	59963.9657	61519.6901	63338.377	50138.2413
2	64137.1912	57851.3777	58107.0883	61002.3023	43920.7483
3	57211.1786	56960.5434	54013.3622	54332.5259	40048.3149
4	50400.3908	57323.7187	48483.6715	42681.8458	36753.5628
5	50533.5842	57261.9391	40334.8104	41097.1008	31801.6896
6	53245.7395	55510.7203	41232.5808	42539.976	34816.6112
7	51796.6706	48683.0471	38386.217	40438.9845	35068.2432
8	44395.2479	36064.3361	32315.3415	33281.5025	30654.8037
9	30123.2769	19811.3529	22327.8195	22459.7782	21826.0532
10	11957.5408	8250.16907	9161.24124	9081.05925	9166.32491

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	76131.9222	81726.7387	87746.4323	89147.8749	67469.5244
2	78329.0926	83539.9305	87709.4543	87482.9615	66889.4351
3	78685.8347	80551.5653	82745.5055	80758.8626	61433.0344
4	74545.7727	73472.2475	73442.7153	69462.8182	55821.6288
5	66591.2471	63969.2536	61847.6653	55662.7792	49104.3163
6	67035.7776	60897.1531	54759.4351	57855.5066	47074.0795
7	66961.3214	55076.9773	49930.7115	57654.4944	43775.8742
8	58562.5643	43078.1584	45360.1017	50932.593	42162.9311
9	41574.2457	28718.9373	33273.5569	37308.392	32193.6283
10	19313.328	12476.6612	14197.8637	15880.4274	13991.8128

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	64987.8671	54966.7606	54517.7167	51753.8683	48198.488
2	62974.3549	55090.2133	54504.6335	51208.7632	44062.6955
3	52166.7835	54582.9718	51565.7659	44923.0859	38402.4117
4	47028.9352	45838.2344	42357.1404	44118.4805	32012.1808
5	46660.424	51690.3661	38343.0838	36652.0104	31431.6927
6	50688.6722	51248.5864	36951.7007	36589.4933	33521.8938
7	50466.2987	47201.7399	34893.1661	34252.7085	33262.5255
8	42106.7767	38458.2259	29958.186	28873.0453	29211.8722
9	31643.8779	24107.8888	21334.541	20660.6243	21609.9766
10	14124.1152	10431.9245	9005.98714	8810.73322	9369.1361

Tabel 10 Perbandingan Gaya Geser Struktur Tingkat 15

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	714401.374	612861.123	498985.67	421974.787	361987.599	315551.534	286055.083
2	689722.099	589612.101	477468.923	400388.912	340217.317	294545.243	264768.23
3	658737.712	560632.257	451378.194	374735.445	315107.45	270701.195	240306.995
4	623520.448	528228.593	422489.472	346613.84	287912.808	245117.946	213895.965
5	584226.522	492316.933	390692.487	315749.706	258678.432	217401.724	197122.457
6	541433.809	453099.791	355988.025	282331.758	227431.415	189087.384	181312.622
7	496915.078	412844.687	320317.338	248227.81	196826.1	173057.685	165725.653
8	448970.778	369145.039	281885.372	214632.184	167149.922	156139.383	149456.394
9	397239.726	322311.108	240766.143	178734.07	148116.712	138177.946	132283.03
10	342189.639	272110.686	196830.959	140680.703	127804.926	119078.418	114098.92
11	286955.187	222105.591	153244.996	118012.405	107532.079	100184.582	95908.8756
12	229017.096	169298.371	107648.641	94239.2855	86158.9912	80306.2861	76860.0605
13	168378.312	114267.087	79214.6767	69432.1374	63714.0923	59423.1339	56885.5024
14	105777.659	57631.6941	49873.0054	43743.9634	40278.0645	37591.6066	36003.451
15	42166.3912	22977.003	19891.1603	17454.8645	16109.7021	15042.4028	14413.1853

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	140786.626	122109.695	123883.233	117380.425	118972.776	121877.553	117873.398
2	138284.17	117760.795	118177.613	111772.14	115344.269	120021.803	113114.964
3	131263.169	109176.207	114008.053	105437.659	111963.19	112001.02	102127.068
4	119204.063	101804.717	110535.063	101750.295	103792.744	103848.414	91817.9463
5	108426.369	99154.6834	109123.048	96481.4763	93921.6205	89017.4479	85008.8565
6	95048.8024	103372.26	106753.435	88216.3083	81145.0997	78258.697	81310.5575
7	91698.6643	107117.809	106372.857	78649.6824	73402.8001	77967.2144	78157.8367
8	90372.9024	108949.798	103162.391	75990.3043	79520.7076	82276.5414	82033.9097
9	91479.3978	108259.535	97897.0988	79006.7664	80514.3806	83229.1294	82635.2442
10	89604.6668	102777.256	87707.1706	75559.3245	77476.0295	80290.3181	79987.2053
11	83824.1535	91026.8653	72114.5094	68924.3719	69961.8513	72514.6171	72804.1415
12	73065.7333	73397.6858	54496.0896	58133.0306	58440.9509	60297.6224	62831.5904
13	57483.0149	51638.0692	42447.5615	44609.6881	44478.5144	45608.765	50169.0229
14	37669.565	26695.8442	27797.5451	29041.9603	28925.2685	29453.632	34787.9083
15	15448.5493	10722.4416	11457.0943	11855.9276	11796.2285	12018.573	14828.4532

Tabel 10 Perbandingan Gaya Geser Struktur Tingkat 15

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	158284.21	146972.399	157411.219	164054.745	168642.044	167421.014	163300.695
2	148718.512	152698.748	161674.641	167257.361	170421.869	167552.107	160674.851
3	148151.363	154870.301	161739.275	166079.702	166600.697	161859.222	151710.106
4	149660.131	152908.099	156772.855	159493.383	157894.807	151159.568	139377.427
5	146778.313	146694.578	147524.753	148498.803	145053.521	136756.192	131148.052
6	140143.512	137090.72	135468.47	134572.785	129594.086	120345.131	121849.748
7	130706.861	125764.562	122740.322	119512.106	112647.167	110042.944	112057.696
8	129862.257	118098.591	119489.442	115422.925	103749.039	108634.686	101529.581
9	137773.811	122081.005	116498.035	107602.363	109368.757	113723.153	99416.4423
10	137026.167	118264.985	105176.142	98430.8457	109575.184	113947.263	101890.212
11	128076.179	106001.112	90129.1937	94957.9726	103961.658	107980.667	98691.2214
12	111550.556	88732.5195	77442.767	85002.843	90936.8907	94712.9194	88418.3861
13	88894.3096	68984.1775	62987.8712	67870.9961	72341.0886	75430.2153	70744.2846
14	59444.195	38684.2008	42804.8177	45293.1928	47860.7823	49957.8403	47701.8759
15	25193.1724	16280.8589	17828.5034	18857.0661	19740.6594	20710.1416	19886.8821

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	135705.107	119207.743	105634.447	108137.771	106711.106	94720.9135	97905.2193
2	127503.128	117430.542	105353.858	107137.851	105566.022	95274.9955	97710.4613
3	122509.241	107694.823	107416.769	105618.341	103632.909	93425.7805	90977.2083
4	107674.319	103464.502	105523.601	102713.427	97079.8917	86572.7817	76845.1948
5	93497.2646	96333.5486	97113.788	93562.9052	82166.7291	81684.3655	81395.1387
6	84470.9598	85893.2504	90013.2739	77905.1223	80300.332	79398.7211	82109.6841
7	90316.4511	91298.5823	93417.5216	73952.321	72991.9674	74092.4898	77772.0855
8	90363.9386	98667.3673	95436.2349	80824.706	65120.2572	71194.3183	73880.0001
9	97632.8984	104495.885	96914.8282	80963.225	65934.366	71782.6628	73351.6521
10	99467.5872	100078.797	88836.6159	71959.3885	63445.9395	69857.1137	70433.3369
11	91192.8578	85880.8552	74920.8197	65270.6218	58156.8101	63151.2647	62801.5458
12	75706.6676	68701.7172	60197.8771	56195.5237	47996.6565	52312.7906	51234.26
13	62421.2654	51493.3447	48070.0418	43745.8746	38517.3594	39825.0524	39538.4309
14	44577.2378	27852.1455	31910.615	28544.5519	26132.9524	26816.6351	27134.8188
15	19085.614	11400.2315	13078.1732	11593.0596	10933.8187	11302.3104	11463.1834

el 10 Perbandingan Gaya Geser Struktur Tingkat 20

a Bucharest

gkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	1186443.71	1175445.12	1153624.22	1120565.5	1067077.4	1000628.94	924166.46	849000.851	784914.104	783146.567
2	1166748.07	1155509.88	1133641.16	1100614.65	1046965.86	979255.314	901987.565	826561.826	762379.956	763375.372
3	1140299.74	1128192.62	1105630.92	1072315.02	1017682.45	948800.854	871044.282	795686.773	731691.395	734738.943
4	1108443.83	1094786.66	1070805.95	1036335.9	980503.841	910833.418	832846.71	757956.43	694543.808	713158.038
5	1071263.2	1055634.37	1029500.94	992813.989	935814.042	865694.831	787979.839	713746.568	651166.046	687454.049
6	1028889.96	1011023.84	982037.824	942201.67	884071.112	813835.274	736724.346	663201.477	621703.051	658070.21
7	981268.273	961134.517	928629.259	885228.577	825712.222	755659.168	679365.911	607061.783	589143.114	625131.938
8	928570.838	906122.006	869632.548	822793.363	761404.644	691424.404	616560.966	570531.303	553966.634	588987.68
9	871059.297	845964.692	805608.63	755364.764	691715.043	621717.089	549133.566	531663.191	516374.885	550011.704
10	809080.189	780827.338	736922.457	683338.88	617151.381	547487.76	506405.46	490441.206	476383.643	508556.627
11	745800.2	714388.479	667175.606	610654.442	542522.769	473473.258	463774.504	449093.24	436189.881	466861.957
12	678470.337	643883.671	593413.655	534491.03	464495.647	427427.514	419255.241	405864.64	394155.184	422896.145
13	607258.182	569588.74	516035.088	454853.938	383740.124	379902.902	373084.914	360974.909	350521.711	376872.683
14	532583.778	491842.701	435351.715	372236.386	334078.032	331026.058	325413.451	314663.088	305516.023	329146.813
15	454674.259	411064.571	351665.922	287148.519	283292.701	280910.641	276432.148	267095.094	259346.701	279789.304
16	378629.306	332431.36	270570.234	237945.662	234536.903	232796.51	229212.493	221311.12	214914.923	232084.977
17	300276.534	251500.699	187494.997	187825.71	185034.187	183802.722	181040.319	174696.69	169664.795	183374.877
18	220015.223	168672.749	136839.138	137010.106	134917.463	134123.713	132133.616	127456.95	123798.027	133880.193
19	138121.309	84527.1748	85598.7416	85680.08	84355.7267	83887.9898	82674.8078	79725.1922	77442.1658	83792.211
20	54983.3927	33606.3935	34014.117	34043.9482	33519.4431	33338.7784	32855.836	31679.668	30783.4447	33305.3555

pa El Centro

ingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	166540.603	177071.942	178326.914	184045.134	186575.026	193747.111	183289.678	173571.947	154950.454	136341.562
2	169015.937	175217.038	183514.021	187045.194	189411.594	191244.514	182974.056	172376.65	152074.002	137670.396
3	166240.225	168367.39	184187.667	184542.665	184134.064	186674.532	179925.846	162268.897	146360.64	137013.228
4	158187.068	167162.654	175416.536	181617.103	185052.196	179610.4	166524.654	148628.134	136848.305	131982.818
5	148718.28	164663.496	169106.385	175673.398	174650.779	160840.561	147105.516	134817.32	123569.741	121857.741
6	145379.23	157070.127	155764.554	161672.819	156761.789	144159.105	129927.526	117881.556	114488.477	109665.268
7	138413.403	146326.326	137875.872	143404.818	138872.936	125827.604	117617.341	101503.882	104023.75	98626.4276
8	131239.88	140671.74	142426.276	135292.545	122076.98	113339.073	106198.557	92234.1907	91120.2668	99338.2155
9	135893.955	144690.282	143588.783	136524.389	122919.993	110333.784	101691.673	95328.6306	87108.7499	103668.862
10	141212.382	144791.532	145739.237	139529.788	121176.001	107965.877	102732.14	100791.724	91442.5744	106019.883
11	141169.043	139851.036	141847.604	137883.111	121446.68	104224.385	101616.875	101961.252	92897.7972	109214.672
12	134721.735	129350.845	136920.753	135197.615	115064.59	97666.3265	99262.8386	97944.3492	90531.7943	107935.936
13	124872.297	119161.019	125733.932	121852.074	100900.99	90222.5274	95778.3831	92420.5651	89300.4021	100622.589
14	113508.327	106741.137	106563.189	102911.205	91531.5154	85144.7255	90795.4781	86679.347	86913.3948	90713.9832
15	100137.938	90376.6409	86576.3567	82643.3961	80210.157	77856.2391	83276.9294	78708.7924	79843.8831	79693.367
16	84114.0207	71818.291	67597.2626	69818.8688	68574.427	68206.57	72988.7229	69186.7494	69612.5847	66717.1763
17	68358.5721	57494.4271	49280.9468	56674.1431	55589.2845	55497.8461	59525.3897	57892.4469	57677.2838	53500.9683
18	54039.7336	41722.0003	37393.0016	43090.2627	42068.61	41120.6995	44793.3974	45179.3088	43881.4769	40263.7141
19	36054.8425	21934.9881	24352.0116	28163.4646	26958.019	25736.7178	29220.3763	30115.6621	28738.6296	26060.1433
20	15116.4886	8980.28225	9943.32656	11549.1789	10911.4338	10446.2521	12088.4643	12465.1946	11928.0436	10722.8696

el 10 Perbandingan Gaya Geser Struktur Tingkat 20

a Gilroy

gkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	178842.392	186744.804	183203.612	179073.43	177606.896	192174.107	193915.848	195424.664	178638.189	148116.14
2	179857.281	186922.872	185205.458	180007.027	175078.658	186928.587	188993.956	189120.039	171210.914	141886.739
3	184388.542	190786.505	186776.592	171010.669	165014.05	174610.497	177284.34	174818.908	154461.456	126419.547
4	192789.079	194490.858	184675.396	166095.069	149200.156	156255.212	159562.52	153886.529	132584.12	119556.841
5	195051.844	190823.532	176040.827	156164.336	140526.198	143745.153	137953.677	127659.936	116184.034	109807.165
6	189898.796	179664.618	160477.338	146257.331	142590.633	142347.56	131738.696	124894.647	120051.282	102580.045
7	177394.879	160627.598	153471.676	151968.629	142928.987	139366.516	133217.415	127317.477	122040.705	104438.864
8	155620 137	149841.423	157219.529	155834.817	144854.738	138912.321	131150.515	126427.913	121444 153	107251.003
9	147196.571	148039.337	156925.407	162005.956	154424.51	140296.541	133098.095	128233.282	118110.991	116452.873
10	141035.983	146696.775	162907.806	168353.2	157124.504	142752.377	137133.748	134693.621	125446.417	124389.675
11	150843.875	158032.693	161264.994	166088.638	152580.246	139272.677	137782.426	137423.721	133047.798	127859.067
12	162628.888	166999.692	162980.409	156004.037	141743.216	136715.763	134882.975	136859.896	137042.883	127215.91
13	169134.393	169854.14	161918.244	148688.213	139404.228	136461.904	130768.614	132975.31	136765.142	122620.024
14	168605.581	165661.265	154338.337	139417.11	133413.427	131898.538	127168.607	125521.976	131799.746	114272.094
15	160405.045	153598.593	138758.909	122122.192	122603.066	122556.176	118726.85	114295.302	121891.052	108412.377
16	145118.751	134287.653	117290.058	108506.857	108146.592	109270.008	106621.984	102226.49	107840.618	99763.2428
17	123327.851	108669.401	89141.371	91024.5262	89897.7473	91765.3544	90127.737	87390.9435	89433.9702	86146.8273
18	95815.5497	77079.9733	68489.2525	69731.1477	68676.4581	70742.1688	69478.2954	68062.1321	67514.4482	67610.9896
19	63120.9732	40342.3572	44523.841	45163.0952	44429.0756	46040.8853	45213.0297	44658.8461	43146.1142	44600.9396
20	25826.4361	16342.6156	18075.9181	18302.0847	17993.1431	18712.6337	18371.7708	18241.0472	17339.3495	18271.4932

pa Koyna

ingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	84710.4369	83543.1805	81797.96	89319.6442	78336.8979	66806.8184	59306.9391	62080.6638	64182.4936	57614.959
2	83209.4656	82179.6983	78365.6322	83363.5199	69671.9699	63180.9343	56174.2431	55741.9564	60110.9994	52047.2233
3	81724.6537	78511.6867	73983.9389	74714.0958	65612.6291	61276.0326	56555.2849	55182.0247	54322.9214	49160.3807
4	77506.242	75087.5552	71975.8705	68901.4997	65196.0586	59468.5562	52886.6749	48119.3895	42757.045	47449.3639
5	72516.7055	70911.3888	67781.8448	66822.5116	61206.2553	52076.0258	48403.8373	45044.8247	41032.8763	42959.1877
6	68503.4538	67637.1329	65382.5133	62713.0773	56894.6695	49640.6071	47658.3858	47983.3636	44389.7892	37794.8783
7	67101.345	61829.8488	63108.7384	62052.4562	57289.1238	49475.5847	45074.2341	43756.9766	44657.7783	35690.6626
8	60773.3489	56446.9163	64498.0248	60467.7411	52171.5824	45585.0242	40707.4206	39366.526	41528.9435	34520.0504
9	50746.1026	59240.1614	63450.402	58569.5346	50092.9253	43333.5199	42100.4704	40745.1951	40446.7189	34272.4196
10	47592.767	59797.556	60150.321	55083.4896	46123.2499	43132.561	40534.2678	40672.5486	39943.8515	33117.8245
11	50094.4891	57419.2759	54783.2093	47283.5092	42832.1163	37576.5098	36498.4671	38379.5728	40514.4162	32834.7105
12	49250.6034	51687.1439	47232.4155	38934.393	36571.8466	34876.0961	34920.2732	36994.7712	40863.4994	31222.1609
13	44438.4106	44770.3837	40530.1964	34896.8844	31339.442	30663.88	31986.6265	33896.0876	37780.6349	28126.636
14	39727.8074	43305.3715	39986.3706	32184.4085	29108.8969	27446.5145	28869.483	29188.8657	32206.5006	25029.1431
15	40481.715	44044.2818	39770.2857	29511.1268	25409.9333	24383.4487	25476.4889	25917.2119	28682.4719	23399.3585
16	41946.9775	42134.5226	35175.5331	28822.461	25380.2053	22089.0935	21170.9458	21847.9917	26066.3306	23460.1775
17	40873.0759	36592.4429	27734.3765	27332.9612	24448.0503	21140.6655	19673.0775	21254.3163	23908.7505	22788.1481
18	37015.3076	28194.9192	23060.8188	23811.6501	21440.5002	19082.4386	18064.7627	18234.1123	19864.4284	21400.3196
19	28972.492	15904.0134	16802.4893	17810.0274	15997.8224	15505.0869	14873.8533	14438.1632	15547.3584	17418.9961
20	15958.9394	8430.49214	9323.81512	9545.26193	8789.41408	8853.70951	8605.58005	8277.89931	8870.35045	9965.36793

Tabel 11 Perbandingan Momen Guling Maksimum Struktur Tingkat 7

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	21994.9067	17173.7238	22287.3776	19329.8253
2	18851.9021	14719.6209	19102.5744	16567.6314
3	15708.8975	12265.5179	15917.7711	13805.4375
4	12565.893	9811.41494	12732.9679	11043.2436
5	9422.88839	7357.31198	9548.1647	8281.04966
6	6279.88382	4903.20902	6363.36149	5518.85576
7	3136.88439	2449.11399	3178.56377	2756.66693

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	20764.7031	14973.41	17516.2584	14711.9668
2	17797.6027	12833.8711	15013.3518	12609.7247
3	14830.5023	10694.3322	12510.4452	10507.4825
4	11863.4019	8554.7933	10007.5387	8405.24038
5	8896.3015	6415.25439	7504.63209	6302.99823
6	5929.2011	4275.71549	5001.72553	4200.75608
7	2962.10352	2136.17815	2498.82101	2098.51631

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	29178.4883	20493.816	25826.9333	25410.0769
2	25009.0855	17565.3154	22136.3429	21779.0886
3	20839.6827	14636.8148	18445.7525	18148.1004
4	16670.2798	11708.3141	14755.1621	14517.1121
5	12500.877	8779.81348	11064.5716	10886.1239
6	8331.47419	5851.31284	7373.98123	7255.13565
7	4162.07553	2922.81994	3683.39681	3624.15246

Gempa Kovna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3
1	22696.189	16516.9995	14488.6865	15436.9707
2	19453.221	14156.8611	12418.3394	13231.1697
3	16210.2529	11796.7226	10347.9922	11025.3687
4	12967.2849	9436.58412	8277.64513	8819.56769
5	9724.31686	7076.44565	6207.29801	6613.76669
6	6481.34881	4716.30719	4136.9509	4407.96569
7	3238.38201	2356.172	2066.60632	2202.16631

Tabel 11 Perbandingan Momen Guling Maksimum Struktur Tingkat 15

Momen Guling Maksimum Struktur Tingkat 15 Akibat Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	253354.825	138056.379	119515.013	104876.54	96793.6774	90380.8058	86600.1259
2	236462.804	128851.693	111546.544	97884.0678	90340.1199	84354.8162	80826.2073
3	219570.783	119647.008	103578.076	90891.5961	83886.5623	78328.8267	75052.2887
4	202678.762	110442.322	95609.6072	83899.1244	77433.0047	72302.8372	69278.3701
5	185786.741	101237.636	87641.1386	76906.6527	70979.4471	66276.8477	63504.4516
6	168894.72	92032.9503	79672.67	69914.181	64525.8896	60250.8581	57730.533
7	152002.699	82828.2645	71704.2014	62921.7092	58072.332	54224.8686	51956.6144
8	135110.678	73623.5788	63735.7327	55929.2375	51618.7744	48198.8791	46182.6958
9	118218.657	64418.893	55767.2641	48936.7658	45165.2169	42172.8895	40408.7772
10	101326.636	55214.2073	47798.7955	41944.2941	38711.6593	36146.9	34634.8587
11	84434.6155	46009.5215	39830.3269	34951.8224	32258.1017	30120.9105	28860.9401
12	67542.5945	36804.8358	31861.8582	27959.3507	25804.5442	24094.9209	23087.0215
13	50650.5735	27600.15	23893.3896	20966.8789	19350.9866	18068.9314	17313.1029
14	33758.5525	18395.4643	15924.921	13974.4072	12897.429	12042.9419	11539.1843
15	16866.5565	9190.8012	7956.46414	6981.94579	6443.88084	6016.96111	5765.27411

Momen Guling Maksimum Struktur Tingkat 15 Akibat Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6
1	92815.8299	64422.8429	68834.1453	71230.7081	70873.3729	72209.1548	89082.5721
2	86627.5143	60127.5661	64244.7658	66481.5408	66148.0238	67394.7454	83143.2009
3	80439.1988	55832.2893	59655.3863	61732.3734	61422.6747	62580.336	77203.8297
4	74250.8832	51537.0124	55066.0068	56983.2061	56697.3256	57765.9266	71264.4585
5	68062.5677	47241.7356	50476.6273	52234.0387	51971.9765	52951.5171	65325.0873
6	61874.2522	42946.4588	45887.2478	47484.8714	47246.6273	48137.1077	59385.716
7	55685.9366	38651.1819	41297.8682	42735.704	42521.2782	43322.6983	53446.3448
8	49497.6211	34355.9051	36708.4887	37986.5367	37795.9291	38508.2889	47506.9736
9	43309.3055	30060.6282	32119.1092	33237.3693	33070.58	33693.8795	41567.6024
10	37120.99	25765.3514	27529.7297	28488.2019	28345.2309	28879.4701	35628.2312
11	30932.6744	21470.0746	22940.3502	23739.0346	23619.8818	24065.0606	29688.86
12	24744.3589	17174.7977	18350.9707	18989.8672	18894.5326	19250.6512	23749.4888
13	18556.0434	12879.5209	13761.5912	14240.6999	14169.1835	14436.2418	17810.1175
14	12367.7278	8584.24407	9172.21164	9491.53254	9443.8344	9621.83238	11870.7463
15	6179.41971	4288.97665	4582.83773	4742.37106	4718.49139	4807.42918	5931.38128

Tabel 11 Perbandingan Momen Guling Struktur Tingkat 20

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	440499.58	269238.75	272505.35	272744.36	268542.26	267094.76	263225.67	253802.83	246622.5	266826.9
2	418472.93	255775.79	258879.05	259106.11	255114.13	253739.01	250063.39	241111.73	234290.44	253484.55
3	396446.29	242312.83	245252.75	245467.86	241686	240383.26	236901.1	228420.62	221958.38	240142.19
4	374419.64	228849.87	231626.44	231829.6	228257.87	227027.51	223738.82	215729.52	209626.32	226799.83
5	352393	215386.91	218000.14	218191.35	214829.74	213671.76	210576.54	203038.42	197294.26	213457.48
6	330366.35	201923.96	204373.84	204553.1	201401.6	200316.01	197414.26	190347.31	184962.2	200115.12
7	308339.71	188461	190747.54	190914.85	187973.47	186960.26	184251.98	177656.21	172630.14	186772.76
8	286313.06	174998.04	177121.24	177276.59	174545.34	173604.51	171089.7	164965.1	160298.08	173430.41
9	264286.42	161535.08	163494.94	163638.34	161117.21	160248.75	157927.41	152274	147966.02	160088.05
10	242259.77	148072.12	149868.64	150000.09	147689.08	146893	144765.13	139582.89	135633.96	146745.69
11	220233.13	134609.16	136242.34	136361.83	134260.94	133537.25	131602.85	126891.79	123301.9	133403.34
12	198206.48	121146.2	122616.04	122723.58	120832.81	120181.5	118440.57	114200.68	110969.84	120060.98
13	176179.84	107683.24	108989.73	109085.33	107404.68	106825.75	105278.29	101509.58	98637.779	106718.62
14	154153.19	94220.28	95363.433	95447.076	93976.549	93469.998	92116.005	88818.475	86305.719	93376.264
15	132126.55	80757.321	81737.132	81808.823	80548.417	80114.247	78953.723	76127.371	73973.659	80033.907
16	110099.9	67294.361	68110.831	68170.57	67120.285	66758.496	65791.442	63436.266	61641.599	66691.55
17	88073.259	53831.402	54484.53	54532.317	53692.153	53402.745	52629.16	50745.162	49309.539	53349.193
18	66046.614	40368.442	40858.229	40894.064	40264.021	40046.994	39466.878	38054.057	36977.479	40006.836
19	44019.969	26905.483	27231.927	27255.812	26835.889	26691.242	26304.596	25362.953	24645.419	26664.479
20	21993.357	13442.557	13605.647	13617.579	13407.777	13335.511	13142.334	12671.867	12313.378	13322.142

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4	Setback 5	Setback 6	Setback 7	Setback 8	Setback 9
1	121091.16	71940.848	79656.212	92519.807	87413.528	83685.766	96838.022	99853.947	95552.139	85899.62
2	115036.18	68343.546	75673.113	87893.484	83042.53	79501.173	91995.778	94860.901	90774.195	81604.332
3	108981.2	64746.244	71690.014	83267.161	78671.532	75316.58	87153.534	89867.855	85996.252	77309.044
4	102926.23	61148.942	67706.914	78640.837	74300.534	71131.987	82311.289	84874.809	81218.308	73013.755
5	96871.249	57551.639	63723.815	74014.514	69929.536	66947.394	77469.045	79881.763	76440.365	68718.467
6	90816.272	53954.337	59740.716	69388.191	65558.539	62762.8	72626.801	74888.717	71662.421	64423.179
7	84761.295	50357.035	55757.617	64761.868	61187.541	58578.207	67784.556	69895.671	66884.478	60127.89
8	78706.317	46759.733	51774.517	60135.544	56816.543	54393.614	62942.312	64902.625	62106.534	55832.602
9	72651.34	43162.43	47791.418	55509.221	52445.545	50209.021	58100.068	59909.579	57328.591	51537.314
10	66596.363	39565.128	43808.319	50882.898	48074.547	46024.427	53257.823	54916.533	52550.647	47242.025
11	60541.385	35967.826	39825.219	46256.575	43703.549	41839.834	48415.579	49923.487	47772.703	42946.737
12	54486.408	32370.524	35842.12	41630.251	39332.551	37655.241	43573.335	44930.44	42994.76	38651.449
13	48431.43	28773.221	31859.021	37003.928	34961.553	33470.648	38731.09	39937.394	38216.816	34356.161
14	42376.453	25175.919	27875.921	32377.605	30590.555	29286.055	33888.846	34944.348	33438.873	30060.872
15	36321.476	21578.617	23892.822	27751.282	26219.557	25101.461	29046.602	29951.302	28660.929	25765.584
16	30266.498	17981.314	19909.723	23124.958	21848.559	20916.868	24204.357	24958.256	23882.986	21470.296
17	24211.521	14384.012	15926.623	18498.635	17477.562	16732.275	19362.113	19965.21	19105.042	17175.007
18	18156.544	10786.71	11943.524	13872.312	13106.564	12547.682	14519.869	14972.164	14327.099	12879.719
19	12101.566	7189.4077	7960.4247	9245.9888	8735.5657	8363.0886	9677.6242	9979.1181	9549.1551	8584.4306
20	6046.5954	3592.1129	3977.3306	4619.6715	4364.5735	4178.5008	4835.3857	4986.0778	4771.2174	4289.1479

Tabel 12 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3531.396694	12072.34567
2	322.6755	316221.99	8	2529775.92	7062.793388	13443.30822
3	322.6755	316221.99	12	3794663.88	10594.19008	14402.78264
4	322.6755	316221.99	16	5059551.84	14125.58678	14919.9396
5	322.6755	316221.99	20	6324439.8	17656.98347	15186.79825
6	322.6755	316221.99	24	7589327.76	21188.38016	15562.60766
7	156.933	153794.34	28	4306241.52	12022.4459	7842.210977
		2051126.28		30868888.7	**86181.77647**	**93429.99301**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3792.259125	12052.46261
2	322.6755	316221.99	8	2529775.92	7584.518251	13159.99595
3	322.6755	316221.99	12	3794663.88	11376.77738	15825.51765
4	322.6755	316221.99	16	5059551.84	15169.0365	17955.39522
5	322.6755	316221.99	20	6324439.8	18961.29563	19809.00397
6	193.6053	189733.194	24	4553596.66	13652.13285	12452.59599
7	94.1598	92276.604	28	2583744.91	7746.322623	6122.784979
		1863119.75		26110661	**78282.34235**	**97377.75637**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3969.627037	11439.09613
2	322.6755	316221.99	8	2529775.92	7939.254075	12303.72758
3	322.6755	316221.99	12	3794663.88	11908.88111	16375.49582
4	193.6053	189733.194	16	3035731.1	9527.104889	12435.92481
5	193.6053	189733.194	20	3794663.88	11908.88111	14233.66005
6	193.6053	189733.194	24	4553596.66	14290.65733	15584.85407
7	94.1598	92276.604	28	2583744.91	8108.626206	7946.409435
		1610142.16		21557064.3	**67653.03176**	**90319.16788**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3934.841048	12071.26426
2	322.6755	316221.99	8	2529775.92	7869.682095	13439.33957
3	193.6053	189733.194	12	2276798.33	7082.713886	10599.32108
4	193.6053	189733.194	16	3035731.1	9443.618514	12311.27871
5	193.6053	189733.194	20	3794663.88	11804.52314	13341.28438
6	193.6053	189733.194	24	4553596.66	14165.42777	13804.75619
7	94.1598	92276.604	28	2583744.91	8037.570013	6891.667317
		1483653.36		20039198.8	**62338.37647**	**82458.91152**

Tabel 12 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3531.396694	13498.13913
2	322.6755	316221.99	8	2529775.92	7062.793388	12255.52782
3	322.6755	316221.99	12	3794663.88	10594.19008	12882.12482
4	322.6755	316221.99	16	5059551.84	14125.58678	14105.44879
5	322.6755	316221.99	20	6324439.8	17656.98347	12463.22042
6	322.6755	316221.99	24	7589327.76	21188.38016	18458.84962
7	156.933	153794.34	28	4306241.52	12022.4459	10405.18883
		2051126.28		30868888.7	**86181.77647**	**94068.49943**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3792.259125	11382.43993
2	322.6755	316221.99	8	2529775.92	7584.518251	12723.69752
3	322.6755	316221.99	12	3794663.88	11376.77738	13869.16266
4	322.6755	316221.99	16	5059551.84	15169.0365	14322.57592
5	322.6755	316221.99	20	6324439.8	18961.29563	19609.6415
6	193.6053	189733.194	24	4553596.66	13652.13285	14182.39571
7	94.1598	92276.604	28	2583744.91	7746.322623	7307.049853
		1863119.75		26110661	**78282.34235**	**93396.96308**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3969.627037	15531.08387
2	322.6755	316221.99	8	2529775.92	7939.254075	17161.72236
3	322.6755	316221.99	12	3794663.88	11908.88111	17188.48864
4	193.6053	189733.194	16	3035731.1	9527.104889	11398.81961
5	193.6053	189733.194	20	3794663.88	11908.88111	15179.29683
6	193.6053	189733.194	24	4553596.66	14290.65733	17969.03365
7	94.1598	92276.604	28	2583744.91	8108.626206	9208.492025
		1610142.16		21557064.3	**67653.03176**	**103636.937**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3934.841048	12060.14621
2	322.6755	316221.99	8	2529775.92	7869.682095	14752.60535
3	193.6053	189733.194	12	2276798.33	7082.713886	8946.466851
4	193.6053	189733.194	16	3035731.1	9443.618514	9078.973236
5	193.6053	189733.194	20	3794663.88	11804.52314	13150.72263
6	193.6053	189733.194	24	4553596.66	14165.42777	17076.85092
7	94.1598	92276.604	28	2583744.91	8037.570013	9060.381143
		1483653.36		20039198.8	**62338.37647**	**84126.14634**

Tabel 12 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3531.396694	10419.86438
2	322.6755	316221.99	8	2529775.92	7062.793388	10732.36481
3	322.6755	316221.99	12	3794663.88	10594.19008	14646.41066
4	322.6755	316221.99	16	5059551.84	14125.58678	9908.101924
5	322.6755	316221.99	20	6324439.8	17656.98347	10269.96795
6	322.6755	316221.99	24	7589327.76	21188.38016	13358.24361
7	156.933	153794.34	28	4306241.52	12022.4459	8095.955028
		2051126.28		30868888.7	**86181.77647**	**77430.90836**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3792.259125	8965.489998
2	322.6755	316221.99	8	2529775.92	7584.518251	10107.81571
3	322.6755	316221.99	12	3794663.88	11376.77738	10521.23852
4	322.6755	316221.99	16	5059551.84	15169.0365	12065.2094
5	322.6755	316221.99	20	6324439.8	18961.29563	13446.96959
6	193.6053	189733.194	24	4553596.66	13652.13285	9907.969566
7	94.1598	92276.604	28	2583744.91	7746.322623	5890.429998
		1863119.75		26110661	**78282.34235**	**70905.12278**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3969.627037	9283.399876
2	322.6755	316221.99	8	2529775.92	7939.254075	9886.773284
3	322.6755	316221.99	12	3794663.88	11908.88111	11165.34173
4	193.6053	189733.194	16	3035731.1	9527.104889	7515.288736
5	193.6053	189733.194	20	3794663.88	11908.88111	8611.169161
6	193.6053	189733.194	24	4553596.66	14290.65733	9345.665579
7	94.1598	92276.604	28	2583744.91	8108.626206	5166.515789
		1610142.16		21557064.3	**67653.03176**	**60974.15415**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3934.841048	10425.56698
2	322.6755	316221.99	8	2529775.92	7869.682095	12613.4141
3	193.6053	189733.194	12	2276798.33	7082.713886	6245.811903
4	193.6053	189733.194	16	3035731.1	9443.618514	7782.06132
5	193.6053	189733.194	20	3794663.88	11804.52314	8098.522985
6	193.6053	189733.194	24	4553596.66	14165.42777	9082.665167
7	94.1598	92276.604	28	2583744.91	8037.570013	5505.415775
		1483653.36		20039198.8	**62338.37647**	**59753.45822**

Tabel 13 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	13569.75076
2	501.90695	491868.811	8	3934950.49	5458.385745	12912.7368
3	501.90695	491868.811	12	5902425.73	8187.578617	18866.47117
4	501.90695	491868.811	16	7869900.98	10916.77149	17862.46836
5	486.3608	476633.584	20	9532671.68	13223.29197	14758.79518
6	486.3608	476633.584	24	11439206	15867.95037	11564.41713
7	486.3608	476633.584	28	13345740.4	18512.60876	11485.82834
8	486.3608	476633.584	32	15252274.7	21157.26716	16009.95817
9	486.3608	476633.584	36	17158809	23801.92555	18116.31201
10	302.9616	296902.368	40	11876094.7	16473.98266	14124.11518
		4632310.31		98218608	**136244.4207**	**149270.8531**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	13274.21068
2	501.90695	491868.811	8	3934950.49	5776.887918	14704.77927
3	501.90695	491868.811	12	5902425.73	8665.331877	19444.88277
4	501.90695	491868.811	16	7869900.98	11553.77584	17442.48029
5	486.3608	476633.584	20	9532671.68	13994.88406	13868.82434
6	486.3608	476633.584	24	11439206	16793.86087	11822.02436
7	486.3608	476633.584	28	13345740.4	19592.83768	13926.9961
8	486.3608	476633.584	32	15252274.7	22391.81449	17487.97023
9	291.81648	285980.15	36	10295285.4	15114.47478	13803.27181
10	181.77696	178141.421	40	7125656.83	10461.15345	10431.92449
		4322895.92		86604646.5	**127143.9978**	**146207.3643**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	13032.24186
2	501.90695	491868.811	8	3934950.49	6068.949053	15967.8758
3	501.90695	491868.811	12	5902425.73	9103.423579	16787.77496
4	501.90695	491868.811	16	7869900.98	12137.89811	17268.3487
5	486.3608	476633.584	20	9532671.68	14702.42102	14825.12545
6	486.3608	476633.584	24	11439206	17642.90522	12602.12699
7	291.81648	285980.15	28	8007444.21	12350.03366	7354.391305
8	291.81648	285980.15	32	9151364.81	14114.32418	9759.297102
9	291.81648	285980.15	36	10295285.4	15878.6147	12504.64618
10	181.77696	178141.421	40	7125656.83	10990.03619	9005.987139
		3941589.06		75165440.5	**115929.0899**	**129107.8155**

Tabel 13 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Bucharest

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	12008.24968
2	501.90695	491868.811	8	3934950.49	6170.493406	17574.89723
3	501.90695	491868.811	12	5902425.73	9255.74011	17235.19233
4	501.90695	491868.811	16	7869900.98	12340.98681	16522.8326
5	291.81648	285980.15	20	5719603.01	8969.051264	9221.167931
6	291.81648	285980.15	24	6863523.61	10762.86152	8559.811701
7	291.81648	285980.15	28	8007444.21	12556.67177	7753.061994
8	291.81648	285980.15	32	9151364.81	14350.48202	8960.430143
9	291.81648	285980.15	36	10295285.4	16144.29228	11849.89111
10	181.77696	178141.421	40	7125656.83	11173.91912	8810.733217
		3560282.19		66776689.4	**104714.1821**	**118496.2679**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	15767.65747
2	501.90695	491868.811	8	3934950.49	5982.011373	19371.68519
3	301.14417	295121.287	12	3541455.44	5383.810236	12869.91444
4	301.14417	295121.287	16	4721940.59	7178.413648	12420.19461
5	291.81648	285980.15	20	5719603.01	8695.085326	9659.836491
6	291.81648	285980.15	24	6863523.61	10434.10239	7430.012233
7	291.81648	285980.15	28	8007444.21	12173.11946	7389.86996
8	291.81648	285980.15	32	9151364.81	13912.13652	9420.188239
9	291.81648	285980.15	36	10295285.4	15651.15359	12358.12876
10	181.77696	178141.421	40	7125656.83	10832.60395	9369.136101
		3166787.14		61267758.7	**93140.79826**	**116056.6235**

Tabel 13 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa El Centro

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	14860.33605
2	501.90695	491868.811	8	3934950.49	5458.385745	17848.78342
3	501.90695	491868.811	12	5902425.73	8187.578617	19200.23553
4	501.90695	491868.811	16	7869900.98	10916.77149	14524.55579
5	486.3608	476633.584	20	9532671.68	13223.29197	18099.19142
6	486.3608	476633.584	24	11439206	15867.95037	15871.48404
7	486.3608	476633.584	28	13345740.4	18512.60876	14838.04629
8	486.3608	476633.584	32	15252274.7	21157.26716	14635.30109
9	486.3608	476633.584	36	17158809	23801.92555	18340.94359
10	302.9616	296902.368	40	11876094.7	16473.98266	11957.54077
		4632310.31		98218608	**136244.4207**	**160176.418**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	14240.29004
2	501.90695	491868.811	8	3934950.49	5776.887918	19013.22186
3	501.90695	491868.811	12	5902425.73	8665.331877	15474.53516
4	501.90695	491868.811	16	7869900.98	11553.77584	18988.68787
5	486.3608	476633.584	20	9532671.68	13994.88406	19544.11331
6	486.3608	476633.584	24	11439206	16793.86087	13216.25253
7	486.3608	476633.584	28	13345740.4	19592.83768	14705.65811
8	486.3608	476633.584	32	15252274.7	22391.81449	17526.06899
9	291.81648	285980.15	36	10295285.4	15114.47478	11561.18383
10	181.77696	178141.421	40	7125656.83	10461.15345	8250.169068
		4322895.92		86604646.5	**127143.9978**	**152520.1808**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	14564.5789
2	501.90695	491868.811	8	3934950.49	6068.949053	17092.31793
3	501.90695	491868.811	12	5902425.73	9103.423579	15694.80069
4	501.90695	491868.811	16	7869900.98	12137.89811	20967.45718
5	486.3608	476633.584	20	9532671.68	14702.42102	17582.65244
6	486.3608	476633.584	24	11439206	17642.90522	12986.73885
7	291.81648	285980.15	28	8007444.21	12350.03366	8316.078794
8	291.81648	285980.15	32	9151364.81	14114.32418	10389.91765
9	291.81648	285980.15	36	10295285.4	15878.6147	13205.61451
10	181.77696	178141.421	40	7125656.83	10990.03619	9161.241239
		3941589.06		75165440.5	**115929.0899**	**139961.3982**

Tabel 11 Perbandingan Momen Guling Maksimum Struktur Tingkat 10

Gempa Bucharest

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	122052.004	61286.2304	49440.3285	45036.4499	50918.9777
2	109844.883	55156.637	44495.5147	40532.0983	45826.2794
3	97637.7626	49027.0435	39550.7008	36027.7466	40733.5811
4	85430.6418	42897.4501	34605.887	31523.395	35640.8828
5	73223.5211	36767.8567	29661.0732	27019.0433	30548.1845
6	61016.4003	30638.2632	24716.2594	22514.6917	25455.4862
7	48809.2796	24508.6698	19771.4456	18010.34	20362.7878
8	36602.1589	18379.0763	14826.6318	13505.9884	15270.0895
9	24395.0381	12249.4829	9881.81799	9001.63672	10177.3912
10	12187.9356	6119.90499	4937.01166	4497.29173	5084.7005

Gempa El Centro

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	47894.0806	33042.3398	36691.5593	36372.4343	36710.9023
2	43103.9618	29737.6423	33021.8853	32734.6549	33039.305
3	38313.843	26432.9448	29352.2112	29096.8755	29367.7076
4	33523.7241	23128.2473	25682.5371	25459.096	25696.1103
5	28733.6053	19823.5497	22012.8631	21821.3166	22024.513
6	23943.4865	16518.8522	18343.189	18183.5372	18352.9157
7	19153.3676	13214.1547	14673.515	14545.7577	14681.3184
8	14363.2488	9909.45723	11003.8409	10907.9783	11009.7211
9	9573.12997	6604.75973	7334.16683	7270.19888	7338.12382
10	4783.01631	3300.06763	3664.4965	3632.4237	3666.52997

Gempa Gilroy

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	77333.4265	49965.1631	56860.1644	63598.8935	56032.8096
2	69599.1933	44967.9959	51173.384	57238.146	50428.7997
3	61864.9602	39970.8288	45486.6036	50877.3984	44824.7899
4	54130.727	34973.6616	39799.8232	44516.6509	39220.7801
5	46396.4939	29976.4945	34113.0428	38155.9033	33616.7703
6	38662.2607	24979.3273	28426.2624	31795.1558	28012.7604
7	30928.0276	19982.1602	22739.482	25434.4082	22408.7506
8	23193.7944	14984.993	17052.7016	19073.6607	16804.7408
9	15459.5613	9987.82589	11365.9212	12712.9131	11200.731
10	7725.3312	4990.66449	5679.14547	6352.17096	5596.72511

Gempa Koyna

Tingkat	Tipikal	Setback 1	Setback 2	Setback 3	Setback 4
1	56559.5575	41776.9732	36067.5572	35285.6186	37520.6336
2	50902.9003	37598.7278	32460.3166	31756.5821	33768.0801
3	45246.2432	33420.4824	28853.076	28227.5456	30015.5265
4	39589.586	29242.237	25245.8354	24698.5091	26262.973
5	33932.9288	25063.9916	21638.5948	21169.4726	22510.4194
6	28276.2716	20885.7462	18031.3542	17640.4361	18757.8659
7	22619.6144	16707.5008	14424.1136	14111.3995	15005.3123
8	16962.9572	12529.2554	10816.873	10582.363	11252.7588
9	11306.3001	8351.00998	7209.63243	7053.32653	7500.20522
10	5649.64607	4172.7698	3602.39486	3524.29329	3747.65444

Tabel 13 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa El Centro

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	17090.26893
2	501.90695	491868.811	8	3934950.49	6170.493406	18546.81813
3	501.90695	491868.811	12	5902425.73	9255.74011	18114.03024
4	501.90695	491868.811	16	7869900.98	12340.98681	22938.27494
5	291.81648	285980.15	20	5719603.01	8969.051264	11219.40831
6	291.81648	285980.15	24	6863523.61	10762.86152	9655.329463
7	291.81648	285980.15	28	8007444.21	12556.67177	10165.11326
8	291.81648	285980.15	32	9151364.81	14350.48202	11072.48588
9	291.81648	285980.15	36	10295285.4	16144.29228	13378.71891
10	181.77696	178141.421	40	7125656.83	11173.91912	9081.059245
		3560282.19		66776689.4	**104714.1821**	**141261.5073**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	14943.06952
2	501.90695	491868.811	8	3934950.49	5982.011373	18083.11782
3	301.14417	295121.287	12	3541455.44	5383.810236	11521.22426
4	301.14417	295121.287	16	4721940.59	7178.413648	14557.60815
5	291.81648	285980.15	20	5719603.01	8695.085326	12867.81778
6	291.81648	285980.15	24	6863523.61	10434.10239	9351.802204
7	291.81648	285980.15	28	8007444.21	12173.11946	8284.10863
8	291.81648	285980.15	32	9151364.81	13912.13652	9375.938717
9	291.81648	285980.15	36	10295285.4	15651.15359	12659.72832
10	181.77696	178141.421	40	7125656.83	10832.60395	9166.324914
		3166787.14		61267758.7	**93140.79826**	**120810.7403**

Tabel 13 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	18814.85766
2	501.90695	491868.811	8	3934950.49	5458.385745	26071.40653
3	501.90695	491868.811	12	5902425.73	8187.578617	28381.99558
4	501.90695	491868.811	16	7869900.98	10916.77149	27207.26799
5	486.3608	476633.584	20	9532671.68	13223.29197	23970.82447
6	486.3608	476633.584	24	11439206	15867.95037	16912.80848
7	486.3608	476633.584	28	13345740.4	18512.60876	12923.22198
8	486.3608	476633.584	32	15252274.7	21157.26716	16988.31859
9	486.3608	476633.584	36	17158809	23801.92555	24422.61138
10	302.9616	296902.368	40	11876094.7	16473.98266	19313.32799
		4632310.31		98218608	**136244.4207**	**215006.6406**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	20012.06506
2	501.90695	491868.811	8	3934950.49	5776.887918	25790.01545
3	501.90695	491868.811	12	5902425.73	8665.331877	25089.03752
4	501.90695	491868.811	16	7869900.98	11553.77584	22104.39929
5	486.3608	476633.584	20	9532671.68	13994.88406	17162.90505
6	486.3608	476633.584	24	11439206	16793.86087	13297.28546
7	486.3608	476633.584	28	13345740.4	19592.83768	14282.11657
8	486.3608	476633.584	32	15252274.7	22391.81449	19820.24828
9	291.81648	285980.15	36	10295285.4	15114.47478	16242.27605
10	181.77696	178141.421	40	7125656.83	10461.15345	12476.66123
		4322895.92		86604646.5	**127143.9978**	**186277.01**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	20631.54598
2	501.90695	491868.811	8	3934950.49	6068.949053	25117.97138
3	501.90695	491868.811	12	5902425.73	9103.423579	22617.99749
4	501.90695	491868.811	16	7869900.98	12137.89811	18392.65931
5	486.3608	476633.584	20	9532671.68	14702.42102	14730.06661
6	486.3608	476633.584	24	11439206	17642.90522	15456.67099
7	291.81648	285980.15	28	8007444.21	12350.03366	10310.94587
8	291.81648	285980.15	32	9151364.81	14114.32418	12522.99206
9	291.81648	285980.15	36	10295285.4	15878.6147	19138.50424
10	181.77696	178141.421	40	7125656.83	10990.03619	14197.86367
		3941589.06		75165440.5	**115929.0899**	**173117.2176**

Tabel 13 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Gilroy

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	22310.17383
2	501.90695	491868.811	8	3934950.49	6170.493406	26979.99582
3	501.90695	491868.811	12	5902425.73	9255.74011	24421.79484
4	501.90695	491868.811	16	7869900.98	12340.98681	22214.07161
5	291.81648	285980.15	20	5719603.01	8969.051264	10262.80959
6	291.81648	285980.15	24	6863523.61	10762.86152	10944.42442
7	291.81648	285980.15	28	8007444.21	12556.67177	11080.08747
8	291.81648	285980.15	32	9151364.81	14350.48202	15012.79549
9	291.81648	285980.15	36	10295285.4	16144.29228	21427.96458
10	181.77696	178141.421	40	7125656.83	11173.91912	15880.42741
		3560282.19		66776689.4	**104714.1821**	**180534.5451**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	22106.60653
2	501.90695	491868.811	8	3934950.49	5982.011373	29709.30697
3	301.14417	295121.287	12	3541455.44	5383.810236	16060.67735
4	301.14417	295121.287	16	4721940.59	7178.413648	14036.26677
5	291.81648	285980.15	20	5719603.01	8695.085326	10630.34635
6	291.81648	285980.15	24	6863523.61	10434.10239	8938.47034
7	291.81648	285980.15	28	8007444.21	12173.11946	9335.801682
8	291.81648	285980.15	32	9151364.81	13912.13652	12201.87612
9	291.81648	285980.15	36	10295285.4	15651.15359	18201.81549
10	181.77696	178141.421	40	7125656.83	10832.60395	13991.81278
		3166787.14		61267758.7	**93140.79826**	**155212.9804**

Tabel 13 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	20494.92201
2	501.90695	491868.811	8	3934950.49	5458.385745	26883.28882
3	501.90695	491868.811	12	5902425.73	8187.578617	31666.86933
4	501.90695	491868.811	16	7869900.98	10916.77149	35545.94835
5	486.3608	476633.584	20	9532671.68	13223.29197	37511.67766
6	486.3608	476633.584	24	11439206	15867.95037	40334.56208
7	486.3608	476633.584	28	13345740.4	18512.60876	43171.6067
8	486.3608	476633.584	32	15252274.7	21157.26716	45915.29298
9	486.3608	476633.584	36	17158809	23801.92555	47925.79995
10	302.9616	296902.368	40	11876094.7	16473.98266	30469.83904
		4632310.31		98218608	**136244.4207**	**359919.8069**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	19252.97637
2	501.90695	491868.811	8	3934950.49	5776.887918	24079.4122
3	501.90695	491868.811	12	5902425.73	8665.331877	27602.36015
4	501.90695	491868.811	16	7869900.98	11553.77584	30427.38071
5	486.3608	476633.584	20	9532671.68	13994.88406	31852.52795
6	486.3608	476633.584	24	11439206	16793.86087	34033.59516
7	486.3608	476633.584	28	13345740.4	19592.83768	36446.68062
8	486.3608	476633.584	32	15252274.7	22391.81449	38749.57917
9	291.81648	285980.15	36	10295285.4	15114.47478	24182.34008
10	181.77696	178141.421	40	7125656.83	10461.15345	15299.76247
		4322895.92		86604646.5	**127143.9978**	**281926.6149**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	18333.22781
2	501.90695	491868.811	8	3934950.49	6068.949053	21367.59427
3	501.90695	491868.811	12	5902425.73	9103.423579	23683.7394
4	501.90695	491868.811	16	7869900.98	12137.89811	25714.76546
5	486.3608	476633.584	20	9532671.68	14702.42102	26727.06364
6	486.3608	476633.584	24	11439206	17642.90522	28140.21876
7	291.81648	285980.15	28	8007444.21	12350.03366	17591.59999
8	291.81648	285980.15	32	9151364.81	14114.32418	18684.60636
9	291.81648	285980.15	36	10295285.4	15878.6147	19486.66162
10	181.77696	178141.421	40	7125656.83	10990.03619	12342.52916
		3941589.06		75165440.5	**115929.0899**	**212072.0065**

Tabel 13 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Koyna

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	17947.63687
2	501.90695	491868.811	8	3934950.49	6170.493406	20248.64272
3	501.90695	491868.811	12	5902425.73	9255.74011	21550.78132
4	501.90695	491868.811	16	7869900.98	12340.98681	23159.80811
5	291.81648	285980.15	20	5719603.01	8969.051264	14286.40105
6	291.81648	285980.15	24	6863523.61	10762.86152	14924.32758
7	291.81648	285980.15	28	8007444.21	12556.67177	15548.79962
8	291.81648	285980.15	32	9151364.81	14350.48202	16654.86885
9	291.81648	285980.15	36	10295285.4	16144.29228	17633.12364
10	181.77696	178141.421	40	7125656.83	11173.91912	11243.22934
		3560282.19		66776689.4	**104714.1821**	**173197.6191**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	18475.7127
2	501.90695	491868.811	8	3934950.49	5982.011373	21484.19244
3	301.14417	295121.287	12	3541455.44	5383.810236	14192.72721
4	301.14417	295121.287	16	4721940.59	7178.413648	15259.2754
5	291.81648	285980.15	20	5719603.01	8695.085326	15893.53048
6	291.81648	285980.15	24	6863523.61	10434.10239	16904.30578
7	291.81648	285980.15	28	8007444.21	12173.11946	17779.65554
8	291.81648	285980.15	32	9151364.81	13912.13652	18952.31507
9	291.81648	285980.15	36	10295285.4	15651.15359	19975.56375
10	181.77696	178141.421	40	7125656.83	10832.60395	12711.75125
		3166787.14		61267758.7	**93140.79826**	**171629.0296**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	23095.6796
2	681.0253	667404.794	8	5339238.35	3861.762083	25972.12007
3	681.0253	667404.794	12	8008857.53	5792.643124	27342.0651
4	681.0253	667404.794	16	10678476.7	7723.524165	28655.52399
5	681.0253	667404.794	20	13348095.9	9654.405206	30362.74444
6	389.14875	381365.775	24	9152778.6	6620.017878	17963.532
7	389.14875	381365.775	28	10678241.7	7723.354191	18704.22428
8	389.14875	381365.775	32	12203704.8	8826.690505	19401.54408
9	389.14875	381365.775	36	13729167.9	9930.026818	19996.79712
10	366.43788	359109.122	40	14364364.9	10389.45184	19291.66393
11	366.43788	359109.122	44	15800801.4	11428.39702	20127.10321
12	366.43788	359109.122	48	17237237.9	12467.3422	20935.90816
13	366.43788	359109.122	52	18673674.4	13506.28739	21831.52734
14	366.43788	359109.122	56	20110110.9	14545.23257	22549.20378
15	240.98829	236168.524	60	14170111.5	10248.95229	15042.40277
		6862406.04		186037301	**134556.9811**	**331272.0399**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	22397.61436
2	681.0253	667404.794	8	5339238.35	3755.29842	25285.09921
3	681.0253	667404.794	12	8008857.53	5632.947629	27223.07471
4	408.61518	400442.876	16	6407086.02	4506.358103	17328.88911
5	408.61518	400442.876	20	8008857.53	5632.947629	18234.92199
6	389.14875	381365.775	24	9152778.6	6437.512758	18129.92562
7	389.14875	381365.775	28	10678241.7	7510.431551	18777.45609
8	389.14875	381365.775	32	12203704.8	8583.350345	19247.86283
9	389.14875	381365.775	36	13729167.9	9656.269138	19488.16302
10	366.43788	359109.122	40	14364364.9	10103.02842	18560.65997
11	366.43788	359109.122	44	15800801.4	11113.33126	19323.39631
12	366.43788	359109.122	48	17237237.9	12123.6341	20101.20338
13	366.43788	359109.122	52	18673674.4	13133.93694	20882.05136
14	366.43788	359109.122	56	20110110.9	14144.23978	21590.26572
15	240.98829	236168.524	60	14170111.5	9966.402253	14413.18528
		6328482.2		176426672	**124087.8863**	**300983.769**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	17988.94541
2	681.0253	667404.794	8	5339238.35	3410.473437	21653.82719
3	681.0253	667404.794	12	8008857.53	5115.710155	26704.86128
4	681.0253	667404.794	16	10678476.7	6820.946874	29424.41403
5	681.0253	667404.794	20	13348095.9	8526.183592	26808.89725
6	648.58125	635609.625	24	15254631	9743.995376	21921.41842
7	648.58125	635609.625	28	17797069.5	11367.99461	22638.04541
8	648.58125	635609.625	32	20339508	12991.99383	23318.97118
9	648.58125	635609.625	36	22881946.5	14615.99306	20741.6985
10	610.7298	598515.204	40	23940608.2	15292.22013	16240.89638
11	610.7298	598515.204	44	26334669	16821.44214	20911.27436
12	610.7298	598515.204	48	28728729.8	18350.66415	18940.2739
13	610.7298	598515.204	52	31122790.6	19879.88617	20277.13409
14	610.7298	598515.204	56	33516851.4	21409.10818	22486.25048
15	401.64715	393614.207	60	23616852.4	15085.41903	15448.54927
		9233857.53		283450763	**181056.03**	**325505.4571**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	18470.81526
2	681.0253	667404.794	8	5339238.35	3550.131088	24206.47144
3	681.0253	667404.794	12	8008857.53	5325.196632	29464.74851
4	681.0253	667404.794	16	10678476.7	7100.262176	28632.58625
5	681.0253	667404.794	20	13348095.9	8875.32772	24304.06585
6	648.58125	635609.625	24	15254631	10143.00846	22839.60318
7	648.58125	635609.625	28	17797069.5	11833.50986	25200.85014
8	648.58125	635609.625	32	20339508	13524.01127	22994.92876
9	648.58125	635609.625	36	22881946.5	15214.51268	18967.87628
10	610.7298	598515.204	40	23940608.2	15918.431	19614.06331
11	610.7298	598515.204	44	26334669	17510.2741	20900.97767
12	610.7298	598515.204	48	28728729.8	19102.1172	22738.84081
13	610.7298	598515.204	52	31122790.6	20693.9603	25228.26977
14	366.43788	359109.122	56	20110110.9	13371.48204	15990.54544
15	240.98829	236168.524	60	14170111.5	9421.896883	10722.44163
		8837005.76		260597282	**173274.6228**	**330277.0843**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	19514.39278
2	681.0253	667404.794	8	5339238.35	3697.454201	25839.7933
3	681.0253	667404.794	12	8008857.53	5546.181302	29232.99612
4	681.0253	667404.794	16	10678476.7	7394.908403	25224.0289
5	681.0253	667404.794	20	13348095.9	9243.635503	21806.16823
6	648.58125	635609.625	24	15254631	10563.92237	26054.80594
7	648.58125	635609.625	28	17797069.5	12324.5761	25624.03206
8	648.58125	635609.625	32	20339508	14085.22983	21718.60458
9	648.58125	635609.625	36	22881946.5	15845.88356	16524.05698
10	610.7298	598515.204	40	23940608.2	16579.01303	19698.66715
11	610.7298	598515.204	44	26334669	18236.91434	20808.02728
12	366.43788	359109.122	48	17237237.9	11936.88938	13452.00804
13	366.43788	359109.122	52	18673674.4	12931.63017	14805.69888
14	366.43788	359109.122	56	20110110.9	13926.37095	16462.28641
15	240.98829	236168.524	60	14170111.5	9812.886159	11457.09433
		8358193.6		236656674	**163886.149**	**308222.661**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	20586.88508
2	681.0253	667404.794	8	5339238.35	3809.341983	27517.88253
3	681.0253	667404.794	12	8008857.53	5714.012975	27913.18613
4	681.0253	667404.794	16	10678476.7	7618.683966	24082.88903
5	681.0253	667404.794	20	13348095.9	9523.354958	24868.33937
6	648.58125	635609.625	24	15254631	10883.59471	26415.73049
7	648.58125	635609.625	28	17797069.5	12697.52717	24381.02352
8	648.58125	635609.625	32	20339508	14511.45962	22296.49439
9	648.58125	635609.625	36	22881946.5	16325.39207	17631.80871
10	366.43788	359109.122	40	14364364.9	10248.42396	12345.72535
11	366.43788	359109.122	44	15800801.4	11273.26636	12432.09379
12	366.43788	359109.122	48	17237237.9	12298.10875	14069.14863
13	366.43788	359109.122	52	18673674.4	13322.95115	15929.49875
14	366.43788	359109.122	56	20110110.9	14347.79354	17249.4243
15	240.98829	236168.524	60	14170111.5	10109.83157	11855.92764
		7879381.44		216546563	**154497.6752**	**299576.0577**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	21674.07677
2	681.0253	667404.794	8	5339238.35	3872.697343	28634.05877
3	681.0253	667404.794	12	8008857.53	5809.046014	29166.44563
4	681.0253	667404.794	16	10678476.7	7745.394686	25835.5865
5	681.0253	667404.794	20	13348095.9	9681.743357	25718.64999
6	648.58125	635609.625	24	15254631	11064.60604	26914.01506
7	648.58125	635609.625	28	17797069.5	12908.70705	26312.90583
8	389.14875	381365.775	32	12203704.8	8851.684835	13944.49977
9	389.14875	381365.775	36	13729167.9	9958.14544	11019.88972
10	366.43788	359109.122	40	14364364.9	10418.8714	12868.85168
11	366.43788	359109.122	44	15800801.4	11460.75854	12939.16958
12	366.43788	359109.122	48	17237237.9	12502.64568	14604.31767
13	366.43788	359109.122	52	18673674.4	13544.53282	16054.19121
14	366.43788	359109.122	56	20110110.9	14586.41996	17129.04001
15	240.98829	236168.524	60	14170111.5	10277.974	11796.22848
		7370893.74		199257981	**144527.3282**	**294611.9267**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	25787.41222
2	681.0253	667404.794	8	5339238.35	3861.762083	31650.98235
3	681.0253	667404.794	12	8008857.53	5792.643124	27856.51903
4	681.0253	667404.794	16	10678476.7	7723.524165	25764.72195
5	681.0253	667404.794	20	13348095.9	9654.405206	32555.2868
6	389.14875	381365.775	24	9152778.6	6620.017878	18124.78536
7	389.14875	381365.775	28	10678241.7	7723.354191	16991.47575
8	389.14875	381365.775	32	12203704.8	8826.690505	15158.31811
9	389.14875	381365.775	36	13729167.9	9930.026818	12215.94574
10	366.43788	359109.122	40	14364364.9	10389.45184	13128.08978
11	366.43788	359109.122	44	15800801.4	11428.39702	12876.2579
12	366.43788	359109.122	48	17237237.9	12467.3422	15195.64884
13	366.43788	359109.122	52	18673674.4	13506.28739	16637.01434
14	366.43788	359109.122	56	20110110.9	14545.23257	17482.9862
15	240.98829	236168.524	60	14170111.5	10248.95229	12018.57295
		6862406.04		186037301	**134556.9811**	**293444.0173**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	21937.99502
2	681.0253	667404.794	8	5339238.35	3755.29842	27658.87623
3	681.0253	667404.794	12	8008857.53	5632.947629	32171.65394
4	408.61518	400442.876	16	6407086.02	4506.358103	21413.33911
5	408.61518	400442.876	20	8008857.53	5632.947629	23075.65224
6	389.14875	381365.775	24	9152778.6	6437.512758	21279.4329
7	389.14875	381365.775	28	10678241.7	7510.431551	19767.92412
8	389.14875	381365.775	32	12203704.8	8583.350345	17480.21673
9	389.14875	381365.775	36	13729167.9	9656.269138	13520.21086
10	366.43788	359109.122	40	14364364.9	10103.02842	12727.49344
11	366.43788	359109.122	44	15800801.4	11113.33126	12339.5128
12	366.43788	359109.122	48	17237237.9	12123.6341	16069.71326
13	366.43788	359109.122	52	18673674.4	13133.93694	17888.82802
14	366.43788	359109.122	56	20110110.9	14144.23978	19959.45514
15	240.98829	236168.524	60	14170111.5	9966.402253	14828.45319
		6328482.2		176426672	**124087.8863**	**292118.757**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	23051.29532
2	681.0253	667404.794	8	5339238.35	3410.473437	30270.61055
3	681.0253	667404.794	12	8008857.53	5115.710155	34673.51858
4	681.0253	667404.794	16	10678476.7	6820.946874	36587.83991
5	681.0253	667404.794	20	13348095.9	8526.183592	36826.4109
6	648.58125	635609.625	24	15254631	9743.995376	36690.39086
7	648.58125	635609.625	28	17797069.5	11367.99461	36253.80509
8	648.58125	635609.625	32	20339508	12991.99383	32087.97891
9	648.58125	635609.625	36	22881946.5	14615.99306	24019.56173
10	610.7298	598515.204	40	23940608.2	15292.22013	15973.17048
11	610.7298	598515.204	44	26334669	16821.44214	17664.39204
12	610.7298	598515.204	48	28728729.8	18350.66415	23872.44706
13	610.7298	598515.204	52	31122790.6	19879.88617	29519.78413
14	610.7298	598515.204	56	33516851.4	21409.10818	34929.89946
15	401.64715	393614.207	60	23616852.4	15085.41903	25193.17236
		9233857.53		283450763	**181056.03**	**437614.2774**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	24496.49174
2	681.0253	667404.794	8	5339238.35	3550.131088	30892.70664
3	681.0253	667404.794	12	8008857.53	5325.196632	34403.66137
4	681.0253	667404.794	16	10678476.7	7100.262176	35868.27213
5	681.0253	667404.794	20	13348095.9	8875.32772	34989.90149
6	648.58125	635609.625	24	15254631	10143.00846	33302.08048
7	648.58125	635609.625	28	17797069.5	11833.50986	30594.24198
8	648.58125	635609.625	32	20339508	13524.01127	25069.18129
9	648.58125	635609.625	36	22881946.5	15214.51268	17831.83044
10	610.7298	598515.204	40	23940608.2	15918.431	17012.16073
11	610.7298	598515.204	44	26334669	17510.2741	21692.81582
12	610.7298	598515.204	48	28728729.8	19102.1172	26435.63655
13	610.7298	598515.204	52	31122790.6	20693.9603	31231.07505
14	366.43788	359109.122	56	20110110.9	13371.48204	22552.92691
15	240.98829	236168.524	60	14170111.5	9421.896883	16280.85891
		8837005.76		260597282	**173274.6228**	**402653.8415**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	24436.59206
2	681.0253	667404.794	8	5339238.35	3697.454201	30100.72885
3	681.0253	667404.794	12	8008857.53	5546.181302	33270.45373
4	681.0253	667404.794	16	10678476.7	7394.908403	33640.22125
5	681.0253	667404.794	20	13348095.9	9243.635503	30230.48539
6	648.58125	635609.625	24	15254631	10563.92237	26344.42098
7	648.58125	635609.625	28	17797069.5	12324.5761	22905.7248
8	648.58125	635609.625	32	20339508	14085.22983	18641.44369
9	648.58125	635609.625	36	22881946.5	15845.88356	19063.76699
10	610.7298	598515.204	40	23940608.2	16579.01303	19418.87467
11	610.7298	598515.204	44	26334669	18236.91434	24222.50384
12	366.43788	359109.122	48	17237237.9	11936.88938	16283.06607
13	366.43788	359109.122	52	18673674.4	12931.63017	20883.07502
14	366.43788	359109.122	56	20110110.9	13926.37095	24976.31431
15	240.98829	236168.524	60	14170111.5	9812.886159	17828.5034
		8358193.6		236656674	**163886.149**	**362246.175**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	25163.29407
2	681.0253	667404.794	8	5339238.35	3809.341983	30230.80812
3	681.0253	667404.794	12	8008857.53	5714.012975	32531.05855
4	681.0253	667404.794	16	10678476.7	7618.683966	31506.79668
5	681.0253	667404.794	20	13348095.9	9523.354958	28797.14162
6	648.58125	635609.625	24	15254631	10883.59471	23883.18209
7	648.58125	635609.625	28	17797069.5	12697.52717	20020.22364
8	648.58125	635609.625	32	20339508	14511.45962	20169.77686
9	648.58125	635609.625	36	22881946.5	16325.39207	21128.00495
10	366.43788	359109.122	40	14364364.9	10248.42396	13197.03705
11	366.43788	359109.122	44	15800801.4	11273.26636	15187.8071
12	366.43788	359109.122	48	17237237.9	12298.10875	18114.93436
13	366.43788	359109.122	52	18673674.4	13322.95115	22936.8112
14	366.43788	359109.122	56	20110110.9	14347.79354	26562.5255
15	240.98829	236168.524	60	14170111.5	10109.83157	18857.06606
		7879381.44		216546563	**154497.6752**	**348286.4678**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	24863.60524
2	681.0253	667404.794	8	5339238.35	3872.697343	29621.1293
3	681.0253	667404.794	12	8008857.53	5809.046014	32291.17754
4	681.0253	667404.794	16	10678476.7	7745.394686	31690.59189
5	681.0253	667404.794	20	13348095.9	9681.743357	29761.40168
6	648.58125	635609.625	24	15254631	11064.60604	24277.38439
7	648.58125	635609.625	28	17797069.5	12908.70705	21894.06018
8	389.14875	381365.775	32	12203704.8	8851.684835	13216.9611
9	389.14875	381365.775	36	13729167.9	9958.14544	14498.78956
10	366.43788	359109.122	40	14364364.9	10418.8714	13389.38197
11	366.43788	359109.122	44	15800801.4	11460.75854	14930.86595
12	366.43788	359109.122	48	17237237.9	12502.64568	20109.33417
13	366.43788	359109.122	52	18673674.4	13544.53282	24936.23052
14	366.43788	359109.122	56	20110110.9	14586.41996	28279.95377
15	240.98829	236168.524	60	14170111.5	10277.974	19740.65937
		7370893.74		199257981	**144527.3282**	**343501.5266**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	25732.16617
2	681.0253	667404.794	8	5339238.35	3861.762083	32122.12697
3	681.0253	667404.794	12	8008857.53	5792.643124	35344.33513
4	681.0253	667404.794	16	10678476.7	7723.524165	35060.35035
5	681.0253	667404.794	20	13348095.9	9654.405206	35212.47806
6	389.14875	381365.775	24	9152778.6	6620.017878	17003.08632
7	389.14875	381365.775	28	10678241.7	7723.354191	14781.91415
8	389.14875	381365.775	32	12203704.8	8826.690505	14071.08264
9	389.14875	381365.775	36	13729167.9	9930.026818	15565.55403
10	366.43788	359109.122	40	14364364.9	10389.45184	14476.45737
11	366.43788	359109.122	44	15800801.4	11428.39702	15550.92141
12	366.43788	359109.122	48	17237237.9	12467.3422	20878.67404
13	366.43788	359109.122	52	18673674.4	13506.28739	25899.28103
14	366.43788	359109.122	56	20110110.9	14545.23257	29504.81752
15	240.98829	236168.524	60	14170111.5	10248.95229	20710.14156
		6862406.04		186037301	**134556.9811**	**351913.3867**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	28121.99547
2	681.0253	667404.794	8	5339238.35	3755.29842	37195.61339
3	681.0253	667404.794	12	8008857.53	5632.947629	42050.35536
4	408.61518	400442.876	16	6407086.02	4506.358103	22927.06283
5	408.61518	400442.876	20	8008857.53	5632.947629	19868.24312
6	389.14875	381365.775	24	9152778.6	6437.512758	15602.99873
7	389.14875	381365.775	28	10678241.7	7510.431551	14334.22924
8	389.14875	381365.775	32	12203704.8	8583.350345	16295.79741
9	389.14875	381365.775	36	13729167.9	9656.269138	16883.57496
10	366.43788	359109.122	40	14364364.9	10103.02842	14575.53385
11	366.43788	359109.122	44	15800801.4	11113.33126	13897.36425
12	366.43788	359109.122	48	17237237.9	12123.6341	18426.0987
13	366.43788	359109.122	52	18673674.4	13133.93694	23813.80856
14	366.43788	359109.122	56	20110110.9	14144.23978	27814.99382
15	240.98829	236168.524	60	14170111.5	9966.402253	19886.88206
		6328482.2		176426672	**124087.8863**	**331694.5517**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	19569.16636
2	681.0253	667404.794	8	5339238.35	3410.473437	20200.67751
3	681.0253	667404.794	12	8008857.53	5115.710155	18816.00038
4	681.0253	667404.794	16	10678476.7	6820.946874	23834.93267
5	681.0253	667404.794	20	13348095.9	8526.183592	26432.68997
6	648.58125	635609.625	24	15254631	9743.995376	22660.78899
7	648.58125	635609.625	28	17797069.5	11367.99461	21158.32487
8	648.58125	635609.625	32	20339508	12991.99383	20218.04408
9	648.58125	635609.625	36	22881946.5	14615.99306	17108.4817
10	610.7298	598515.204	40	23940608.2	15292.22013	15364.24385
11	610.7298	598515.204	44	26334669	16821.44214	17160.7208
12	610.7298	598515.204	48	28728729.8	18350.66415	21917.84709
13	610.7298	598515.204	52	31122790.6	19879.88617	21499.09435
14	610.7298	598515.204	56	33516851.4	21409.10818	25491.62376
15	401.64715	393614.207	60	23616852.4	15085.41903	19085.614
		9233857.53		283450763	**181056.03**	**310518.2504**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	19188.59245
2	681.0253	667404.794	8	5339238.35	3550.131088	20520.98831
3	681.0253	667404.794	12	8008857.53	5325.196632	19307.36483
4	681.0253	667404.794	16	10678476.7	7100.262176	24345.79475
5	681.0253	667404.794	20	13348095.9	8875.32772	23959.60754
6	648.58125	635609.625	24	15254631	10143.00846	20251.43874
7	648.58125	635609.625	28	17797069.5	11833.50986	19968.98635
8	648.58125	635609.625	32	20339508	13524.01127	18010.57924
9	648.58125	635609.625	36	22881946.5	15214.51268	15162.68975
10	610.7298	598515.204	40	23940608.2	15918.431	15185.40512
11	610.7298	598515.204	44	26334669	17510.2741	21338.04819
12	610.7298	598515.204	48	28728729.8	19102.1172	22638.31148
13	610.7298	598515.204	52	31122790.6	20693.9603	23641.19915
14	366.43788	359109.122	56	20110110.9	13371.48204	16451.91409
15	240.98829	236168.524	60	14170111.5	9421.896883	11400.23146
		8837005.76		260597282	**173274.6228**	**291371.1514**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	20040.30094
2	681.0253	667404.794	8	5339238.35	3697.454201	21341.97111
3	681.0253	667404.794	12	8008857.53	5546.181302	20407.22308
4	681.0253	667404.794	16	10678476.7	7394.908403	23905.30579
5	681.0253	667404.794	20	13348095.9	9243.635503	24016.06186
6	648.58125	635609.625	24	15254631	10563.92237	21394.54576
7	648.58125	635609.625	28	17797069.5	12324.5761	20729.61733
8	648.58125	635609.625	32	20339508	14085.22983	17531.82487
9	648.58125	635609.625	36	22881946.5	15845.88356	16196.0222
10	610.7298	598515.204	40	23940608.2	16579.01303	16138.63155
11	610.7298	598515.204	44	26334669	18236.91434	21089.52538
12	366.43788	359109.122	48	17237237.9	11936.88938	13336.86353
13	366.43788	359109.122	52	18673674.4	12931.63017	16159.42679
14	366.43788	359109.122	56	20110110.9	13926.37095	18832.44174
15	240.98829	236168.524	60	14170111.5	9812.886159	13078.17323
		8358193.6		236656674	**163886.149**	**284197.9352**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	20447.75526
2	681.0253	667404.794	8	5339238.35	3809.341983	18339.49701
3	681.0253	667404.794	12	8008857.53	5714.012975	20534.14764
4	681.0253	667404.794	16	10678476.7	7618.683966	24407.55354
5	681.0253	667404.794	20	13348095.9	9523.354958	24509.84143
6	648.58125	635609.625	24	15254631	10883.59471	21464.66554
7	648.58125	635609.625	28	17797069.5	12697.52717	17940.55019
8	648.58125	635609.625	32	20339508	14511.45962	17743.68591
9	648.58125	635609.625	36	22881946.5	16325.39207	19110.13678
10	366.43788	359109.122	40	14364364.9	10248.42396	10802.62981
11	366.43788	359109.122	44	15800801.4	11273.26636	10811.64352
12	366.43788	359109.122	48	17237237.9	12298.10875	12449.64911
13	366.43788	359109.122	52	18673674.4	13322.95115	15279.9505
14	366.43788	359109.122	56	20110110.9	14347.79354	16951.49239
15	240.98829	236168.524	60	14170111.5	10109.83157	11593.05956
		7879381.44		216546563	**154497.6752**	**262386.2582**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	18192.74448
2	681.0253	667404.794	8	5339238.35	3872.697343	19021.43645
3	681.0253	667404.794	12	8008857.53	5809.046014	23909.10147
4	681.0253	667404.794	16	10678476.7	7745.394686	25213.15136
5	681.0253	667404.794	20	13348095.9	9681.743357	23795.02501
6	648.58125	635609.625	24	15254631	11064.60604	21529.21774
7	648.58125	635609.625	28	17797069.5	12908.70705	20510.33049
8	389.14875	381365.775	32	12203704.8	8851.684835	11814.16768
9	389.14875	381365.775	36	13729167.9	9958.14544	11673.32203
10	366.43788	359109.122	40	14364364.9	10418.8714	11340.56709
11	366.43788	359109.122	44	15800801.4	11460.75854	11224.89823
12	366.43788	359109.122	48	17237237.9	12502.64568	13162.0669
13	366.43788	359109.122	52	18673674.4	13544.53282	13813.98171
14	366.43788	359109.122	56	20110110.9	14586.41996	15199.13366
15	240.98829	236168.524	60	14170111.5	10277.974	10933.81873
		7370893.74		199257981	**144527.3282**	**251332.963**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	16932.02648
2	681.0253	667404.794	8	5339238.35	3861.762083	22517.50281
3	681.0253	667404.794	12	8008857.53	5792.643124	28185.73797
4	681.0253	667404.794	16	10678476.7	7723.524165	26970.04628
5	681.0253	667404.794	20	13348095.9	9654.405206	26396.35541
6	389.14875	381365.775	24	9152778.6	6620.017878	12484.88787
7	389.14875	381365.775	28	10678241.7	7723.354191	13207.92482
8	389.14875	381365.775	32	12203704.8	8826.690505	12174.07254
9	389.14875	381365.775	36	13729167.9	9930.026818	11803.57974
10	366.43788	359109.122	40	14364364.9	10389.45184	11417.64528
11	366.43788	359109.122	44	15800801.4	11428.39702	11410.94667
12	366.43788	359109.122	48	17237237.9	12467.3422	14203.21652
13	366.43788	359109.122	52	18673674.4	13506.28739	14773.79497
14	366.43788	359109.122	56	20110110.9	14545.23257	15514.32476
15	240.98829	236168.524	60	14170111.5	10248.95229	11302.31035
		6862406.04		186037301	**134556.9811**	**249294.3725**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	18131.41567
2	681.0253	667404.794	8	5339238.35	3755.29842	26165.96223
3	681.0253	667404.794	12	8008857.53	5632.947629	28039.30263
4	408.61518	400442.876	16	6407086.02	4506.358103	15338.08271
5	408.61518	400442.876	20	8008857.53	5632.947629	14634.2172
6	389.14875	381365.775	24	9152778.6	6437.512758	12497.01151
7	389.14875	381365.775	28	10678241.7	7510.431551	13055.86871
8	389.14875	381365.775	32	12203704.8	8583.350345	13058.93329
9	389.14875	381365.775	36	13729167.9	9656.269138	11774.69978
10	366.43788	359109.122	40	14364364.9	10103.02842	12347.79503
11	366.43788	359109.122	44	15800801.4	11113.33126	12164.98421
12	366.43788	359109.122	48	17237237.9	12123.6341	14371.78293
13	366.43788	359109.122	52	18673674.4	13133.93694	14424.94778
14	366.43788	359109.122	56	20110110.9	14144.23978	15671.63537
15	240.98829	236168.524	60	14170111.5	9966.402253	11463.18342
		6328482.2		176426672	**124087.8863**	**233139.8225**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	19704.78562
2	681.0253	667404.794	8	5339238.35	1939.854608	26579.12363
3	681.0253	667404.794	12	8008857.53	2909.781912	32275.9538
4	681.0253	667404.794	16	10678476.7	3879.709217	37865.7474
5	681.0253	667404.794	20	13348095.9	4849.636521	43074.6695
6	681.0253	667404.794	24	16017715.1	5819.563825	47961.6713
7	681.0253	667404.794	28	18687334.2	6789.491129	52750.89497
8	681.0253	667404.794	32	21356953.4	7759.418433	57511.54107
9	681.0253	667404.794	36	24026572.6	8729.345737	61979.10726
10	648.58125	635609.625	40	25424385	9237.199607	63281.41584
11	648.58125	635609.625	44	27966823.5	10160.91957	67329.86371
12	648.58125	635609.625	48	30509262	11084.63953	71212.15411
13	648.58125	635609.625	52	33051700.5	12008.35949	74714.21998
14	648.58125	635609.625	56	35594139	12932.07945	77956.79974
15	610.7298	598515.204	60	35910912.2	13047.16965	76097.54237
16	610.7298	598515.204	64	38304973.1	13916.98096	78400.76178
17	610.7298	598515.204	68	40699033.9	14786.79227	80326.54663
18	610.7298	598515.204	72	43093094.7	15656.60358	81897.77631
19	610.7298	598515.204	76	45487155.5	16526.41489	83137.91621
20	401.64715	393614.207	80	31489136.6	11440.64802	54983.39265
		12539086.3		507536298	**184398.3284**	**1189041.884**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	19948.29118
2	681.0253	667404.794	8	5339238.35	1999.779701	27317.25822
3	681.0253	667404.794	12	8008857.53	2999.669552	33532.21512
4	681.0253	667404.794	16	10678476.7	3999.559403	39494.60789
5	681.0253	667404.794	20	13348095.9	4999.449254	45006.76073
6	681.0253	667404.794	24	16017715.1	5999.339104	50496.91316
7	681.0253	667404.794	28	18687334.2	6999.228955	55666.87222
8	681.0253	667404.794	32	21356953.4	7999.118806	60557.77569
9	681.0253	667404.794	36	24026572.6	8999.008656	65339.62609
10	648.58125	635609.625	40	25424385	9522.550913	66494.42013
11	648.58125	635609.625	44	27966823.5	10474.806	70504.80748
12	648.58125	635609.625	48	30509262	11427.0611	74294.93166
13	648.58125	635609.625	52	33051700.5	12379.31619	77748.88197
14	648.58125	635609.625	56	35594139	13331.57128	80819.88405
15	610.7298	598515.204	60	35910912.2	13450.2168	78649.67294
16	610.7298	598515.204	64	38304973.1	14346.89792	80930.66094
17	610.7298	598515.204	68	40699033.9	15243.57904	82841.99719
18	610.7298	598515.204	72	43093094.7	16140.26015	84163.45905
19	366.43788	359109.122	76	27292293.3	10222.16476	50920.78129
20	240.98829	236168.524	80	18893481.9	7076.440341	33606.39351
		12142234.6		476745781	**178562.273**	**1178336.211**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	983.8739198	20270.70101
2	681.0253	667404.794	8	5339238.35	2066.180703	28010.23624
3	681.0253	667404.794	12	8008857.53	3099.271054	34827.93726
4	681.0253	667404.794	16	10678476.7	4132.361405	41527.61145
5	681.0253	667404.794	20	13348095.9	5165.451756	48150.63503
6	681.0253	667404.794	24	16017715.1	6198.542108	54278.24136
7	681.0253	667404.794	28	18687334.2	7231.632459	59741.79277
8	681.0253	667404.794	32	21356953.4	8264.72281	64649.57226
9	681.0253	667404.794	36	24026572.6	9297.813161	69165.4041
10	648.58125	635609.625	40	25424385	9838.739198	69994.00754
11	648.58125	635609.625	44	27966823.5	10822.61312	73849.84618
12	648.58125	635609.625	48	30509262	11806.48704	77418.27023
13	648.58125	635609.625	52	33051700.5	12790.36096	80747.16129
14	648.58125	635609.625	56	35594139	13774.23488	83773.55975
15	610.7298	598515.204	60	35910912.2	13896.81992	81236.95528
16	610.7298	598515.204	64	38304973.1	14823.27458	83120.32512
17	366.43788	359109.122	68	24419420.3	9449.837545	50655.85898
18	366.43788	359109.122	72	25855856.8	10005.71034	51240.39605
19	366.43788	359109.122	76	27292293.3	10561.58314	51584.62458
20	240.98829	236168.524	80	18893481.9	7311.407584	34014.11697
		11663422.4		443228930	**171520.9177**	**1158257.253**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1011.211895	20270.70101
2	681.0253	667404.794	8	5339238.35	2123.591714	28010.23624
3	681.0253	667404.794	12	8008857.53	3185.387571	34827.93726
4	681.0253	667404.794	16	10678476.7	4247.183428	41527.61145
5	681.0253	667404.794	20	13348095.9	5308.979285	48150.63503
6	681.0253	667404.794	24	16017715.1	6370.775142	54278.24136
7	681.0253	667404.794	28	18687334.2	7432.570999	59741.79277
8	681.0253	667404.794	32	21356953.4	8494.366855	64649.57226
9	681.0253	667404.794	36	24026572.6	9556.162712	69165.4041
10	648.58125	635609.625	40	25424385	10112.11895	69994.00754
11	648.58125	635609.625	44	27966823.5	11123.33084	73849.84618
12	648.58125	635609.625	48	30509262	12134.54274	77418.27023
13	648.58125	635609.625	52	33051700.5	13145.75463	80747.16129
14	648.58125	635609.625	56	35594139	14156.96653	83773.55975
15	366.43788	359109.122	60	21546547.3	8569.774636	81236.95528
16	366.43788	359109.122	64	22982983.8	9141.092945	83120.32512
17	366.43788	359109.122	68	24419420.3	9712.411254	50655.85898
18	366.43788	359109.122	72	25855856.8	10283.72956	51240.39605
19	366.43788	359109.122	76	27292293.3	10855.04787	51584.62458
20	240.98829	236168.524	80	18893481.9	7514.56276	34014.11697
		11184610.2		413542576	**164479.5623**	**1158257.253**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	24880.46296
2	681.0253	667404.794	8	5339238.35	3410.473437	31905.83882
3	681.0253	667404.794	12	8008857.53	5115.710155	37443.46428
4	681.0253	667404.794	16	10678476.7	6820.946874	42478.15416
5	681.0253	667404.794	20	13348095.9	8526.183592	46753.68164
6	648.58125	635609.625	24	15254631	9743.995376	47953.10541
7	648.58125	635609.625	28	17797069.5	11367.99461	50905.4743
8	648.58125	635609.625	32	20339508	12991.99383	53663.28327
9	648.58125	635609.625	36	22881946.5	14615.99306	56454.07248
10	610.7298	598515.204	40	23940608.2	15292.22013	55796.37297
11	610.7298	598515.204	44	26334669	16821.44214	58395.80592
12	610.7298	598515.204	48	28728729.8	18350.66415	60751.05771
13	610.7298	598515.204	52	31122790.6	19879.88617	62600.65276
14	610.7298	598515.204	56	33516851.4	21409.10818	63662.02479
15	401.64715	393614.207	60	23616852.4	15085.41903	42166.3912
		9233857.53		283450763	**181056.03**	**735809.8426**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	24459.06122
2	681.0253	667404.794	8	5339238.35	3550.131088	30765.93949
3	681.0253	667404.794	12	8008857.53	5325.196632	35396.33343
4	681.0253	667404.794	16	10678476.7	7100.262176	39562.5327
5	681.0253	667404.794	20	13348095.9	8875.32772	43120.94073
6	648.58125	635609.625	24	15254631	10143.00846	43866.59391
7	648.58125	635609.625	28	17797069.5	11833.50986	46292.03437
8	648.58125	635609.625	32	20339508	13524.01127	48646.97959
9	648.58125	635609.625	36	22881946.5	15214.51268	51142.03192
10	610.7298	598515.204	40	23940608.2	15918.431	50583.29781
11	610.7298	598515.204	44	26334669	17510.2741	52991.8594
12	610.7298	598515.204	48	28728729.8	19102.1172	55139.1929
13	610.7298	598515.204	52	31122790.6	20693.9603	56716.51055
14	366.43788	359109.122	56	20110110.9	13371.48204	34654.69111
15	240.98829	236168.524	60	14170111.5	9421.896883	22977.003
		8837005.76		260597282	**173274.6228**	**636315.0021**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	24170.90912
2	681.0253	667404.794	8	5339238.35	3697.454201	28601.14806
3	681.0253	667404.794	12	8008857.53	5546.181302	32174.09626
4	681.0253	667404.794	16	10678476.7	7394.908403	35248.33165
5	681.0253	667404.794	20	13348095.9	9243.635503	37830.16129
6	648.58125	635609.625	24	15254631	10563.92237	38126.90182
7	648.58125	635609.625	28	17797069.5	12324.5761	40073.31132
8	648.58125	635609.625	32	20339508	14085.22983	42089.21566
9	648.58125	635609.625	36	22881946.5	15845.88356	44192.23159
10	610.7298	598515.204	40	23940608.2	16579.01303	43732.77118
11	610.7298	598515.204	44	26334669	18236.91434	45671.64874
12	366.43788	359109.122	48	17237237.9	11936.88938	28433.96438
13	366.43788	359109.122	52	18673674.4	12931.63017	29341.67134
14	366.43788	359109.122	56	20110110.9	13926.37095	29981.84502
15	240.98829	236168.524	60	14170111.5	9812.886159	19891.16034
		8358193.6		236656674	**163886.149**	**519559.3678**

Tabel 14 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	23861.74773
2	681.0253	667404.794	8	5339238.35	3809.341983	27684.92681
3	681.0253	667404.794	12	8008857.53	5714.012975	30126.13486
4	681.0253	667404.794	16	10678476.7	7618.683966	32440.73808
5	681.0253	667404.794	20	13348095.9	9523.354958	34469.23686
6	648.58125	635609.625	24	15254631	10883.59471	34672.59846
7	648.58125	635609.625	28	17797069.5	12697.52717	36338.42371
8	648.58125	635609.625	32	20339508	14511.45962	37792.8633
9	648.58125	635609.625	36	22881946.5	16325.39207	39073.08963
10	366.43788	359109.122	40	14364364.9	10248.42396	22746.21895
11	366.43788	359109.122	44	15800801.4	11273.26636	23773.11996
12	366.43788	359109.122	48	17237237.9	12298.10875	24807.14816
13	366.43788	359109.122	52	18673674.4	13322.95115	25688.17398
14	366.43788	359109.122	56	20110110.9	14347.79354	26289.0989
15	240.98829	236168.524	60	14170111.5	10109.83157	17454.86448
		7879381.44		216546563	**154497.6752**	**437218.3839**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	23574.7888
2	681.0253	667404.794	8	5339238.35	3872.697343	27181.97882
3	681.0253	667404.794	12	8008857.53	5809.046014	29210.70847
4	681.0253	667404.794	16	10678476.7	7745.394686	30829.39708
5	681.0253	667404.794	20	13348095.9	9681.743357	32155.34165
6	648.58125	635609.625	24	15254631	11064.60604	31843.23318
7	648.58125	635609.625	28	17797069.5	12908.70705	33132.52371
8	389.14875	381365.775	32	12203704.8	8851.684835	20605.59457
9	389.14875	381365.775	36	13729167.9	9958.14544	21253.8981
10	366.43788	359109.122	40	14364364.9	10418.8714	20542.95257
11	366.43788	359109.122	44	15800801.4	11460.75854	21411.7522
12	366.43788	359109.122	48	17237237.9	12502.64568	22444.89888
13	366.43788	359109.122	52	18673674.4	13544.53282	23437.9256
14	366.43788	359109.122	56	20110110.9	14586.41996	24168.36241
15	240.98829	236168.524	60	14170111.5	10277.974	16109.7021
		7370893.74		199257981	**144527.3282**	**377903.0581**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	22613.45071
2	681.0253	667404.794	8	5339238.35	2171.210207	29476.95878
3	681.0253	667404.794	12	8008857.53	3256.815311	37178.61216
4	681.0253	667404.794	16	10678476.7	4342.420415	44714.26984
5	681.0253	667404.794	20	13348095.9	5428.025518	51785.5727
6	681.0253	667404.794	24	16017715.1	6513.630622	58358.89007
7	681.0253	667404.794	28	18687334.2	7599.235725	64307.57789
8	681.0253	667404.794	32	21356953.4	8684.840829	69935.19706
9	681.0253	667404.794	36	24026572.6	9770.445933	75041.77782
10	648.58125	635609.625	40	25424385	10338.86869	75258.99711
11	648.58125	635609.625	44	27966823.5	11372.75556	78335.71906
12	648.58125	635609.625	48	30509262	12406.64243	80911.22878
13	389.14875	381365.775	52	19831020.3	8064.317578	49795.77785
14	389.14875	381365.775	56	21356483.4	8684.6497	50854.69687
15	366.43788	359109.122	60	21546547.3	8761.93952	48782.71958
16	366.43788	359109.122	64	22982983.8	9346.068822	49502.71642
17	366.43788	359109.122	68	24419420.3	9930.198123	50116.72376
18	366.43788	359109.122	72	25855856.8	10514.32742	50567.38333
19	366.43788	359109.122	76	27292293.3	11098.45673	50837.24463
20	240.98829	236168.524	80	18893481.9	7683.066034	33519.44306
		10676122.5		386084240	**157001.802**	**1071894.957**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	23149.45887
2	681.0253	667404.794	8	5339238.35	2201.152833	30454.45931
3	681.0253	667404.794	12	8008857.53	3301.72925	38037.71342
4	681.0253	667404.794	16	10678476.7	4402.305666	45307.80326
5	681.0253	667404.794	20	13348095.9	5502.882083	52145.5563
6	681.0253	667404.794	24	16017715.1	6603.458499	58341.95064
7	681.0253	667404.794	28	18687334.2	7704.034916	64234.76376
8	681.0253	667404.794	32	21356953.4	8804.611333	69707.31517
9	681.0253	667404.794	36	24026572.6	9905.187749	74229.32941
10	648.58125	635609.625	40	25424385	10481.44948	74014.50155
11	389.14875	381365.775	44	16780094.1	6917.75666	46045.74371
12	389.14875	381365.775	48	18305557.2	7546.643629	47524.61255
13	389.14875	381365.775	52	19831020.3	8175.530598	48876.84375
14	389.14875	381365.775	56	21356483.4	8804.417567	50115.41694
15	366.43788	359109.122	60	21546547.3	8882.773273	48175.93217
16	366.43788	359109.122	64	22982983.8	9474.958158	49042.40191
17	366.43788	359109.122	68	24419420.3	10067.14304	49685.93135
18	366.43788	359109.122	72	25855856.8	10659.32793	50235.72301
19	366.43788	359109.122	76	27292293.3	11251.51281	50549.21132
20	240.98829	236168.524	80	18893481.9	7789.021308	33338.77845
		10167634.8		362693806	**149524.0417**	**1003213.447**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	23026.19024
2	681.0253	667404.794	8	5339238.35	2208.780128	30943.28262
3	681.0253	667404.794	12	8008857.53	3313.170192	38218.27709
4	681.0253	667404.794	16	10678476.7	4417.560255	45059.52661
5	681.0253	667404.794	20	13348095.9	5521.950319	51453.79135
6	681.0253	667404.794	24	16017715.1	6626.340383	57458.77861
7	681.0253	667404.794	28	18687334.2	7730.730447	63010.3031
8	681.0253	667404.794	32	21356953.4	8835.120511	67690.70246
9	408.61518	400442.876	36	14415943.6	5963.706345	42879.68535
10	389.14875	381365.775	40	15254631	6310.661482	42724.00046
11	389.14875	381365.775	44	16780094.1	6941.72763	44519.8429
12	389.14875	381365.775	48	18305557.2	7572.793778	46170.32713
13	389.14875	381365.775	52	19831020.3	8203.859926	47671.4634
14	389.14875	381365.775	56	21356483.4	8834.926074	48987.30018
15	366.43788	359109.122	60	21546547.3	8913.553293	47233.56871
16	366.43788	359109.122	64	22982983.8	9507.790179	48172.174
17	366.43788	359109.122	68	24419420.3	10102.02707	48906.70258
18	366.43788	359109.122	72	25855856.8	10696.26395	49459.97122
19	366.43788	359109.122	76	27292293.3	11290.50084	49818.97181
20	240.98829	236168.524	80	18893481.9	7816.011328	32855.83595
		9646429.07		342913423	**141859.251**	**926260.6958**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	23183.87865
2	681.0253	667404.794	8	5339238.35	2188.764161	30875.05335
3	681.0253	667404.794	12	8008857.53	3283.146241	37797.34442
4	681.0253	667404.794	16	10678476.7	4377.528322	44333.26481
5	681.0253	667404.794	20	13348095.9	5471.910402	50650.63047
6	681.0253	667404.794	24	16017715.1	6566.292482	56416.71235
7	408.61518	400442.876	28	11212400.5	4596.404738	36810.66485
8	408.61518	400442.876	32	12814172	5253.033986	39380.23594
9	408.61518	400442.876	36	14415943.6	5909.663234	41602.18685
10	389.14875	381365.775	40	15254631	6253.474263	41488.28107
11	389.14875	381365.775	44	16780094.1	6878.821689	43235.75124
12	389.14875	381365.775	48	18305557.2	7504.169116	44889.73066
13	389.14875	381365.775	52	19831020.3	8129.516542	46386.99028
14	389.14875	381365.775	56	21356483.4	8754.863968	47652.27525
15	366.43788	359109.122	60	21546547.3	8832.778667	45824.52328
16	366.43788	359109.122	64	22982983.8	9421.630579	46618.02502
17	366.43788	359109.122	68	24419420.3	10010.48249	47287.96244
18	366.43788	359109.122	72	25855856.8	10599.3344	47744.40122
19	366.43788	359109.122	76	27292293.3	11188.18631	48045.52415
20	240.98829	236168.524	80	18893481.9	7745.182629	31679.66801
		9112505.24		326895708	**134007.4299**	**851903.1043**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	23168.95182
2	681.0253	667404.794	8	5339238.35	2137.319318	30688.56116
3	681.0253	667404.794	12	8008857.53	3205.978977	37147.58746
4	681.0253	667404.794	16	10678476.7	4274.638635	43377.76126
5	408.61518	400442.876	20	8008857.53	3205.978977	29478.46344
6	408.61518	400442.876	24	9610629.03	3847.174772	32681.11577
7	408.61518	400442.876	28	11212400.5	4488.370567	35549.4204
8	408.61518	400442.876	32	12814172	5129.566363	38052.28109
9	408.61518	400442.876	36	14415943.6	5770.762158	40235.16148
10	389.14875	381365.775	40	15254631	6106.492232	40246.74667
11	389.14875	381365.775	44	16780094.1	6717.141455	42034.69676
12	389.14875	381365.775	48	18305557.2	7327.790678	43660.44884
13	389.14875	381365.775	52	19831020.3	7938.439902	45086.54186
14	389.14875	381365.775	56	21356483.4	8549.089125	46244.08847
15	366.43788	359109.122	60	21546547.3	8625.172512	44453.63632
16	366.43788	359109.122	64	22982983.8	9200.184013	45250.12805
17	366.43788	359109.122	68	24419420.3	9775.195514	45894.79654
18	366.43788	359109.122	72	25855856.8	10350.20701	46369.47967
19	366.43788	359109.122	76	27292293.3	10925.21852	46658.72101
20	240.98829	236168.524	80	18893481.9	7563.139395	30783.44474
		8578581.4		315149383	**126155.6088**	**787062.0328**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	21627.33471
2	681.0253	667404.794	8	5339238.35	2052.988545	29256.5123
3	408.61518	400442.876	12	4805314.52	1847.68969	21754.83404
4	408.61518	400442.876	16	6407086.02	2463.586254	25796.49124
5	408.61518	400442.876	20	8008857.53	3079.482817	29633.38744
6	408.61518	400442.876	24	9610629.03	3695.37938	33189.9322
7	408.61518	400442.876	28	11212400.5	4311.275944	36430.85352
8	408.61518	400442.876	32	12814172	4927.172507	39408.35766
9	408.61518	400442.876	36	14415943.6	5543.069071	42173.54571
10	389.14875	381365.775	40	15254631	5865.552469	42415.30157
11	389.14875	381365.775	44	16780094.1	6452.107715	44365.25041
12	389.14875	381365.775	48	18305557.2	7038.662962	46206.25565
13	389.14875	381365.775	52	19831020.3	7625.218209	47869.04631
14	389.14875	381365.775	56	21356483.4	8211.773456	49375.47727
15	366.43788	359109.122	60	21546547.3	8284.854872	47704.3272
16	366.43788	359109.122	64	22982983.8	8837.17853	48710.09961
17	366.43788	359109.122	68	24419420.3	9389.502188	49494.68416
18	366.43788	359109.122	72	25855856.8	9941.825846	50087.98205
19	366.43788	359109.122	76	27292293.3	10494.1495	50486.85549
20	240.98829	236168.524	80	18893481.9	7264.725683	33305.35549
		8044657.57		307674450	**118303.7877**	**789291.884**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	983.8739198	19372.4678
2	681.0253	667404.794	8	5339238.35	2066.180703	20561.27644
3	681.0253	667404.794	12	8008857.53	3099.271054	23379.90254
4	681.0253	667404.794	16	10678476.7	4132.361405	23850.69106
5	681.0253	667404.794	20	13348095.9	5165.451756	22759.0338
6	681.0253	667404.794	24	16017715.1	6198.542108	22848.8851
7	681.0253	667404.794	28	18687334.2	7231.632459	25065.28237
8	681.0253	667404.794	32	21356953.4	8264.72281	23856.88032
9	681.0253	667404.794	36	24026572.6	9297.813161	21387.01656
10	648.58125	635609.625	40	25424385	9838.739198	22016.14722
11	648.58125	635609.625	44	27966823.5	10822.61312	22020.15392
12	648.58125	635609.625	48	30509262	11806.48704	21044.82192
13	648.58125	635609.625	52	33051700.5	12790.36096	21170.68643
14	648.58125	635609.625	56	35594139	13774.23488	21531.35289
15	610.7298	598515.204	60	35910912.2	13896.81992	21682.97052
16	610.7298	598515.204	64	38304973.1	14823.27458	20943.56095
17	366.43788	359109.122	68	24419420.3	9449.837545	13130.44023
18	366.43788	359109.122	72	25855856.8	10005.71034	13526.03087
19	366.43788	359109.122	76	27292293.3	10561.58314	14408.68508
20	240.98829	236168.524	80	18893481.9	7311.407584	9943.326557
		11663422.4		443228930	**171520.9177**	**404499.6126**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1011.211895	19668.8302
2	681.0253	667404.794	8	5339238.35	2123.591714	21097.85671
3	681.0253	667404.794	12	8008857.53	3185.387571	24454.97374
4	681.0253	667404.794	16	10678476.7	4247.183428	23710.10986
5	681.0253	667404.794	20	13348095.9	5308.979285	23813.51307
6	681.0253	667404.794	24	16017715.1	6370.775142	25012.57941
7	681.0253	667404.794	28	18687334.2	7432.570999	24965.02533
8	681.0253	667404.794	32	21356953.4	8494.366855	22280.89366
9	681.0253	667404.794	36	24026572.6	9556.162712	22508.3755
10	648.58125	635609.625	40	25424385	10112.11895	22890.26791
11	648.58125	635609.625	44	27966823.5	11123.33084	23146.77376
12	648.58125	635609.625	48	30509262	12134.54274	22289.41995
13	648.58125	635609.625	52	33051700.5	13145.75463	21451.25961
14	648.58125	635609.625	56	35594139	14156.96653	21812.12902
15	366.43788	359109.122	60	21546547.3	8569.774636	13363.66261
16	366.43788	359109.122	64	22982983.8	9141.092945	13956.64341
17	366.43788	359109.122	68	24419420.3	9712.411254	15090.42683
18	366.43788	359109.122	72	25855856.8	10283.72956	15425.93966
19	366.43788	359109.122	76	27292293.3	10855.04787	16614.28575
20	240.98829	236168.524	80	18893481.9	7514.56276	11549.17886
		11184610.2		413542576	**164479.5623**	**405102.1449**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	19538.59683
2	681.0253	667404.794	8	5339238.35	2171.210207	23422.17751
3	681.0253	667404.794	12	8008857.53	3256.815311	24288.06674
4	681.0253	667404.794	16	10678476.7	4342.420415	23122.44028
5	681.0253	667404.794	20	13348095.9	5428.025518	22801.25974
6	681.0253	667404.794	24	16017715.1	6513.630622	23544.23478
7	681.0253	667404.794	28	18687334.2	7599.235725	22358.12177
8	681.0253	667404.794	32	21356953.4	8684.840829	25512.81126
9	681.0253	667404.794	36	24026572.6	9770.445933	25718.10326
10	648.58125	635609.625	40	25424385	10338.86869	25636.46211
11	648.58125	635609.625	44	27966823.5	11372.75556	25504.31491
12	648.58125	635609.625	48	30509262	12406.64243	23050.8595
13	389.14875	381365.775	52	19831020.3	8064.317578	12999.11
14	389.14875	381365.775	56	21356483.4	8684.6497	12656.402
15	366.43788	359109.122	60	21546547.3	8761.93952	12919.22924
16	366.43788	359109.122	64	22982983.8	9346.068822	13603.16251
17	366.43788	359109.122	68	24419420.3	9930.198123	15250.98495
18	366.43788	359109.122	72	25855856.8	10514.32742	15644.51442
19	366.43788	359109.122	76	27292293.3	11098.45673	16091.03901
20	240.98829	236168.524	80	18893481.9	7683.066034	10911.43382
		10676122.5		386084240	**157001.802**	**394573.3246**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	20222.88116
2	681.0253	667404.794	8	5339238.35	2201.152833	22246.53782
3	681.0253	667404.794	12	8008857.53	3301.72925	21319.92049
4	681.0253	667404.794	16	10678476.7	4402.305666	19937.39544
5	681.0253	667404.794	20	13348095.9	5502.882083	25695.79159
6	681.0253	667404.794	24	16017715.1	6603.458499	24168.95137
7	681.0253	667404.794	28	18687334.2	7704.034916	24834.42856
8	681.0253	667404.794	32	21356953.4	8804.611333	24490.6261
9	681.0253	667404.794	36	24026572.6	9905.187749	25532.74506
10	648.58125	635609.625	40	25424385	10481.44948	24045.07572
11	389.14875	381365.775	44	16780094.1	6917.75666	14605.50453
12	389.14875	381365.775	48	18305557.2	7546.643629	14835.2477
13	389.14875	381365.775	52	19831020.3	8175.530598	14211.21259
14	389.14875	381365.775	56	21356483.4	8804.417567	12090.36223
15	366.43788	359109.122	60	21546547.3	8882.773273	12141.49414
16	366.43788	359109.122	64	22982983.8	9474.958158	12761.11099
17	366.43788	359109.122	68	24419420.3	10067.14304	14777.44731
18	366.43788	359109.122	72	25855856.8	10659.32793	15498.01494
19	366.43788	359109.122	76	27292293.3	11251.51281	15554.00593
20	240.98829	236168.524	80	18893481.9	7789.021308	10446.25211
		10167634.8		362693806	**149524.0417**	**369415.0058**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	19093.22161
2	681.0253	667404.794	8	5339238.35	2208.780128	19412.40364
3	681.0253	667404.794	12	8008857.53	3313.170192	20146.37059
4	681.0253	667404.794	16	10678476.7	4417.560255	25087.82547
5	681.0253	667404.794	20	13348095.9	5521.950319	26281.46529
6	681.0253	667404.794	24	16017715.1	6626.340383	25321.43276
7	681.0253	667404.794	28	18687334.2	7730.730447	25757.4811
8	681.0253	667404.794	32	21356953.4	8835.120511	24927.36236
9	408.61518	400442.876	36	14415943.6	5963.706345	15181.21962
10	389.14875	381365.775	40	15254631	6310.661482	14525.8434
11	389.14875	381365.775	44	16780094.1	6941.72763	15342.52924
12	389.14875	381365.775	48	18305557.2	7572.793778	16948.1045
13	389.14875	381365.775	52	19831020.3	8203.859926	16227.9082
14	389.14875	381365.775	56	21356483.4	8834.926074	12221.35203
15	366.43788	359109.122	60	21546547.3	8913.553293	11258.81885
16	366.43788	359109.122	64	22982983.8	9507.790179	13939.43282
17	366.43788	359109.122	68	24419420.3	10102.02707	15863.25081
18	366.43788	359109.122	72	25855856.8	10696.26395	16618.97398
19	366.43788	359109.122	76	27292293.3	11290.50084	17289.01635
20	240.98829	236168.524	80	18893481.9	7816.011328	12088.46429
		9646429.07		342913423	**141859.251**	**363532.4769**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	18068.31706
2	681.0253	667404.794	8	5339238.35	2188.764161	18866.97741
3	681.0253	667404.794	12	8008857.53	3283.146241	19629.73011
4	681.0253	667404.794	16	10678476.7	4377.528322	26095.32495
5	681.0253	667404.794	20	13348095.9	5471.910402	28063.18888
6	681.0253	667404.794	24	16017715.1	6566.292482	24844.78587
7	408.61518	400442.876	28	11212400.5	4596.404738	15208.38321
8	408.61518	400442.876	32	12814172	5253.033986	16533.05189
9	408.61518	400442.876	36	14415943.6	5909.663234	16351.70123
10	389.14875	381365.775	40	15254631	6253.474263	15057.64513
11	389.14875	381365.775	44	16780094.1	6878.821689	14962.63603
12	389.14875	381365.775	48	18305557.2	7504.169116	15007.02709
13	389.14875	381365.775	52	19831020.3	8129.516542	15062.1724
14	389.14875	381365.775	56	21356483.4	8754.863968	11822.02067
15	366.43788	359109.122	60	21546547.3	8832.778667	11406.88444
16	366.43788	359109.122	64	22982983.8	9421.630579	12798.54079
17	366.43788	359109.122	68	24419420.3	10010.48249	14761.34097
18	366.43788	359109.122	72	25855856.8	10599.3344	15714.822
19	366.43788	359109.122	76	27292293.3	11188.18631	17659.96476
20	240.98829	236168.524	80	18893481.9	7745.182629	12465.19457
		9112505.24		326895708	**134007.4299**	**340379.7094**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	21529.33501
2	681.0253	667404.794	8	5339238.35	1939.854608	25010.0488
3	681.0253	667404.794	12	8008857.53	2909.781912	24282.87196
4	681.0253	667404.794	16	10678476.7	3879.709217	22178.50843
5	681.0253	667404.794	20	13348095.9	4849.636521	24319.57537
6	681.0253	667404.794	24	16017715.1	5819.563825	28343.07524
7	681.0253	667404.794	28	18687334.2	6789.491129	30144.42014
8	681.0253	667404.794	32	21356953.4	7759.418433	30233.4135
9	681.0253	667404.794	36	24026572.6	8729.345737	36176.6861
10	648.58125	635609.625	40	25424385	9237.199607	38535.80676
11	648.58125	635609.625	44	27966823.5	10160.91957	37997.39154
12	648.58125	635609.625	48	30509262	11084.63953	34200.44304
13	648.58125	635609.625	52	33051700.5	12008.35949	29824.43645
14	648.58125	635609.625	56	35594139	12932.07945	24213.75983
15	610.7298	598515.204	60	35910912.2	13047.16965	17364.32306
16	610.7298	598515.204	64	38304973.1	13916.98096	23679.54349
17	610.7298	598515.204	68	40699033.9	14786.79227	29190.29421
18	610.7298	598515.204	72	43093094.7	15656.60358	33094.76689
19	610.7298	598515.204	76	45487155.5	16526.41489	37294.53707
20	401.64715	393614.207	80	31489136.6	11440.64802	25826.43613
		12539086.3		507536298	**184398.3284**	**573439.673**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	22969.59867
2	681.0253	667404.794	8	5339238.35	1999.779701	25022.2958
3	681.0253	667404.794	12	8008857.53	2999.669552	23330.38267
4	681.0253	667404.794	16	10678476.7	3999.559403	23085.59472
5	681.0253	667404.794	20	13348095.9	4999.449254	27760.89163
6	681.0253	667404.794	24	16017715.1	5999.339104	30650.66598
7	681.0253	667404.794	28	18687334.2	6999.228955	30329.64876
8	681.0253	667404.794	32	21356953.4	7999.118806	34367.33975
9	681.0253	667404.794	36	24026572.6	8999.008656	40280.41467
10	648.58125	635609.625	40	25424385	9522.550913	39786.86284
11	648.58125	635609.625	44	27966823.5	10474.806	36869.89551
12	648.58125	635609.625	48	30509262	11427.0611	31638.55027
13	648.58125	635609.625	52	33051700.5	12379.31619	26063.00335
14	648.58125	635609.625	56	35594139	13331.57128	19394.90018
15	610.7298	598515.204	60	35910912.2	13450.2168	20745.27555
16	610.7298	598515.204	64	38304973.1	14346.89792	27358.77725
17	610.7298	598515.204	68	40699033.9	15243.57904	32296.50203
18	610.7298	598515.204	72	43093094.7	16140.26015	36860.47894
19	366.43788	359109.122	76	27292293.3	10222.16476	23999.74157
20	240.98829	236168.524	80	18893481.9	7076.440341	16342.6156
		12142234.6		476745781	**178562.273**	**569153.4358**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	983.8739198	23634.69241
2	681.0253	667404.794	8	5339238.35	2066.180703	25304.40563
3	681.0253	667404.794	12	8008857.53	3099.271054	22990.89591
4	681.0253	667404.794	16	10678476.7	4132.361405	26105.00319
5	681.0253	667404.794	20	13348095.9	5165.451756	29767.43663
6	681.0253	667404.794	24	16017715.1	6198.542108	31695.17977
7	681.0253	667404.794	28	18687334.2	7231.632459	32172.94098
8	681.0253	667404.794	32	21356953.4	8264.72281	37953.97667
9	681.0253	667404.794	36	24026572.6	9297.813161	42900.92923
10	648.58125	635609.625	40	25424385	9838.739198	39980.19563
11	648.58125	635609.625	44	27966823.5	10822.61312	34016.45157
12	648.58125	635609.625	48	30509262	11806.48704	27009.52313
13	648.58125	635609.625	52	33051700.5	12790.36096	20128.11944
14	648.58125	635609.625	56	35594139	13774.23488	23151.7556
15	610.7298	598515.204	60	35910912.2	13896.81992	23396.05264
16	610.7298	598515.204	64	38304973.1	14823.27458	29461.85173
17	366.43788	359109.122	68	24419420.3	9449.837545	20749.86539
18	366.43788	359109.122	72	25855856.8	10005.71034	24026.30761
19	366.43788	359109.122	76	27292293.3	10561.58314	26447.92291
20	240.98829	236168.524	80	18893481.9	7311.407584	18075.91812
		11663422.4		443228930	**171520.9177**	**558969.4242**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1011.211895	23236.56946
2	681.0253	667404.794	8	5339238.35	2123.591714	23920.60249
3	681.0253	667404.794	12	8008857.53	3185.387571	22679.07103
4	681.0253	667404.794	16	10678476.7	4247.183428	26399.98005
5	681.0253	667404.794	20	13348095.9	5308.979285	30835.82203
6	681.0253	667404.794	24	16017715.1	6370.775142	32511.34935
7	681.0253	667404.794	28	18687334.2	7432.570999	33577.70191
8	681.0253	667404.794	32	21356953.4	8494.366855	38782.63052
9	681.0253	667404.794	36	24026572.6	9556.162712	41434.47371
10	648.58125	635609.625	40	25424385	10112.11895	36528.47271
11	648.58125	635609.625	44	27966823.5	11123.33084	30087.87652
12	648.58125	635609.625	48	30509262	12134.54274	23278.70267
13	648.58125	635609.625	52	33051700.5	13145.75463	22490.86686
14	648.58125	635609.625	56	35594139	14156.96653	26173.12131
15	366.43788	359109.122	60	21546547.3	8569.774636	15736.391
16	366.43788	359109.122	64	22982983.8	9141.092945	18209.22685
17	366.43788	359109.122	68	24419420.3	9712.411254	21441.27822
18	366.43788	359109.122	72	25855856.8	10283.72956	24568.05248
19	366.43788	359109.122	76	27292293.3	10855.04787	26861.01048
20	240.98829	236168.524	80	18893481.9	7514.56276	18302.08473
		11184610.2		413542576	**164479.5623**	**537055.2844**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	21502.75096
2	681.0253	667404.794	8	5339238.35	2171.210207	22513.364
3	681.0253	667404.794	12	8008857.53	3256.815311	23945.61391
4	681.0253	667404.794	16	10678476.7	4342.420415	29156.79771
5	681.0253	667404.794	20	13348095.9	5428.025518	32400.13376
6	681.0253	667404.794	24	16017715.1	6513.630622	31781.37005
7	681.0253	667404.794	28	18687334.2	7599.235725	31875.2445
8	681.0253	667404.794	32	21356953.4	8684.840829	36896.57829
9	681.0253	667404.794	36	24026572.6	9770.445933	37818.86525
10	648.58125	635609.625	40	25424385	10338.86869	32358.96339
11	648.58125	635609.625	44	27966823.5	11372.75556	27591.57387
12	648.58125	635609.625	48	30509262	12406.64243	22461.89049
13	389.14875	381365.775	52	19831020.3	8064.317578	13066.63852
14	389.14875	381365.775	56	21356483.4	8684.6497	14856.17375
15	366.43788	359109.122	60	21546547.3	8761.93952	15709.00712
16	366.43788	359109.122	64	22982983.8	9346.068822	18640.31374
17	366.43788	359109.122	68	24419420.3	9930.198123	21640.76148
18	366.43788	359109.122	72	25855856.8	10514.32742	24290.76006
19	366.43788	359109.122	76	27292293.3	11098.45673	26435.93254
20	240.98829	236168.524	80	18893481.9	7683.066034	17993.1431
		10676122.5		386084240	**157001.802**	**502935.8765**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	21373.49372
2	681.0253	667404.794	8	5339238.35	2201.152833	23628.67132
3	681.0253	667404.794	12	8008857.53	3301.72925	28780.25311
4	681.0253	667404.794	16	10678476.7	4402.305666	33167.58123
5	681.0253	667404.794	20	13348095.9	5502.882083	35203.64837
6	681.0253	667404.794	24	16017715.1	6603.458499	32036.50546
7	681.0253	667404.794	28	18687334.2	7704.034916	31102.31962
8	681.0253	667404.794	32	21356953.4	8804.611333	35220.90566
9	681.0253	667404.794	36	24026572.6	9905.187749	34776.45381
10	648.58125	635609.625	40	25424385	10481.44948	29663.21393
11	389.14875	381365.775	44	16780094.1	6917.75666	16058.54816
12	389.14875	381365.775	48	18305557.2	7546.643629	14734.47775
13	389.14875	381365.775	52	19831020.3	8175.530598	13455.5167
14	389.14875	381365.775	56	21356483.4	8804.417567	13604.27736
15	366.43788	359109.122	60	21546547.3	8882.773273	14678.06081
16	366.43788	359109.122	64	22982983.8	9474.958158	17943.94799
17	366.43788	359109.122	68	24419420.3	10067.14304	21399.99953
18	366.43788	359109.122	72	25855856.8	10659.32793	24701.28348
19	366.43788	359109.122	76	27292293.3	11251.51281	27328.25161
20	240.98829	236168.524	80	18893481.9	7789.021308	18712.63366
		10167634.8		362693806	**149524.0417**	**487570.0433**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	20972.36385
2	681.0253	667404.794	8	5339238.35	2208.780128	25597.41817
3	681.0253	667404.794	12	8008857.53	3313.170192	30549.03153
4	681.0253	667404.794	16	10678476.7	4417.560255	33863.55885
5	681.0253	667404.794	20	13348095.9	5521.950319	33802.28179
6	681.0253	667404.794	24	16017715.1	6626.340383	32854.38144
7	681.0253	667404.794	28	18687334.2	7730.730447	35181.6247
8	681.0253	667404.794	32	21356953.4	8835.120511	37116.21567
9	408.61518	400442.876	36	14415943.6	5963.706345	19570.63812
10	389.14875	381365.775	40	15254631	6310.661482	18020.16494
11	389.14875	381365.775	44	16780094.1	6941.72763	16950.77169
12	389.14875	381365.775	48	18305557.2	7572.793778	15188.42493
13	389.14875	381365.775	52	19831020.3	8203.859926	13384.02091
14	389.14875	381365.775	56	21356483.4	8834.926074	13193.84214
15	366.43788	359109.122	60	21546547.3	8913.553293	15133.62789
16	366.43788	359109.122	64	22982983.8	9507.790179	17251.56284
17	366.43788	359109.122	68	24419420.3	10102.02707	20701.22889
18	366.43788	359109.122	72	25855856.8	10696.26395	24265.26563
19	366.43788	359109.122	76	27292293.3	11290.50084	26841.25891
20	240.98829	236168.524	80	18893481.9	7816.011328	18371.77081
		9646429.07		342913423	**141859.251**	**468809.4537**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	21394.42091
2	681.0253	667404.794	8	5339238.35	2188.764161	26924.72149
3	681.0253	667404.794	12	8008857.53	3283.146241	31980.56768
4	681.0253	667404.794	16	10678476.7	4377.528322	34951.77978
5	681.0253	667404.794	20	13348095.9	5471.910402	35535.41268
6	681.0253	667404.794	24	16017715.1	6566.292482	38635.55717
7	408.61518	400442.876	28	11212400.5	4596.404738	24274.02961
8	408.61518	400442.876	32	12814172	5253.033986	23691.67935
9	408.61518	400442.876	36	14415943.6	5909.663234	21888.08583
10	389.14875	381365.775	40	15254631	6253.474263	18691.2264
11	389.14875	381365.775	44	16780094.1	6878.821689	16856.51995
12	389.14875	381365.775	48	18305557.2	7504.169116	15484.28551
13	389.14875	381365.775	52	19831020.3	8129.516542	14028.32554
14	389.14875	381365.775	56	21356483.4	8754.863968	12833.34801
15	366.43788	359109.122	60	21546547.3	8832.778667	14069.54368
16	366.43788	359109.122	64	22982983.8	9421.630579	17432.61555
17	366.43788	359109.122	68	24419420.3	10010.48249	20366.67015
18	366.43788	359109.122	72	25855856.8	10599.3344	23403.28592
19	366.43788	359109.122	76	27292293.3	11188.18631	26417.79894
20	240.98829	236168.524	80	18893481.9	7745.182629	18241.04721
		9112505.24		326895708	**134007.4299**	**457100.9214**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	22312.4107
2	681.0253	667404.794	8	5339238.35	2137.319318	28921.32976
3	681.0253	667404.794	12	8008857.53	3205.978977	34689.41082
4	681.0253	667404.794	16	10678476.7	4274.638635	35965.21261
5	408.61518	400442.876	20	8008857.53	3205.978977	21390.18243
6	408.61518	400442.876	24	9610629.03	3847.174772	23037.61844
7	408.61518	400442.876	28	11212400.5	4488.370567	24623.85338
8	408.61518	400442.876	32	12814172	5129.566363	24218.113
9	408.61518	400442.876	36	14415943.6	5770.762158	23059.42273
10	389.14875	381365.775	40	15254631	6106.492232	21233.64761
11	389.14875	381365.775	44	16780094.1	6717.141455	18707.32289
12	389.14875	381365.775	48	18305557.2	7327.790678	15940.5494
13	389.14875	381365.775	52	19831020.3	7938.439902	14525.04451
14	389.14875	381365.775	56	21356483.4	8549.089125	12686.029
15	366.43788	359109.122	60	21546547.3	8625.172512	14168.65741
16	366.43788	359109.122	64	22982983.8	9200.184013	18506.134
17	366.43788	359109.122	68	24419420.3	9775.195514	21977.57454
18	366.43788	359109.122	72	25855856.8	10350.20701	24368.33402
19	366.43788	359109.122	76	27292293.3	10925.21852	25806.76464
20	240.98829	236168.524	80	18893481.9	7563.139395	17339.34952
		8578581.4		315149383	**126155.6088**	**443476.9614**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	21729.44514
2	681.0253	667404.794	8	5339238.35	2052.988545	27573.93484
3	408.61518	400442.876	12	4805314.52	1847.68969	19463.42506
4	408.61518	400442.876	16	6407086.02	2463.586254	21781.1612
5	408.61518	400442.876	20	8008857.53	3079.482817	22746.20747
6	408.61518	400442.876	24	9610629.03	3695.37938	21670.55545
7	408.61518	400442.876	28	11212400.5	4311.275944	24439.2608
8	408.61518	400442.876	32	12814172	4927.172507	27138.23154
9	408.61518	400442.876	36	14415943.6	5543.069071	27809.32927
10	389.14875	381365.775	40	15254631	5865.552469	24131.14214
11	389.14875	381365.775	44	16780094.1	6452.107715	19866.96459
12	389.14875	381365.775	48	18305557.2	7038.662962	16225.28162
13	389.14875	381365.775	52	19831020.3	7625.218209	14972.12005
14	389.14875	381365.775	56	21356483.4	8211.773456	13811.09246
15	366.43788	359109.122	60	21546547.3	8284.854872	14349.855
16	366.43788	359109.122	64	22982983.8	8837.17853	16842.08618
17	366.43788	359109.122	68	24419420.3	9389.502188	18665.92892
18	366.43788	359109.122	72	25855856.8	9941.825846	23010.04998
19	366.43788	359109.122	76	27292293.3	10494.1495	26329.4464
20	240.98829	236168.524	80	18893481.9	7264.725683	18271.49317
		8044657.57		307674450	**118303.7877**	**420827.0113**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	18371.71458
2	681.0253	667404.794	8	5339238.35	1939.854608	18099.44556
3	681.0253	667404.794	12	8008857.53	2909.781912	19401.64307
4	681.0253	667404.794	16	10678476.7	3879.709217	20611.83727
5	681.0253	667404.794	20	13348095.9	4849.636521	18961.2887
6	681.0253	667404.794	24	16017715.1	5819.563825	15848.56389
7	681.0253	667404.794	28	18687334.2	6789.491129	15475.99294
8	681.0253	667404.794	32	21356953.4	7759.418433	14128.9933
9	681.0253	667404.794	36	24026572.6	8729.345737	15563.9565
10	648.58125	635609.625	40	25424385	9237.199607	13119.49011
11	648.58125	635609.625	44	27966823.5	10160.91957	13498.72202
12	648.58125	635609.625	48	30509262	11084.63953	11751.37541
13	648.58125	635609.625	52	33051700.5	12008.35949	12563.62385
14	648.58125	635609.625	56	35594139	12932.07945	12377.54987
15	610.7298	598515.204	60	35910912.2	13047.16965	11311.4388
16	610.7298	598515.204	64	38304973.1	13916.98096	12173.4745
17	610.7298	598515.204	68	40699033.9	14786.79227	8952.677381
18	610.7298	598515.204	72	43093094.7	15656.60358	10014.00294
19	610.7298	598515.204	76	45487155.5	16526.41489	13173.68487
20	401.64715	393614.207	80	31489136.6	11440.64802	15958.93942
		12539086.3		507536298	**184398.3284**	**291358.415**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	17663.18737
2	681.0253	667404.794	8	5339238.35	1999.779701	19273.6071
3	681.0253	667404.794	12	8008857.53	2999.669552	20603.23641
4	681.0253	667404.794	16	10678476.7	3999.559403	20087.46732
5	681.0253	667404.794	20	13348095.9	4999.449254	16689.13766
6	681.0253	667404.794	24	16017715.1	5999.339104	14911.82917
7	681.0253	667404.794	28	18687334.2	6999.228955	13746.35279
8	681.0253	667404.794	32	21356953.4	7999.118806	15752.8821
9	681.0253	667404.794	36	24026572.6	8999.008656	13553.89984
10	648.58125	635609.625	40	25424385	9522.550913	12452.92446
11	648.58125	635609.625	44	27966823.5	10474.806	11677.20153
12	648.58125	635609.625	48	30509262	11427.0611	13080.58603
13	648.58125	635609.625	52	33051700.5	12379.31619	13164.4898
14	648.58125	635609.625	56	35594139	13331.57128	11452.23549
15	610.7298	598515.204	60	35910912.2	13450.2168	11873.53623
16	610.7298	598515.204	64	38304973.1	14346.89792	9474.636452
17	610.7298	598515.204	68	40699033.9	15243.57904	11107.49114
18	610.7298	598515.204	72	43093094.7	16140.26015	12704.06452
19	366.43788	359109.122	76	27292293.3	10222.16476	7598.277026
20	240.98829	236168.524	80	18893481.9	7076.440341	8430.492145
		12142234.6		476745781	**178562.273**	**275297.5346**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	983.8739198	18040.97121
2	681.0253	667404.794	8	5339238.35	2066.180703	19105.08452
3	681.0253	667404.794	12	8008857.53	3099.271054	20591.66977
4	681.0253	667404.794	16	10678476.7	4132.361405	18281.81725
5	681.0253	667404.794	20	13348095.9	5165.451756	14469.54084
6	681.0253	667404.794	24	16017715.1	6198.542108	13183.09299
7	681.0253	667404.794	28	18687334.2	7231.632459	14905.62607
8	681.0253	667404.794	32	21356953.4	8264.72281	15140.89239
9	681.0253	667404.794	36	24026572.6	9297.813161	13194.84695
10	648.58125	635609.625	40	25424385	9838.739198	12439.99335
11	648.58125	635609.625	44	27966823.5	10822.61312	13118.09429
12	648.58125	635609.625	48	30509262	11806.48704	13855.2497
13	648.58125	635609.625	52	33051700.5	12790.36096	12890.32516
14	648.58125	635609.625	56	35594139	13774.23488	10405.61272
15	610.7298	598515.204	60	35910912.2	13896.81992	10037.88861
16	610.7298	598515.204	64	38304973.1	14823.27458	10935.72932
17	366.43788	359109.122	68	24419420.3	9449.837545	5946.959921
18	366.43788	359109.122	72	25855856.8	10005.71034	6820.786376
19	366.43788	359109.122	76	27292293.3	10561.58314	7956.204781
20	240.98829	236168.524	80	18893481.9	7311.407584	9323.815123
		11663422.4		443228930	**171520.9177**	**260644.2013**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1011.211895	17752.8375
2	681.0253	667404.794	8	5339238.35	2123.591714	20324.70797
3	681.0253	667404.794	12	8008857.53	3185.387571	20265.2986
4	681.0253	667404.794	16	10678476.7	4247.183428	16092.39791
5	681.0253	667404.794	20	13348095.9	5308.979285	14757.03046
6	681.0253	667404.794	24	16017715.1	6370.775142	15032.13363
7	681.0253	667404.794	28	18687334.2	7432.570999	16376.54105
8	681.0253	667404.794	32	21356953.4	8494.366855	14585.17369
9	681.0253	667404.794	36	24026572.6	9556.162712	13048.4136
10	648.58125	635609.625	40	25424385	10112.11895	12831.67556
11	648.58125	635609.625	44	27966823.5	11123.33084	15046.05074
12	648.58125	635609.625	48	30509262	12134.54274	14717.9897
13	648.58125	635609.625	52	33051700.5	13145.75463	11845.09371
14	648.58125	635609.625	56	35594139	14156.96653	12241.60899
15	366.43788	359109.122	60	21546547.3	8569.774636	5258.300624
16	366.43788	359109.122	64	22982983.8	9141.092945	5491.698231
17	366.43788	359109.122	68	24419420.3	9712.411254	5380.954481
18	366.43788	359109.122	72	25855856.8	10283.72956	6465.748165
19	366.43788	359109.122	76	27292293.3	10855.04787	8299.964781
20	240.98829	236168.524	80	18893481.9	7514.56276	9545.261926
		11184610.2		413542576	**164479.5623**	**255358.8813**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	18526.60468
2	681.0253	667404.794	8	5339238.35	2171.210207	20057.30565
3	681.0253	667404.794	12	8008857.53	3256.815311	17958.80415
4	681.0253	667404.794	16	10678476.7	4342.420415	15029.34451
5	681.0253	667404.794	20	13348095.9	5428.025518	13856.99877
6	681.0253	667404.794	24	16017715.1	6513.630622	17283.54473
7	681.0253	667404.794	28	18687334.2	7599.235725	15984.40149
8	681.0253	667404.794	32	21356953.4	8684.840829	13859.11097
9	681.0253	667404.794	36	24026572.6	9770.445933	12313.70381
10	648.58125	635609.625	40	25424385	10338.86869	13267.60421
11	648.58125	635609.625	44	27966823.5	11372.75556	15006.16683
12	648.58125	635609.625	48	30509262	12406.64243	13962.51889
13	389.14875	381365.775	52	19831020.3	8064.317578	6559.038242
14	389.14875	381365.775	56	21356483.4	8684.6497	6137.637267
15	366.43788	359109.122	60	21546547.3	8761.93952	5841.088156
16	366.43788	359109.122	64	22982983.8	9346.068822	5937.548414
17	366.43788	359109.122	68	24419420.3	9930.198123	4816.728821
18	366.43788	359109.122	72	25855856.8	10514.32742	5843.870277
19	366.43788	359109.122	76	27292293.3	11098.45673	7504.241635
20	240.98829	236168.524	80	18893481.9	7683.066034	8789.414077
		10676122.5		386084240	**157001.802**	**238535.6756**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	20796.22517
2	681.0253	667404.794	8	5339238.35	2201.152833	19735.97799
3	681.0253	667404.794	12	8008857.53	3301.72925	14478.09959
4	681.0253	667404.794	16	10678476.7	4402.305666	14171.02129
5	681.0253	667404.794	20	13348095.9	5502.882083	15915.27639
6	681.0253	667404.794	24	16017715.1	6603.458499	16562.01413
7	681.0253	667404.794	28	18687334.2	7704.034916	14667.66686
8	681.0253	667404.794	32	21356953.4	8804.611333	12688.66384
9	681.0253	667404.794	36	24026572.6	9905.187749	13952.52824
10	648.58125	635609.625	40	25424385	10481.44948	14911.3128
11	389.14875	381365.775	44	16780094.1	6917.75666	7460.867456
12	389.14875	381365.775	48	18305557.2	7546.643629	6672.723052
13	389.14875	381365.775	52	19831020.3	8175.530598	6956.171651
14	389.14875	381365.775	56	21356483.4	8804.417567	7433.659292
15	366.43788	359109.122	60	21546547.3	8882.773273	6347.429241
16	366.43788	359109.122	64	22982983.8	9474.958158	6093.079654
17	366.43788	359109.122	68	24419420.3	10067.14304	4725.442782
18	366.43788	359109.122	72	25855856.8	10659.32793	5437.958542
19	366.43788	359109.122	76	27292293.3	11251.51281	6743.31561
20	240.98829	236168.524	80	18893481.9	7789.021308	8853.709514
		10167634.8		362693806	**149524.0417**	**224603.1431**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	17025.14803
2	681.0253	667404.794	8	5339238.35	2208.780128	13830.47819
3	681.0253	667404.794	12	8008857.53	3313.170192	13383.36089
4	681.0253	667404.794	16	10678476.7	4417.560255	14863.47763
5	681.0253	667404.794	20	13348095.9	5521.950319	15432.65816
6	681.0253	667404.794	24	16017715.1	6626.340383	14249.03833
7	681.0253	667404.794	28	18687334.2	7730.730447	13492.10073
8	681.0253	667404.794	32	21356953.4	8835.120511	15167.62421
9	408.61518	400442.876	36	14415943.6	5963.706345	7319.86907
10	389.14875	381365.775	40	15254631	6310.661482	6829.910816
11	389.14875	381365.775	44	16780094.1	6941.72763	6661.841797
12	389.14875	381365.775	48	18305557.2	7572.793778	6683.724233
13	389.14875	381365.775	52	19831020.3	8203.859926	7687.710088
14	389.14875	381365.775	56	21356483.4	8834.926074	7559.465279
15	366.43788	359109.122	60	21546547.3	8913.553293	7126.458109
16	366.43788	359109.122	64	22982983.8	9507.790179	7066.44531
17	366.43788	359109.122	68	24419420.3	10102.02707	4950.702199
18	366.43788	359109.122	72	25855856.8	10696.26395	5181.992619
19	366.43788	359109.122	76	27292293.3	11290.50084	6268.273286
20	240.98829	236168.524	80	18893481.9	7816.011328	8605.580054
		9646429.07		342913423	**141859.251**	**199385.859**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	16440.21424
2	681.0253	667404.794	8	5339238.35	2188.764161	15654.43474
3	681.0253	667404.794	12	8008857.53	3283.146241	15045.35759
4	681.0253	667404.794	16	10678476.7	4377.528322	14489.89765
5	681.0253	667404.794	20	13348095.9	5471.910402	17803.36154
6	681.0253	667404.794	24	16017715.1	6566.292482	15149.92005
7	408.61518	400442.876	28	11212400.5	4596.404738	7550.014794
8	408.61518	400442.876	32	12814172	5253.033986	7485.566416
9	408.61518	400442.876	36	14415943.6	5909.663234	7357.252677
10	389.14875	381365.775	40	15254631	6253.474263	7130.69545
11	389.14875	381365.775	44	16780094.1	6878.821689	6721.836513
12	389.14875	381365.775	48	18305557.2	7504.169116	6333.723511
13	389.14875	381365.775	52	19831020.3	8129.516542	7832.860592
14	389.14875	381365.775	56	21356483.4	8754.863968	7899.167774
15	366.43788	359109.122	60	21546547.3	8832.778667	7303.290796
16	366.43788	359109.122	64	22982983.8	9421.630579	6925.816222
17	366.43788	359109.122	68	24419420.3	10010.48249	5512.514645
18	366.43788	359109.122	72	25855856.8	10599.3344	5429.033338
19	366.43788	359109.122	76	27292293.3	11188.18631	6384.920153
20	240.98829	236168.524	80	18893481.9	7745.182629	8277.899307
		9112505.24		326895708	**134007.4299**	**192727.778**

Tabel 15 Perbandingan Gaya Horisontal Tingkat Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	15127.23615
2	681.0253	667404.794	8	5339238.35	2137.319318	13431.13442
3	681.0253	667404.794	12	8008857.53	3205.978977	14903.7406
4	681.0253	667404.794	16	10678476.7	4274.638635	18003.96381
5	408.61518	400442.876	20	8008857.53	3205.978977	8722.417211
6	408.61518	400442.876	24	9610629.03	3847.174772	7753.653503
7	408.61518	400442.876	28	11212400.5	4488.370567	8601.148606
8	408.61518	400442.876	32	12814172	5129.566363	8022.274371
9	408.61518	400442.876	36	14415943.6	5770.762158	7042.427582
10	389.14875	381365.775	40	15254631	6106.492232	6711.897444
11	389.14875	381365.775	44	16780094.1	6717.141455	6879.087902
12	389.14875	381365.775	48	18305557.2	7327.790678	6995.865721
13	389.14875	381365.775	52	19831020.3	7938.439902	8005.856665
14	389.14875	381365.775	56	21356483.4	8549.089125	7710.037464
15	366.43788	359109.122	60	21546547.3	8625.172512	6637.16445
16	366.43788	359109.122	64	22982983.8	9200.184013	6259.852783
17	366.43788	359109.122	68	24419420.3	9775.195514	5909.399746
18	366.43788	359109.122	72	25855856.8	10350.20701	6834.611424
19	366.43788	359109.122	76	27292293.3	10925.21852	7011.593465
20	240.98829	236168.524	80	18893481.9	7563.139395	8870.350446
		8578581.4		315149383	**126155.6088**	**179433.7138**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	19642.01525
2	681.0253	667404.794	8	5339238.35	2052.988545	17539.45532
3	408.61518	400442.876	12	4805314.52	1847.68969	7680.921554
4	408.61518	400442.876	16	6407086.02	2463.586254	7415.776075
5	408.61518	400442.876	20	8008857.53	3079.482817	9373.342593
6	408.61518	400442.876	24	9610629.03	3695.37938	9864.595679
7	408.61518	400442.876	28	11212400.5	4311.275944	9408.035198
8	408.61518	400442.876	32	12814172	4927.172507	8500.382244
9	408.61518	400442.876	36	14415943.6	5543.069071	7505.000863
10	389.14875	381365.775	40	15254631	5865.552469	8028.004322
11	389.14875	381365.775	44	16780094.1	6452.107715	7794.242124
12	389.14875	381365.775	48	18305557.2	7038.662962	7755.026128
13	389.14875	381365.775	52	19831020.3	7625.218209	7443.966022
14	389.14875	381365.775	56	21356483.4	8211.773456	6910.382095
15	366.43788	359109.122	60	21546547.3	8284.854872	6832.1268
16	366.43788	359109.122	64	22982983.8	8837.17853	5756.55072
17	366.43788	359109.122	68	24419420.3	9389.502188	4915.842733
18	366.43788	359109.122	72	25855856.8	9941.825846	5590.85805
19	366.43788	359109.122	76	27292293.3	10494.1495	7453.628143
20	240.98829	236168.524	80	18893481.9	7264.725683	9965.367928
		8044657.57		307674450	**118303.7877**	**175375.5198**

Tabel 16 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3531.396694	86181.77647	90426.44078
2	322.6755	316221.99	8	2529775.92	7062.793388	82650.37978	79209.38437
3	322.6755	316221.99	12	3794663.88	10594.19008	75587.58639	66452.43657
4	322.6755	316221.99	16	5059551.84	14125.58678	64993.39631	52645.66689
5	322.6755	316221.99	20	6324439.8	17656.98347	50867.80953	38214.18008
6	322.6755	316221.99	24	7589327.76	21188.38016	33210.82606	23217.81201
7	156.933	153794.34	28	4306241.52	12022.4459	12022.4459	7842.210977
		2051126.28		30868888.7	**86181.77647**	**405514.2204**	**358008.1317**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3792.259125	78282.34235	90509.27809
2	322.6755	316221.99	8	2529775.92	7584.518251	74490.08323	83376.69461
3	322.6755	316221.99	12	3794663.88	11376.77738	66905.56498	71156.44261
4	322.6755	316221.99	16	5059551.84	15169.0365	55528.7876	55798.99735
5	322.6755	316221.99	20	6324439.8	18961.29563	40359.7511	38384.38494
6	193.6053	189733.194	24	4553596.66	13652.13285	21398.45547	18575.38097
7	94.1598	92276.604	28	2583744.91	7746.322623	7746.322623	6122.784979
		1863119.75		26110661	**78282.34235**	**344711.3074**	**363923.9635**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3969.627037	67653.03176	84371.27355
2	322.6755	316221.99	8	2529775.92	7939.254075	63683.40473	76844.52768
3	322.6755	316221.99	12	3794663.88	11908.88111	55744.15065	65387.29227
4	193.6053	189733.194	16	3035731.1	9527.104889	43835.26954	49357.64596
5	193.6053	189733.194	20	3794663.88	11908.88111	34308.16465	37344.28566
6	193.6053	189733.194	24	4553596.66	14290.65733	22399.28354	23531.2635
7	94.1598	92276.604	28	2583744.91	8108.626206	8108.626206	7946.409435
		1610142.16		21557064.3	**67653.03176**	**295731.9311**	**344782.6981**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	F Dinamik
1	322.6755	316221.99	4	1264887.96	3934.841048	62338.37647	76818.82632
2	322.6755	316221.99	8	2529775.92	7869.682095	58403.53542	69827.05457
3	193.6053	189733.194	12	2276798.33	7082.713886	50533.85333	56661.22463
4	193.6053	189733.194	16	3035731.1	9443.618514	43451.13944	46201.16406
5	193.6053	189733.194	20	3794663.88	11804.52314	34007.52093	33889.88535
6	193.6053	189733.194	24	4553596.66	14165.42777	22202.99778	20696.42351
7	94.1598	92276.604	28	2583744.91	8037.570013	8037.570013	6891.667317
		1483653.36		20039198.8	**62338.37647**	**278974.9934**	**310986.2458**

Tabel 16 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa El Centro

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3531.396694	86181.77647	30742.95902
2	322.6755	316221.99	8	2529775.92	7062.793388	82650.37978	30035.09256
3	322.6755	316221.99	12	3794663.88	10594.19008	75587.58639	29466.7598
4	322.6755	316221.99	16	5059551.84	14125.58678	64993.39631	29108.34071
5	322.6755	316221.99	20	6324439.8	17656.98347	50867.80953	26988.43853
6	322.6755	316221.99	24	7589327.76	21188.38016	33210.82606	19890.40909
7	156.933	153794.34	28	4306241.52	12022.4459	12022.4459	7405.258797
		2051126.28		30868888.7	**86181.77647**	**405514.2204**	**173637.2585**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3792.259125	78282.34235	33715.94128
2	322.6755	316221.99	8	2529775.92	7584.518251	74490.08323	30756.77733
3	322.6755	316221.99	12	3794663.88	11376.77738	66905.56498	28346.7078
4	322.6755	316221.99	16	5059551.84	15169.0365	55528.7876	27326.72112
5	322.6755	316221.99	20	6324439.8	18961.29563	40359.7511	23566.66543
6	193.6053	189733.194	24	4553596.66	13652.13285	21398.45547	13738.43888
7	94.1598	92276.604	28	2583744.91	7746.322623	7746.322623	5340.445364
		1863119.75		26110661	**78282.34235**	**344711.3074**	**162791.6972**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3969.627037	67653.03176	32958.50959
2	322.6755	316221.99	8	2529775.92	7939.254075	63683.40473	31773.09119
3	322.6755	316221.99	12	3794663.88	11908.88111	55744.15065	30144.73098
4	193.6053	189733.194	16	3035731.1	9527.104889	43835.26954	28067.58444
5	193.6053	189733.194	20	3794663.88	11908.88111	34308.16465	23668.33729
6	193.6053	189733.194	24	4553596.66	14290.65733	22399.28354	16455.82443
7	94.1598	92276.604	28	2583744.91	8108.626206	8108.626206	6247.052521
		1610142.16		21557064.3	**67653.03176**	**295731.9311**	**169315.1304**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3934.841048	62338.37647	27238.88304
2	322.6755	316221.99	8	2529775.92	7869.682095	58403.53542	23356.23588
3	193.6053	189733.194	12	2276798.33	7082.713886	50533.85333	23611.03932
4	193.6053	189733.194	16	3035731.1	9443.618514	43451.13944	23049.13755
5	193.6053	189733.194	20	3794663.88	11804.52314	34007.52093	20508.92124
6	193.6053	189733.194	24	4553596.66	14165.42777	22202.99778	14554.95428
7	94.1598	92276.604	28	2583744.91	8037.570013	8037.570013	5246.290763
		1483653.36		20039198.8	**62338.37647**	**278974.9934**	**137565.4621**

Tabel 16 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3531.396694	86181.77647	60605.14111
2	322.6755	316221.99	8	2529775.92	7062.793388	82650.37978	56045.01251
3	322.6755	316221.99	12	3794663.88	10594.19008	75587.58639	49654.80399
4	322.6755	316221.99	16	5059551.84	14125.58678	64993.39631	43059.99008
5	322.6755	316221.99	20	6324439.8	17656.98347	50867.80953	39912.63284
6	322.6755	316221.99	24	7589327.76	21188.38016	33210.82606	28713.00448
7	156.933	153794.34	28	4306241.52	12022.4459	12022.4459	10405.18883
		2051126.28		30868888.7	**86181.77647**	**405514.2204**	**288395.7738**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3792.259125	78282.34235	58429.52639
2	322.6755	316221.99	8	2529775.92	7584.518251	74490.08323	53924.70922
3	322.6755	316221.99	12	3794663.88	11376.77738	66905.56498	54739.21418
4	322.6755	316221.99	16	5059551.84	15169.0365	55528.7876	52418.61629
5	322.6755	316221.99	20	6324439.8	18961.29563	40359.7511	40827.48722
6	193.6053	189733.194	24	4553596.66	13652.13285	21398.45547	21489.44556
7	94.1598	92276.604	28	2583744.91	7746.322623	7746.322623	7307.049853
		1863119.75		26110661	**78282.34235**	**344711.3074**	**289136.0487**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3969.627037	67653.03176	71429.01888
2	322.6755	316221.99	8	2529775.92	7939.254075	63683.40473	66923.64379
3	322.6755	316221.99	12	3794663.88	11908.88111	55744.15065	62125.07409
4	193.6053	189733.194	16	3035731.1	9527.104889	43835.26954	52692.50094
5	193.6053	189733.194	20	3794663.88	11908.88111	34308.16465	42138.72201
6	193.6053	189733.194	24	4553596.66	14290.65733	22399.28354	27177.52568
7	94.1598	92276.604	28	2583744.91	8108.626206	8108.626206	9208.492025
		1610142.16		21557064.3	**67653.03176**	**295731.9311**	**331694.9774**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3934.841048	62338.37647	48248.21548
2	322.6755	316221.99	8	2529775.92	7869.682095	58403.53542	44122.03355
3	193.6053	189733.194	12	2276798.33	7082.713886	50533.85333	47773.47214
4	193.6053	189733.194	16	3035731.1	9443.618514	43451.13944	46132.22613
5	193.6053	189733.194	20	3794663.88	11804.52314	34007.52093	38969.12812
6	193.6053	189733.194	24	4553596.66	14165.42777	22202.99778	26137.23206
7	94.1598	92276.604	28	2583744.91	8037.570013	8037.570013	9060.381143
		1483653.36		20039198.8	**62338.37647**	**278974.9934**	**260442.6886**

Tabel 16 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3531.396694	86181.77647	39513.9909
2	322.6755	316221.99	8	2529775.92	7062.793388	82650.37978	37069.74194
3	322.6755	316221.99	12	3794663.88	10594.19008	75587.58639	33592.53405
4	322.6755	316221.99	16	5059551.84	14125.58678	64993.39631	30429.58592
5	322.6755	316221.99	20	6324439.8	17656.98347	50867.80953	27042.75508
6	322.6755	316221.99	24	7589327.76	21188.38016	33210.82606	21370.18063
7	156.933	153794.34	28	4306241.52	12022.4459	12022.4459	8095.955028
		2051126.28		30868888.7	**86181.77647**	**405514.2204**	**197114.7436**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3792.259125	78282.34235	37990.16923
2	322.6755	316221.99	8	2529775.92	7584.518251	74490.08323	35262.59088
3	322.6755	316221.99	12	3794663.88	11376.77738	66905.56498	33781.40301
4	322.6755	316221.99	16	5059551.84	15169.0365	55528.7876	29089.67234
5	322.6755	316221.99	20	6324439.8	18961.29563	40359.7511	23999.28938
6	193.6053	189733.194	24	4553596.66	13652.13285	21398.45547	15798.39956
7	94.1598	92276.604	28	2583744.91	7746.322623	7746.322623	5890.429998
		1863119.75		26110661	**78282.34235**	**344711.3074**	**181811.9544**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3969.627037	67653.03176	39902.2658
2	322.6755	316221.99	8	2529775.92	7939.254075	63683.40473	38086.82912
3	322.6755	316221.99	12	3794663.88	11908.88111	55744.15065	36290.82401
4	193.6053	189733.194	16	3035731.1	9527.104889	43835.26954	29139.42377
5	193.6053	189733.194	20	3794663.88	11908.88111	34308.16465	21624.13504
6	193.6053	189733.194	24	4553596.66	14290.65733	22399.28354	14512.18137
7	94.1598	92276.604	28	2583744.91	8108.626206	8108.626206	5166.515789
		1610142.16		21557064.3	**67653.03176**	**295731.9311**	**184722.1749**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	322.6755	316221.99	4	1264887.96	3934.841048	62338.37647	32759.65534
2	322.6755	316221.99	8	2529775.92	7869.682095	58403.53542	31391.20133
3	193.6053	189733.194	12	2276798.33	7082.713886	50533.85333	27576.98144
4	193.6053	189733.194	16	3035731.1	9443.618514	43451.13944	22681.92355
5	193.6053	189733.194	20	3794663.88	11804.52314	34007.52093	18658.98988
6	193.6053	189733.194	24	4553596.66	14165.42777	22202.99778	14588.08094
7	94.1598	92276.604	28	2583744.91	8037.570013	8037.570013	5505.415775
		1483653.36		20039198.8	**62338.37647**	**278974.9934**	**153162.2483**

Tabel 17 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	136244.4207	348667.6673
2	501.90695	491868.811	8	3934950.49	5458.385745	133599.7623	328851.4687
3	501.90695	491868.811	12	5902425.73	8187.578617	128141.3766	303842.8931
4	501.90695	491868.811	16	7869900.98	10916.77149	119953.798	274669.7459
5	486.3608	476633.584	20	9532671.68	13223.29197	109037.0265	241673.4292
6	486.3608	476633.584	24	11439206	15867.95037	95813.73451	206070.4084
7	486.3608	476633.584	28	13345740.4	18512.60876	79945.78414	166832.6654
8	486.3608	476633.584	32	15252274.7	21157.26716	61433.17538	124129.3087
9	486.3608	476633.584	36	17158809	23801.92555	40275.90822	78387.09114
10	302.9616	296902.368	40	11876094.7	16473.98266	16473.98266	30469.83904
		4632310.31		98218608	**136244.4207**	**920918.9691**	**2103594.517**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	127143.9978	272450.8697
2	501.90695	491868.811	8	3934950.49	5776.887918	124345.021	254642.3522
3	501.90695	491868.811	12	5902425.73	8665.331877	118568.133	232522.5849
4	501.90695	491868.811	16	7869900.98	11553.77584	109902.8012	207111.4976
5	486.3608	476633.584	20	9532671.68	13994.88406	98349.02533	178632.2363
6	486.3608	476633.584	24	11439206	16793.86087	84354.14127	148049.8517
7	486.3608	476633.584	28	13345740.4	19592.83768	67560.2804	114485.9076
8	486.3608	476633.584	32	15252274.7	22391.81449	47967.44272	78231.68172
9	291.81648	285980.15	36	10295285.4	15114.47478	25575.62823	39482.10255
10	181.77696	178141.421	40	7125656.83	10461.15345	10461.15345	15299.76247
		4322895.92		86604646.5	**127143.9978**	**814227.6243**	**1540908.847**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	115929.0899	206982.2562
2	501.90695	491868.811	8	3934950.49	6068.949053	112988.6057	190053.7527
3	501.90695	491868.811	12	5902425.73	9103.423579	106919.6567	169728.4391
4	501.90695	491868.811	16	7869900.98	12137.89811	97816.23308	146594.7373
5	486.3608	476633.584	20	9532671.68	14702.42102	85678.33497	121000.8316
6	486.3608	476633.584	24	11439206	17642.90522	70975.91395	95202.21991
7	291.81648	285980.15	28	8007444.21	12350.03366	53333.00873	68056.92305
8	291.81648	285980.15	32	9151364.81	14114.32418	40982.97507	50513.79713
9	291.81648	285980.15	36	10295285.4	15878.6147	26868.65089	31829.19078
10	181.77696	178141.421	40	7125656.83	10990.03619	10990.03619	12342.52916
		3941589.06		75165440.5	**115929.0899**	**722482.5052**	**1092304.677**

Tabel 17 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Bucharest

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	104714.1821	165888.6383
2	501.90695	491868.811	8	3934950.49	6170.493406	101724.4983	149502.1716
3	501.90695	491868.811	12	5902425.73	9255.74011	95554.00489	130596.4261
4	501.90695	491868.811	16	7869900.98	12340.98681	86298.26478	109550.0383
5	291.81648	285980.15	20	5719603.01	8969.051264	73957.27797	88202.69177
6	291.81648	285980.15	24	6863523.61	10762.86152	64988.22671	75108.89342
7	291.81648	285980.15	28	8007444.21	12556.67177	54225.36519	60906.9831
8	291.81648	285980.15	32	9151364.81	14350.48202	41668.69342	45531.22183
9	291.81648	285980.15	36	10295285.4	16144.29228	27318.2114	28876.35298
10	181.77696	178141.421	40	7125656.83	11173.91912	11173.91912	11243.22934
		3560282.19		66776689.4	**104714.1821**	**661622.6438**	**865406.6467**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	93140.79826	166037.7246
2	501.90695	491868.811	8	3934950.49	5982.011373	90242.43649	149170.0036
3	301.14417	295121.287	12	3541455.44	5383.810236	84260.42512	128911.2475
4	301.14417	295121.287	16	4721940.59	7178.413648	78876.61488	115241.3638
5	291.81648	285980.15	20	5719603.01	8695.085326	71698.20123	100134.138
6	291.81648	285980.15	24	6863523.61	10434.10239	63003.11591	85314.02854
7	291.81648	285980.15	28	8007444.21	12173.11946	52569.01352	69225.06907
8	291.81648	285980.15	32	9151364.81	13912.13652	40395.89406	51639.63007
9	291.81648	285980.15	36	10295285.4	15651.15359	26483.75754	32687.31499
10	181.77696	178141.421	40	7125656.83	10832.60395	10832.60395	12711.75125
		3166787.14		61267758.7	**93140.79826**	**611502.861**	**911072.2714**

Tabel 17 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa El Centro

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	104714.1821	63338.37703
2	501.90695	491868.811	8	3934950.49	6170.493406	101724.4983	61002.30225
3	501.90695	491868.811	12	5902425.73	9255.74011	95554.00489	54332.52585
4	501.90695	491868.811	16	7869900.98	12340.98681	86298.26478	42681.84577
5	291.81648	285980.15	20	5719603.01	8969.051264	73957.27797	41097.10078
6	291.81648	285980.15	24	6863523.61	10762.86152	64988.22671	42539.97599
7	291.81648	285980.15	28	8007444.21	12556.67177	54225.36519	40438.98445
8	291.81648	285980.15	32	9151364.81	14350.48202	41668.69342	33281.50253
9	291.81648	285980.15	36	10295285.4	16144.29228	27318.2114	22459.77816
10	181.77696	178141.421	40	7125656.83	11173.91912	11173.91912	9081.059245
		3560282.19		66776689.4	**104714.1821**	**661622.6438**	**410253.4521**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	93140.79826	50138.24131
2	501.90695	491868.811	8	3934950.49	5982.011373	90242.43649	43920.74828
3	301.14417	295121.287	12	3541455.44	5383.810236	84260.42512	40048.31488
4	301.14417	295121.287	16	4721940.59	7178.413648	78876.61488	36753.56284
5	291.81648	285980.15	20	5719603.01	8695.085326	71698.20123	31801.6896
6	291.81648	285980.15	24	6863523.61	10434.10239	63003.11591	34816.61119
7	291.81648	285980.15	28	8007444.21	12173.11946	52569.01352	35068.2432
8	291.81648	285980.15	32	9151364.81	13912.13652	40395.89406	30654.80369
9	291.81648	285980.15	36	10295285.4	15651.15359	26483.75754	21826.05323
10	181.77696	178141.421	40	7125656.83	10832.60395	10832.60395	9166.324914
		3166787.14		61267758.7	**93140.79826**	**611502.861**	**334194.5931**

Tabel 17 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	136244.4207	76131.92218
2	501.90695	491868.811	8	3934950.49	5458.385745	133599.7623	78329.09257
3	501.90695	491868.811	12	5902425.73	8187.578617	128141.3766	78685.8347
4	501.90695	491868.811	16	7869900.98	10916.77149	119953.798	74545.77269
5	486.3608	476633.584	20	9532671.68	13223.29197	109037.0265	66591.24711
6	486.3608	476633.584	24	11439206	15867.95037	95813.73451	67035.77756
7	486.3608	476633.584	28	13345740.4	18512.60876	79945.78414	66961.32139
8	486.3608	476633.584	32	15252274.7	21157.26716	61433.17538	58562.56426
9	486.3608	476633.584	36	17158809	23801.92555	40275.90822	41574.24567
10	302.9616	296902.368	40	11876094.7	16473.98266	16473.98266	19313.32799
		4632310.31		98218608	**136244.4207**	**920918.9691**	**627731.1061**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	127143.9978	81726.73871
2	501.90695	491868.811	8	3934950.49	5776.887918	124345.021	83539.93049
3	501.90695	491868.811	12	5902425.73	8665.331877	118568.133	80551.56533
4	501.90695	491868.811	16	7869900.98	11553.77584	109902.8012	73472.24745
5	486.3608	476633.584	20	9532671.68	13994.88406	98349.02533	63969.25357
6	486.3608	476633.584	24	11439206	16793.86087	84354.14127	60897.15313
7	486.3608	476633.584	28	13345740.4	19592.83768	67560.2804	55076.9773
8	486.3608	476633.584	32	15252274.7	22391.81449	47967.44272	43078.15839
9	291.81648	285980.15	36	10295285.4	15114.47478	25575.62823	28718.93728
10	181.77696	178141.421	40	7125656.83	10461.15345	10461.15345	12476.66123
		4322895.92		86604646.5	**127143.9978**	**814227.6243**	**583507.6229**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	115929.0899	87746.43227
2	501.90695	491868.811	8	3934950.49	6068.949053	112988.6057	87709.4543
3	501.90695	491868.811	12	5902425.73	9103.423579	106919.6567	82745.50548
4	501.90695	491868.811	16	7869900.98	12137.89811	97816.23308	73442.71535
5	486.3608	476633.584	20	9532671.68	14702.42102	85678.33497	61847.66528
6	486.3608	476633.584	24	11439206	17642.90522	70975.91395	54759.4351
7	291.81648	285980.15	28	8007444.21	12350.03366	53333.00873	49930.71152
8	291.81648	285980.15	32	9151364.81	14114.32418	40982.97507	45360.10168
9	291.81648	285980.15	36	10295285.4	15878.6147	26868.65089	33273.55693
10	181.77696	178141.421	40	7125656.83	10990.03619	10990.03619	14197.86367
		3941589.06		75165440.5	**115929.0899**	**722482.5052**	**591013.4416**

Tabel 17 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	136244.4207	64987.86706
2	501.90695	491868.811	8	3934950.49	5458.385745	133599.7623	62974.3549
3	501.90695	491868.811	12	5902425.73	8187.578617	128141.3766	52166.78354
4	501.90695	491868.811	16	7869900.98	10916.77149	119953.798	47028.93522
5	486.3608	476633.584	20	9532671.68	13223.29197	109037.0265	46660.42399
6	486.3608	476633.584	24	11439206	15867.95037	95813.73451	50688.67217
7	486.3608	476633.584	28	13345740.4	18512.60876	79945.78414	50466.29867
8	486.3608	476633.584	32	15252274.7	21157.26716	61433.17538	42106.77671
9	486.3608	476633.584	36	17158809	23801.92555	40275.90822	31643.87794
10	302.9616	296902.368	40	11876094.7	16473.98266	16473.98266	14124.11518
		4632310.31		98218608	**136244.4207**	**920918.9691**	**462848.1054**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	127143.9978	54966.76063
2	501.90695	491868.811	8	3934950.49	5776.887918	124345.021	55090.21335
3	501.90695	491868.811	12	5902425.73	8665.331877	118568.133	54582.97178
4	501.90695	491868.811	16	7869900.98	11553.77584	109902.8012	45838.23442
5	486.3608	476633.584	20	9532671.68	13994.88406	98349.02533	51690.36613
6	486.3608	476633.584	24	11439206	16793.86087	84354.14127	51248.58638
7	486.3608	476633.584	28	13345740.4	19592.83768	67560.2804	47201.7399
8	486.3608	476633.584	32	15252274.7	22391.81449	47967.44272	38458.22586
9	291.81648	285980.15	36	10295285.4	15114.47478	25575.62823	24107.88878
10	181.77696	178141.421	40	7125656.83	10461.15345	10461.15345	10431.92449
		4322895.92		86604646.5	**127143.9978**	**814227.6243**	**433616.9117**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	115929.0899	54517.71674
2	501.90695	491868.811	8	3934950.49	6068.949053	112988.6057	54504.63346
3	501.90695	491868.811	12	5902425.73	9103.423579	106919.6567	51565.76587
4	501.90695	491868.811	16	7869900.98	12137.89811	97816.23308	42357.14042
5	486.3608	476633.584	20	9532671.68	14702.42102	85678.33497	38343.08382
6	486.3608	476633.584	24	11439206	17642.90522	70975.91395	36951.70067
7	291.81648	285980.15	28	8007444.21	12350.03366	53333.00873	34893.16612
8	291.81648	285980.15	32	9151364.81	14114.32418	40982.97507	29958.18605
9	291.81648	285980.15	36	10295285.4	15878.6147	26868.65089	21334.54101
10	181.77696	178141.421	40	7125656.83	10990.03619	10990.03619	9005.987139
		3941589.06		75165440.5	**115929.0899**	**722482.5052**	**373431.9213**

Tabel 17 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Koyna

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	104714.1821	51753.86833
2	501.90695	491868.811	8	3934950.49	6170.493406	101724.4983	51208.76322
3	501.90695	491868.811	12	5902425.73	9255.74011	95554.00489	44923.08594
4	501.90695	491868.811	16	7869900.98	12340.98681	86298.26478	44118.48047
5	291.81648	285980.15	20	5719603.01	8969.051264	73957.27797	36652.01041
6	291.81648	285980.15	24	6863523.61	10762.86152	64988.22671	36589.49325
7	291.81648	285980.15	28	8007444.21	12556.67177	54225.36519	34252.70854
8	291.81648	285980.15	32	9151364.81	14350.48202	41668.69342	28873.04532
9	291.81648	285980.15	36	10295285.4	16144.29228	27318.2114	20660.62433
10	181.77696	178141.421	40	7125656.83	11173.91912	11173.91912	8810.733217
		3560282.19		66776689.4	**104714.1821**	**661622.6438**	**357842.813**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	93140.79826	48198.48798
2	501.90695	491868.811	8	3934950.49	5982.011373	90242.43649	44062.6955
3	301.14417	295121.287	12	3541455.44	5383.810236	84260.42512	38402.41169
4	301.14417	295121.287	16	4721940.59	7178.413648	78876.61488	32012.1808
5	291.81648	285980.15	20	5719603.01	8695.085326	71698.20123	31431.69266
6	291.81648	285980.15	24	6863523.61	10434.10239	63003.11591	33521.89378
7	291.81648	285980.15	28	8007444.21	12173.11946	52569.01352	33262.52549
8	291.81648	285980.15	32	9151364.81	13912.13652	40395.89406	29211.87223
9	291.81648	285980.15	36	10295285.4	15651.15359	26483.75754	21609.97655
10	181.77696	178141.421	40	7125656.83	10832.60395	10832.60395	9369.136101
		3166787.14		61267758.7	**93140.79826**	**611502.861**	**321082.8728**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	154497.6752	421974.7871
2	681.0253	667404.794	8	5339238.35	3809.341983	152683.7428	400388.9115
3	681.0253	667404.794	12	8008857.53	5714.012975	148874.4008	374735.4452
4	681.0253	667404.794	16	10678476.7	7618.683966	143160.3878	346613.8402
5	681.0253	667404.794	20	13348095.9	9523.354958	135541.7039	315749.7058
6	648.58125	635609.625	24	15254631	10883.59471	126018.3489	282331.758
7	648.58125	635609.625	28	17797069.5	12697.52717	115134.7542	248227.8096
8	648.58125	635609.625	32	20339508	14511.45962	102437.227	214632.1839
9	648.58125	635609.625	36	22881946.5	16325.39207	87925.76741	178734.0695
10	366.43788	359109.122	40	14364364.9	10248.42396	71600.37534	140680.7035
11	366.43788	359109.122	44	15800801.4	11273.26636	61351.95137	118012.4055
12	366.43788	359109.122	48	17237237.9	12298.10875	50078.68502	94239.28552
13	366.43788	359109.122	52	18673674.4	13322.95115	37780.57627	69432.13736
14	366.43788	359109.122	56	20110110.9	14347.79354	24457.62512	43743.96339
15	240.98829	236168.524	60	14170111.5	10109.83157	10109.83157	17454.86448
		7879381.44		216546563	**154497.6752**	**1421653.053**	**3266951.87**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	144527.3282	361987.5994
2	681.0253	667404.794	8	5339238.35	3872.697343	142683.2272	340217.3166
3	681.0253	667404.794	12	8008857.53	5809.046014	138810.5298	315107.4503
4	681.0253	667404.794	16	10678476.7	7745.394686	133001.4838	287912.8083
5	681.0253	667404.794	20	13348095.9	9681.743357	125256.0891	258678.4317
6	648.58125	635609.625	24	15254631	11064.60604	115574.3458	227431.4149
7	648.58125	635609.625	28	17797069.5	12908.70705	104509.7397	196826.0999
8	389.14875	381365.775	32	12203704.8	8851.684835	91601.03268	167149.9218
9	389.14875	381365.775	36	13729167.9	9958.14544	82749.34784	148116.7123
10	366.43788	359109.122	40	14364364.9	10418.8714	72791.2024	127804.9258
11	366.43788	359109.122	44	15800801.4	11460.75854	62372.331	107532.0791
12	366.43788	359109.122	48	17237237.9	12502.64568	50911.57246	86158.9912
13	366.43788	359109.122	52	18673674.4	13544.53282	38408.92678	63714.09232
14	366.43788	359109.122	56	20110110.9	14586.41996	24864.39396	40278.06452
15	240.98829	236168.524	60	14170111.5	10277.974	10277.974	16109.7021
		7370893.74		199257981	**144527.3282**	**1338339.525**	**2745025.61**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	134556.9811	315551.5339
2	681.0253	667404.794	8	5339238.35	3861.762083	132718.0873	294545.2425
3	681.0253	667404.794	12	8008857.53	5792.643124	128856.3252	270701.1947
4	681.0253	667404.794	16	10678476.7	7723.524165	123063.6821	245117.9459
5	681.0253	667404.794	20	13348095.9	9654.405206	115340.1579	217401.7237
6	389.14875	381365.775	24	9152778.6	6620.017878	105685.7527	189087.3838
7	389.14875	381365.775	28	10678241.7	7723.354191	99065.73481	173057.6852
8	389.14875	381365.775	32	12203704.8	8826.690505	91342.38062	156139.3833
9	389.14875	381365.775	36	13729167.9	9930.026818	82515.69011	138177.9459
10	366.43788	359109.122	40	14364364.9	10389.45184	72585.6633	119078.4177
11	366.43788	359109.122	44	15800801.4	11428.39702	62196.21146	100184.5822
12	366.43788	359109.122	48	17237237.9	12467.3422	50767.81444	80306.28606
13	366.43788	359109.122	52	18673674.4	13506.28739	38300.47224	59423.13389
14	366.43788	359109.122	56	20110110.9	14545.23257	24794.18485	37591.60655
15	240.98829	236168.524	60	14170111.5	10248.95229	10248.95229	15042.40277
		6862406.04		186037301	**134556.9811**	**1272038.09**	**2411406.468**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	124087.8863	286055.0826
2	681.0253	667404.794	8	5339238.35	3755.29842	122299.6883	264768.2304
3	681.0253	667404.794	12	8008857.53	5632.947629	118544.3899	240306.9948
4	408.61518	400442.876	16	6407086.02	4506.358103	112911.4423	213895.965
5	408.61518	400442.876	20	8008857.53	5632.947629	108405.0842	197122.4574
6	389.14875	381365.775	24	9152778.6	6437.512758	102772.1365	181312.6224
7	389.14875	381365.775	28	10678241.7	7510.431551	96334.62379	165725.6532
8	389.14875	381365.775	32	12203704.8	8583.350345	88824.19223	149456.3937
9	389.14875	381365.775	36	13729167.9	9656.269138	80240.84189	132283.0301
10	366.43788	359109.122	40	14364364.9	10103.02842	70584.57275	114098.9197
11	366.43788	359109.122	44	15800801.4	11113.33126	60481.54433	95908.87557
12	366.43788	359109.122	48	17237237.9	12123.6341	49368.21308	76860.06053
13	366.43788	359109.122	52	18673674.4	13133.93694	37244.57898	56885.50236
14	366.43788	359109.122	56	20110110.9	14144.23978	24110.64204	36003.451
15	240.98829	236168.524	60	14170111.5	9966.402253	9966.402253	14413.18528
		6328482.2		176426672	**124087.8863**	**1206176.239**	**2225096.424**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	181056.03	140786.6256
2	681.0253	667404.794	8	5339238.35	3410.473437	179432.0307	138284.1697
3	681.0253	667404.794	12	8008857.53	5115.710155	176021.5573	131263.1686
4	681.0253	667404.794	16	10678476.7	6820.946874	170905.8471	119204.0631
5	681.0253	667404.794	20	13348095.9	8526.183592	164084.9003	108426.3695
6	648.58125	635609.625	24	15254631	9743.995376	155558.7167	95048.80238
7	648.58125	635609.625	28	17797069.5	11367.99461	145814.7213	91698.66429
8	648.58125	635609.625	32	20339508	12991.99383	134446.7267	90372.9024
9	648.58125	635609.625	36	22881946.5	14615.99306	121454.7329	91479.39777
10	610.7298	598515.204	40	23940608.2	15292.22013	106838.7398	89604.6668
11	610.7298	598515.204	44	26334669	16821.44214	91546.51967	83824.15347
12	610.7298	598515.204	48	28728729.8	18350.66415	74725.07753	73065.73326
13	610.7298	598515.204	52	31122790.6	19879.88617	56374.41337	57483.01488
14	610.7298	598515.204	56	33516851.4	21409.10818	36494.52721	37669.56504
15	401.64715	393614.207	60	23616852.4	15085.41903	15085.41903	15448.54927
		9233857.53		283450763	**181056.03**	**1809839.96**	**1363659.846**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	173274.6228	122109.6952
2	681.0253	667404.794	8	5339238.35	3550.131088	171584.1214	117760.7952
3	681.0253	667404.794	12	8008857.53	5325.196632	168033.9903	109176.2066
4	681.0253	667404.794	16	10678476.7	7100.262176	162708.7937	101804.7173
5	681.0253	667404.794	20	13348095.9	8875.32772	155608.5315	99154.68336
6	648.58125	635609.625	24	15254631	10143.00846	146733.2038	103372.2602
7	648.58125	635609.625	28	17797069.5	11833.50986	136590.1953	107117.8091
8	648.58125	635609.625	32	20339508	13524.01127	124756.6855	108949.7978
9	648.58125	635609.625	36	22881946.5	15214.51268	111232.6742	108259.5351
10	610.7298	598515.204	40	23940608.2	15918.431	96018.16152	102777.2561
11	610.7298	598515.204	44	26334669	17510.2741	80099.73052	91026.86528
12	610.7298	598515.204	48	28728729.8	19102.1172	62589.45642	73397.68584
13	610.7298	598515.204	52	31122790.6	20693.9603	43487.33922	51638.06918
14	366.43788	359109.122	56	20110110.9	13371.48204	22793.37892	26695.84422
15	240.98829	236168.524	60	14170111.5	9421.896883	9421.896883	10722.44163
		8837005.76		260597282	**173274.6228**	**1664932.782**	**1333963.662**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	163886.149	123883.233
2	681.0253	667404.794	8	5339238.35	3697.454201	162125.4953	118177.613
3	681.0253	667404.794	12	8008857.53	5546.181302	158428.0411	114008.0533
4	681.0253	667404.794	16	10678476.7	7394.908403	152881.8598	110535.0635
5	681.0253	667404.794	20	13348095.9	9243.635503	145486.9514	109123.0476
6	648.58125	635609.625	24	15254631	10563.92237	136243.3159	106753.4351
7	648.58125	635609.625	28	17797069.5	12324.5761	125679.3935	106372.8574
8	648.58125	635609.625	32	20339508	14085.22983	113354.8174	103162.3907
9	648.58125	635609.625	36	22881946.5	15845.88356	99269.58758	97897.09876
10	610.7298	598515.204	40	23940608.2	16579.01303	83423.70402	87707.17058
11	610.7298	598515.204	44	26334669	18236.91434	66844.69099	72114.50941
12	366.43788	359109.122	48	17237237.9	11936.88938	48607.77666	54496.08964
13	366.43788	359109.122	52	18673674.4	12931.63017	36670.88727	42447.56152
14	366.43788	359109.122	56	20110110.9	13926.37095	23739.25711	27797.54509
15	240.98829	236168.524	60	14170111.5	9812.886159	9812.886159	11457.09433
		8358193.6		236656674	**163886.149**	**1526454.813**	**1285932.763**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	134556.9811	121877.5534
2	681.0253	667404.794	8	5339238.35	3861.762083	132718.0873	120021.8028
3	681.0253	667404.794	12	8008857.53	5792.643124	128856.3252	112001.0196
4	681.0253	667404.794	16	10678476.7	7723.524165	123063.6821	103848.4142
5	681.0253	667404.794	20	13348095.9	9654.405206	115340.1579	89017.44795
6	389.14875	381365.775	24	9152778.6	6620.017878	105685.7527	78258.69702
7	389.14875	381365.775	28	10678241.7	7723.354191	99065.73481	77967.21436
8	389.14875	381365.775	32	12203704.8	8826.690505	91342.38062	82276.54137
9	389.14875	381365.775	36	13729167.9	9930.026818	82515.69011	83229.12936
10	366.43788	359109.122	40	14364364.9	10389.45184	72585.6633	80290.31806
11	366.43788	359109.122	44	15800801.4	11428.39702	62196.21146	72514.61715
12	366.43788	359109.122	48	17237237.9	12467.3422	50767.81444	60297.62238
13	366.43788	359109.122	52	18673674.4	13506.28739	38300.47224	45608.76502
14	366.43788	359109.122	56	20110110.9	14545.23257	24794.18485	29453.63199
15	240.98829	236168.524	60	14170111.5	10248.95229	10248.95229	12018.57295
		6862406.04		186037301	**134556.9811**	**1272038.09**	**1168681.348**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	124087.8863	117873.3982
2	681.0253	667404.794	8	5339238.35	3755.29842	122299.6883	113114.9643
3	681.0253	667404.794	12	8008857.53	5632.947629	118544.3899	102127.0676
4	408.61518	400442.876	16	6407086.02	4506.358103	112911.4423	91817.94633
5	408.61518	400442.876	20	8008857.53	5632.947629	108405.0842	85008.8565
6	389.14875	381365.775	24	9152778.6	6437.512758	102772.1365	81310.55746
7	389.14875	381365.775	28	10678241.7	7510.431551	96334.62379	78157.83672
8	389.14875	381365.775	32	12203704.8	8583.350345	88824.19223	82033.90968
9	389.14875	381365.775	36	13729167.9	9656.269138	80240.84189	82635.2442
10	366.43788	359109.122	40	14364364.9	10103.02842	70584.57275	79987.2053
11	366.43788	359109.122	44	15800801.4	11113.33126	60481.54433	72804.1415
12	366.43788	359109.122	48	17237237.9	12123.6341	49368.21308	62831.59036
13	366.43788	359109.122	52	18673674.4	13133.93694	37244.57898	50169.02295
14	366.43788	359109.122	56	20110110.9	14144.23978	24110.64204	34787.90832
15	240.98829	236168.524	60	14170111.5	9966.402253	9966.402253	14828.45319
		6328482.2		176426672	**124087.8863**	**1206176.239**	**1149488.103**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	181056.03	158284.2097
2	681.0253	667404.794	8	5339238.35	3410.473437	179432.0307	148718.512
3	681.0253	667404.794	12	8008857.53	5115.710155	176021.5573	148151.3629
4	681.0253	667404.794	16	10678476.7	6820.946874	170905.8471	149660.1312
5	681.0253	667404.794	20	13348095.9	8526.183592	164084.9003	146778.3134
6	648.58125	635609.625	24	15254631	9743.995376	155558.7167	140143.5117
7	648.58125	635609.625	28	17797069.5	11367.99461	145814.7213	130706.8608
8	648.58125	635609.625	32	20339508	12991.99383	134446.7267	129862.2566
9	648.58125	635609.625	36	22881946.5	14615.99306	121454.7329	137773.811
10	610.7298	598515.204	40	23940608.2	15292.22013	106838.7398	137026.1666
11	610.7298	598515.204	44	26334669	16821.44214	91546.51967	128076.1792
12	610.7298	598515.204	48	28728729.8	18350.66415	74725.07753	111550.556
13	610.7298	598515.204	52	31122790.6	19879.88617	56374.41337	88894.30957
14	610.7298	598515.204	56	33516851.4	21409.10818	36494.52721	59444.19504
15	401.64715	393614.207	60	23616852.4	15085.41903	15085.41903	25193.17236
		9233857.53		283450763	**181056.03**	**1809839.96**	**1840263.548**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	173274.6228	146972.3992
2	681.0253	667404.794	8	5339238.35	3550.131088	171584.1214	152698.7484
3	681.0253	667404.794	12	8008857.53	5325.196632	168033.9903	154870.3006
4	681.0253	667404.794	16	10678476.7	7100.262176	162708.7937	152908.0992
5	681.0253	667404.794	20	13348095.9	8875.32772	155608.5315	146694.5783
6	648.58125	635609.625	24	15254631	10143.00846	146733.2038	137090.7195
7	648.58125	635609.625	28	17797069.5	11833.50986	136590.1953	125764.5617
8	648.58125	635609.625	32	20339508	13524.01127	124756.6855	118098.5911
9	648.58125	635609.625	36	22881946.5	15214.51268	111232.6742	122081.0052
10	610.7298	598515.204	40	23940608.2	15918.431	96018.16152	118264.9847
11	610.7298	598515.204	44	26334669	17510.2741	80099.73052	106001.1122
12	610.7298	598515.204	48	28728729.8	19102.1172	62589.45642	88732.51949
13	610.7298	598515.204	52	31122790.6	20693.9603	43487.33922	68984.17747
14	366.43788	359109.122	56	20110110.9	13371.48204	22793.37892	38684.20082
15	240.98829	236168.524	60	14170111.5	9421.896883	9421.896883	16280.85891
		8837005.76		260597282	**173274.6228**	**1664932.782**	**1694126.857**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	163886.149	157411.2187
2	681.0253	667404.794	8	5339238.35	3697.454201	162125.4953	161674.6408
3	681.0253	667404.794	12	8008857.53	5546.181302	158428.0411	161739.2749
4	681.0253	667404.794	16	10678476.7	7394.908403	152881.8598	156772.8547
5	681.0253	667404.794	20	13348095.9	9243.635503	145486.9514	147524.7527
6	648.58125	635609.625	24	15254631	10563.92237	136243.3159	135468.4701
7	648.58125	635609.625	28	17797069.5	12324.5761	125679.3935	122740.3221
8	648.58125	635609.625	32	20339508	14085.22983	113354.8174	119489.4416
9	648.58125	635609.625	36	22881946.5	15845.88356	99269.58758	116498.035
10	610.7298	598515.204	40	23940608.2	16579.01303	83423.70402	105176.1415
11	610.7298	598515.204	44	26334669	18236.91434	66844.69099	90129.19373
12	366.43788	359109.122	48	17237237.9	11936.88938	48607.77666	77442.76697
13	366.43788	359109.122	52	18673674.4	12931.63017	36670.88727	62987.87119
14	366.43788	359109.122	56	20110110.9	13926.37095	23739.25711	42804.81771
15	240.98829	236168.524	60	14170111.5	9812.886159	9812.886159	17828.5034
		8358193.6		236656674	**163886.149**	**1526454.813**	**1675688.305**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	154497.6752	164054.7453
2	681.0253	667404.794	8	5339238.35	3809.341983	152683.7428	167257.3607
3	681.0253	667404.794	12	8008857.53	5714.012975	148874.4008	166079.7024
4	681.0253	667404.794	16	10678476.7	7618.683966	143160.3878	159493.3825
5	681.0253	667404.794	20	13348095.9	9523.354958	135541.7039	148498.8027
6	648.58125	635609.625	24	15254631	10883.59471	126018.3489	134572.7852
7	648.58125	635609.625	28	17797069.5	12697.52717	115134.7542	119512.106
8	648.58125	635609.625	32	20339508	14511.45962	102437.227	115422.9249
9	648.58125	635609.625	36	22881946.5	16325.39207	87925.76741	107602.3634
10	366.43788	359109.122	40	14364364.9	10248.42396	71600.37534	98430.84567
11	366.43788	359109.122	44	15800801.4	11273.26636	61351.95137	94957.97259
12	366.43788	359109.122	48	17237237.9	12298.10875	50078.68502	85002.84303
13	366.43788	359109.122	52	18673674.4	13322.95115	37780.57627	67870.99607
14	366.43788	359109.122	56	20110110.9	14347.79354	24457.62512	45293.19285
15	240.98829	236168.524	60	14170111.5	10109.83157	10109.83157	18857.06606
		7879381.44		216546563	**154497.6752**	**1421653.053**	**1692907.089**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	144527.3282	168642.044
2	681.0253	667404.794	8	5339238.35	3872.697343	142683.2272	170421.8693
3	681.0253	667404.794	12	8008857.53	5809.046014	138810.5298	166600.6965
4	681.0253	667404.794	16	10678476.7	7745.394686	133001.4838	157894.807
5	681.0253	667404.794	20	13348095.9	9681.743357	125256.0891	145053.5206
6	648.58125	635609.625	24	15254631	11064.60604	115574.3458	129594.0858
7	648.58125	635609.625	28	17797069.5	12908.70705	104509.7397	112647.1674
8	389.14875	381365.775	32	12203704.8	8851.684835	91601.03268	103749.0392
9	389.14875	381365.775	36	13729167.9	9958.14544	82749.34784	109368.7566
10	366.43788	359109.122	40	14364364.9	10418.8714	72791.2024	109575.1839
11	366.43788	359109.122	44	15800801.4	11460.75854	62372.331	103961.6576
12	366.43788	359109.122	48	17237237.9	12502.64568	50911.57246	90936.89075
13	366.43788	359109.122	52	18673674.4	13544.53282	38408.92678	72341.08862
14	366.43788	359109.122	56	20110110.9	14586.41996	24864.39396	47860.78229
15	240.98829	236168.524	60	14170111.5	10277.974	10277.974	19740.65937
		7370893.74		199257981	**144527.3282**	**1338339.525**	**1708388.249**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	134556.9811	167421.0145
2	681.0253	667404.794	8	5339238.35	3861.762083	132718.0873	167552.1068
3	681.0253	667404.794	12	8008857.53	5792.643124	128856.3252	161859.2219
4	681.0253	667404.794	16	10678476.7	7723.524165	123063.6821	151159.5679
5	681.0253	667404.794	20	13348095.9	9654.405206	115340.1579	136756.1921
6	389.14875	381365.775	24	9152778.6	6620.017878	105685.7527	120345.1307
7	389.14875	381365.775	28	10678241.7	7723.354191	99065.73481	110042.9438
8	389.14875	381365.775	32	12203704.8	8826.690505	91342.38062	108634.686
9	389.14875	381365.775	36	13729167.9	9930.026818	82515.69011	113723.1531
10	366.43788	359109.122	40	14364364.9	10389.45184	72585.6633	113947.2629
11	366.43788	359109.122	44	15800801.4	11428.39702	62196.21146	107980.6666
12	366.43788	359109.122	48	17237237.9	12467.3422	50767.81444	94712.91941
13	366.43788	359109.122	52	18673674.4	13506.28739	38300.47224	75430.21531
14	366.43788	359109.122	56	20110110.9	14545.23257	24794.18485	49957.84032
15	240.98829	236168.524	60	14170111.5	10248.95229	10248.95229	20710.14156
		6862406.04		186037301	**134556.9811**	**1272038.09**	**1700233.063**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	124087.8863	163300.6955
2	681.0253	667404.794	8	5339238.35	3755.29842	122299.6883	160674.8512
3	681.0253	667404.794	12	8008857.53	5632.947629	118544.3899	151710.1058
4	408.61518	400442.876	16	6407086.02	4506.358103	112911.4423	139377.4272
5	408.61518	400442.876	20	8008857.53	5632.947629	108405.0842	131148.0523
6	389.14875	381365.775	24	9152778.6	6437.512758	102772.1365	121849.7476
7	389.14875	381365.775	28	10678241.7	7510.431551	96334.62379	112057.6959
8	389.14875	381365.775	32	12203704.8	8583.350345	88824.19223	101529.5812
9	389.14875	381365.775	36	13729167.9	9656.269138	80240.84189	99416.44226
10	366.43788	359109.122	40	14364364.9	10103.02842	70584.57275	101890.2119
11	366.43788	359109.122	44	15800801.4	11113.33126	60481.54433	98691.22143
12	366.43788	359109.122	48	17237237.9	12123.6341	49368.21308	88418.38614
13	366.43788	359109.122	52	18673674.4	13133.93694	37244.57898	70744.28462
14	366.43788	359109.122	56	20110110.9	14144.23978	24110.64204	47701.87588
15	240.98829	236168.524	60	14170111.5	9966.402253	9966.402253	19886.88206
		6328482.2		176426672	**124087.8863**	**1206176.239**	**1608397.461**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	181056.03	135705.107
2	681.0253	667404.794	8	5339238.35	3410.473437	179432.0307	127503.1277
3	681.0253	667404.794	12	8008857.53	5115.710155	176021.5573	122509.241
4	681.0253	667404.794	16	10678476.7	6820.946874	170905.8471	107674.3187
5	681.0253	667404.794	20	13348095.9	8526.183592	164084.9003	93497.2646
6	648.58125	635609.625	24	15254631	9743.995376	155558.7167	84470.95978
7	648.58125	635609.625	28	17797069.5	11367.99461	145814.7213	90316.45115
8	648.58125	635609.625	32	20339508	12991.99383	134446.7267	90363.93855
9	648.58125	635609.625	36	22881946.5	14615.99306	121454.7329	97632.89843
10	610.7298	598515.204	40	23940608.2	15292.22013	106838.7398	99467.58716
11	610.7298	598515.204	44	26334669	16821.44214	91546.51967	91192.85777
12	610.7298	598515.204	48	28728729.8	18350.66415	74725.07753	75706.66761
13	610.7298	598515.204	52	31122790.6	19879.88617	56374.41337	62421.26543
14	610.7298	598515.204	56	33516851.4	21409.10818	36494.52721	44577.23775
15	401.64715	393614.207	60	23616852.4	15085.41903	15085.41903	19085.614
		9233857.53		283450763	**181056.03**	**1809839.96**	**1342124.537**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	173274.6228	119207.7426
2	681.0253	667404.794	8	5339238.35	3550.131088	171584.1214	117430.5417
3	681.0253	667404.794	12	8008857.53	5325.196632	168033.9903	107694.8226
4	681.0253	667404.794	16	10678476.7	7100.262176	162708.7937	103464.5023
5	681.0253	667404.794	20	13348095.9	8875.32772	155608.5315	96333.54864
6	648.58125	635609.625	24	15254631	10143.00846	146733.2038	85893.25037
7	648.58125	635609.625	28	17797069.5	11833.50986	136590.1953	91298.58231
8	648.58125	635609.625	32	20339508	13524.01127	124756.6855	98667.36731
9	648.58125	635609.625	36	22881946.5	15214.51268	111232.6742	104495.8848
10	610.7298	598515.204	40	23940608.2	15918.431	96018.16152	100078.7973
11	610.7298	598515.204	44	26334669	17510.2741	80099.73052	85880.85519
12	610.7298	598515.204	48	28728729.8	19102.1172	62589.45642	68701.71723
13	610.7298	598515.204	52	31122790.6	20693.9603	43487.33922	51493.3447
14	366.43788	359109.122	56	20110110.9	13371.48204	22793.37892	27852.14555
15	240.98829	236168.524	60	14170111.5	9421.896883	9421.896883	11400.23146
		8837005.76		260597282	**173274.6228**	**1664932.782**	**1269893.334**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	163886.149	105634.4474
2	681.0253	667404.794	8	5339238.35	3697.454201	162125.4953	105353.8576
3	681.0253	667404.794	12	8008857.53	5546.181302	158428.0411	107416.7687
4	681.0253	667404.794	16	10678476.7	7394.908403	152881.8598	105523.6006
5	681.0253	667404.794	20	13348095.9	9243.635503	145486.9514	97113.78798
6	648.58125	635609.625	24	15254631	10563.92237	136243.3159	90013.27387
7	648.58125	635609.625	28	17797069.5	12324.5761	125679.3935	93417.52156
8	648.58125	635609.625	32	20339508	14085.22983	113354.8174	95436.2349
9	648.58125	635609.625	36	22881946.5	15845.88356	99269.58758	96914.82818
10	610.7298	598515.204	40	23940608.2	16579.01303	83423.70402	88836.61586
11	610.7298	598515.204	44	26334669	18236.91434	66844.69099	74920.81969
12	366.43788	359109.122	48	17237237.9	11936.88938	48607.77666	60197.87706
13	366.43788	359109.122	52	18673674.4	12931.63017	36670.88727	48070.04176
14	366.43788	359109.122	56	20110110.9	13926.37095	23739.25711	31910.61497
15	240.98829	236168.524	60	14170111.5	9812.886159	9812.886159	13078.17323
		8358193.6		236656674	**163886.149**	**1526454.813**	**1213838.463**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	154497.6752	108137.7709
2	681.0253	667404.794	8	5339238.35	3809.341983	152683.7428	107137.8509
3	681.0253	667404.794	12	8008857.53	5714.012975	148874.4008	105618.3411
4	681.0253	667404.794	16	10678476.7	7618.683966	143160.3878	102713.4266
5	681.0253	667404.794	20	13348095.9	9523.354958	135541.7039	93562.90517
6	648.58125	635609.625	24	15254631	10883.59471	126018.3489	77905.12233
7	648.58125	635609.625	28	17797069.5	12697.52717	115134.7542	73952.32096
8	648.58125	635609.625	32	20339508	14511.45962	102437.227	80824.70597
9	648.58125	635609.625	36	22881946.5	16325.39207	87925.76741	80963.22502
10	366.43788	359109.122	40	14364364.9	10248.42396	71600.37534	71959.38852
11	366.43788	359109.122	44	15800801.4	11273.26636	61351.95137	65270.62183
12	366.43788	359109.122	48	17237237.9	12298.10875	50078.68502	56195.5237
13	366.43788	359109.122	52	18673674.4	13322.95115	37780.57627	43745.87459
14	366.43788	359109.122	56	20110110.9	14347.79354	24457.62512	28544.55195
15	240.98829	236168.524	60	14170111.5	10109.83157	10109.83157	11593.05956
		7879381.44		216546563	**154497.6752**	**1421653.053**	**1108124.689**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	144527.3282	106711.1063
2	681.0253	667404.794	8	5339238.35	3872.697343	142683.2272	105566.0218
3	681.0253	667404.794	12	8008857.53	5809.046014	138810.5298	103632.9094
4	681.0253	667404.794	16	10678476.7	7745.394686	133001.4838	97079.89166
5	681.0253	667404.794	20	13348095.9	9681.743357	125256.0891	82166.72914
6	648.58125	635609.625	24	15254631	11064.60604	115574.3458	80300.33197
7	648.58125	635609.625	28	17797069.5	12908.70705	104509.7397	72991.96738
8	389.14875	381365.775	32	12203704.8	8851.684835	91601.03268	65120.25724
9	389.14875	381365.775	36	13729167.9	9958.14544	82749.34784	65934.366
10	366.43788	359109.122	40	14364364.9	10418.8714	72791.2024	63445.93947
11	366.43788	359109.122	44	15800801.4	11460.75854	62372.331	58156.81013
12	366.43788	359109.122	48	17237237.9	12502.64568	50911.57246	47996.6565
13	366.43788	359109.122	52	18673674.4	13544.53282	38408.92678	38517.35944
14	366.43788	359109.122	56	20110110.9	14586.41996	24864.39396	26132.95239
15	240.98829	236168.524	60	14170111.5	10277.974	10277.974	10933.81873
		7370893.74		199257981	**144527.3282**	**1338339.525**	**1024687.117**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	134556.9811	94720.9135
2	681.0253	667404.794	8	5339238.35	3861.762083	132718.0873	95274.99555
3	681.0253	667404.794	12	8008857.53	5792.643124	128856.3252	93425.78048
4	681.0253	667404.794	16	10678476.7	7723.524165	123063.6821	86572.7817
5	681.0253	667404.794	20	13348095.9	9654.405206	115340.1579	81684.36551
6	389.14875	381365.775	24	9152778.6	6620.017878	105685.7527	79398.72112
7	389.14875	381365.775	28	10678241.7	7723.354191	99065.73481	74092.48979
8	389.14875	381365.775	32	12203704.8	8826.690505	91342.38062	71194.31832
9	389.14875	381365.775	36	13729167.9	9930.026818	82515.69011	71782.66277
10	366.43788	359109.122	40	14364364.9	10389.45184	72585.6633	69857.11371
11	366.43788	359109.122	44	15800801.4	11428.39702	62196.21146	63151.26471
12	366.43788	359109.122	48	17237237.9	12467.3422	50767.81444	52312.79062
13	366.43788	359109.122	52	18673674.4	13506.28739	38300.47224	39825.05241
14	366.43788	359109.122	56	20110110.9	14545.23257	24794.18485	26816.63511
15	240.98829	236168.524	60	14170111.5	10248.95229	10248.95229	11302.31035
		6862406.04		186037301	**134556.9811**	**1272038.09**	**1011412.196**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	124087.8863	97905.21927
2	681.0253	667404.794	8	5339238.35	3755.29842	122299.6883	97710.46125
3	681.0253	667404.794	12	8008857.53	5632.947629	118544.3899	90977.20832
4	408.61518	400442.876	16	6407086.02	4506.358103	112911.4423	76845.19475
5	408.61518	400442.876	20	8008857.53	5632.947629	108405.0842	81395.13866
6	389.14875	381365.775	24	9152778.6	6437.512758	102772.1365	82109.68408
7	389.14875	381365.775	28	10678241.7	7510.431551	96334.62379	77772.08554
8	389.14875	381365.775	32	12203704.8	8583.350345	88824.19223	73880.00012
9	389.14875	381365.775	36	13729167.9	9656.269138	80240.84189	73351.65209
10	366.43788	359109.122	40	14364364.9	10103.02842	70584.57275	70433.33686
11	366.43788	359109.122	44	15800801.4	11113.33126	60481.54433	62801.54578
12	366.43788	359109.122	48	17237237.9	12123.6341	49368.21308	51234.26
13	366.43788	359109.122	52	18673674.4	13133.93694	37244.57898	39538.43091
14	366.43788	359109.122	56	20110110.9	14144.23978	24110.64204	27134.8188
15	240.98829	236168.524	60	14170111.5	9966.402253	9966.402253	11463.18342
		6328482.2		176426672	**124087.8863**	**1206176.239**	**1014552.22**

Tabel 18 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	181056.03	714401.3742
2	681.0253	667404.794	8	5339238.35	3410.473437	179432.0307	689722.0986
3	681.0253	667404.794	12	8008857.53	5115.710155	176021.5573	658737.7121
4	681.0253	667404.794	16	10678476.7	6820.946874	170905.8471	623520.448
5	681.0253	667404.794	20	13348095.9	8526.183592	164084.9003	584226.5219
6	648.58125	635609.625	24	15254631	9743.995376	155558.7167	541433.8087
7	648.58125	635609.625	28	17797069.5	11367.99461	145814.7213	496915.0778
8	648.58125	635609.625	32	20339508	12991.99383	134446.7267	448970.7781
9	648.58125	635609.625	36	22881946.5	14615.99306	121454.7329	397239.7257
10	610.7298	598515.204	40	23940608.2	15292.22013	106838.7398	342189.6393
11	610.7298	598515.204	44	26334669	16821.44214	91546.51967	286955.187
12	610.7298	598515.204	48	28728729.8	18350.66415	74725.07753	229017.0963
13	610.7298	598515.204	52	31122790.6	19879.88617	56374.41337	168378.3119
14	610.7298	598515.204	56	33516851.4	21409.10818	36494.52721	105777.6591
15	401.64715	393614.207	60	23616852.4	15085.41903	15085.41903	42166.3912
		9233857.53		283450763	**181056.03**	**1809839.96**	**6329651.83**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	173274.6228	612861.1232
2	681.0253	667404.794	8	5339238.35	3550.131088	171584.1214	589612.1008
3	681.0253	667404.794	12	8008857.53	5325.196632	168033.9903	560632.2568
4	681.0253	667404.794	16	10678476.7	7100.262176	162708.7937	528228.593
5	681.0253	667404.794	20	13348095.9	8875.32772	155608.5315	492316.9333
6	648.58125	635609.625	24	15254631	10143.00846	146733.2038	453099.7907
7	648.58125	635609.625	28	17797069.5	11833.50986	136590.1953	412844.6872
8	648.58125	635609.625	32	20339508	13524.01127	124756.6855	369145.0386
9	648.58125	635609.625	36	22881946.5	15214.51268	111232.6742	322311.1076
10	610.7298	598515.204	40	23940608.2	15918.431	96018.16152	272110.686
11	610.7298	598515.204	44	26334669	17510.2741	80099.73052	222105.5906
12	610.7298	598515.204	48	28728729.8	19102.1172	62589.45642	169298.3708
13	610.7298	598515.204	52	31122790.6	20693.9603	43487.33922	114267.0867
14	366.43788	359109.122	56	20110110.9	13371.48204	22793.37892	57631.69411
15	240.98829	236168.524	60	14170111.5	9421.896883	9421.896883	22977.003
		8837005.76		260597282	**173274.6228**	**1664932.782**	**5199442.062**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	F Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	163886.149	498985.6699
2	681.0253	667404.794	8	5339238.35	3697.454201	162125.4953	477468.9233
3	681.0253	667404.794	12	8008857.53	5546.181302	158428.0411	451378.194
4	681.0253	667404.794	16	10678476.7	7394.908403	152881.8598	422489.4725
5	681.0253	667404.794	20	13348095.9	9243.635503	145486.9514	390692.4867
6	648.58125	635609.625	24	15254631	10563.92237	136243.3159	355988.0245
7	648.58125	635609.625	28	17797069.5	12324.5761	125679.3935	320317.3382
8	648.58125	635609.625	32	20339508	14085.22983	113354.8174	281885.3723
9	648.58125	635609.625	36	22881946.5	15845.88356	99269.58758	240766.1433
10	610.7298	598515.204	40	23940608.2	16579.01303	83423.70402	196830.9591
11	610.7298	598515.204	44	26334669	18236.91434	66844.69099	153244.9964
12	366.43788	359109.122	48	17237237.9	11936.88938	48607.77666	107648.6411
13	366.43788	359109.122	52	18673674.4	12931.63017	36670.88727	79214.6767
14	366.43788	359109.122	56	20110110.9	13926.37095	23739.25711	49873.00536
15	240.98829	236168.524	60	14170111.5	9812.886159	9812.886159	19891.16034
		8358193.6		236656674	**163886.149**	**1526454.813**	**4046675.064**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	184398.3284	1186443.712
2	681.0253	667404.794	8	5339238.35	1939.854608	183474.6084	1166748.068
3	681.0253	667404.794	12	8008857.53	2909.781912	181534.7538	1140299.737
4	681.0253	667404.794	16	10678476.7	3879.709217	178624.9719	1108443.83
5	681.0253	667404.794	20	13348095.9	4849.636521	174745.2627	1071263.198
6	681.0253	667404.794	24	16017715.1	5819.563825	169895.6261	1028889.96
7	681.0253	667404.794	28	18687334.2	6789.491129	164076.0623	981268.2731
8	681.0253	667404.794	32	21356953.4	7759.418433	157286.5712	928570.8377
9	681.0253	667404.794	36	24026572.6	8729.345737	149527.1528	871059.2966
10	648.58125	635609.625	40	25424385	9237.199607	140797.807	809080.1893
11	648.58125	635609.625	44	27966823.5	10160.91957	131560.6074	745800.2003
12	648.58125	635609.625	48	30509262	11084.63953	121399.6879	678470.3365
13	648.58125	635609.625	52	33051700.5	12008.35949	110315.0483	607258.1824
14	648.58125	635609.625	56	35594139	12932.07945	98306.68883	532583.7776
15	610.7298	598515.204	60	35910912.2	13047.16965	85374.60938	454674.2591
16	610.7298	598515.204	64	38304973.1	13916.98096	72327.43973	378629.3059
17	610.7298	598515.204	68	40699033.9	14786.79227	58410.45877	300276.5336
18	610.7298	598515.204	72	43093094.7	15656.60358	43623.66649	220015.2228
19	610.7298	598515.204	76	45487155.5	16526.41489	27967.06291	138121.3089
20	401.64715	393614.207	80	31489136.6	11440.64802	11440.64802	54983.39265
		12539086.3		507536298	**184398.3284**	**2445087.062**	**14402879.62**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	178562.273	1175445.116
2	681.0253	667404.794	8	5339238.35	1999.779701	177610.0179	1155509.879
3	681.0253	667404.794	12	8008857.53	2999.669552	175610.2382	1128192.621
4	681.0253	667404.794	16	10678476.7	3999.559403	172610.5687	1094786.655
5	681.0253	667404.794	20	13348095.9	4999.449254	168611.0093	1055634.369
6	681.0253	667404.794	24	16017715.1	5999.339104	163611.56	1011023.844
7	681.0253	667404.794	28	18687334.2	6999.228955	157612.2209	961134.5168
8	681.0253	667404.794	32	21356953.4	7999.118806	150612.9919	906122.0059
9	681.0253	667404.794	36	24026572.6	8999.008656	142613.8731	845964.6924
10	648.58125	635609.625	40	25424385	9522.550913	133614.8645	780827.3378
11	648.58125	635609.625	44	27966823.5	10474.806	124092.3136	714388.4788
12	648.58125	635609.625	48	30509262	11427.0611	113617.5076	643883.6713
13	648.58125	635609.625	52	33051700.5	12379.31619	102190.4465	569588.7396
14	648.58125	635609.625	56	35594139	13331.57128	89811.13029	491842.7012
15	610.7298	598515.204	60	35910912.2	13450.2168	76479.55901	411064.5715
16	610.7298	598515.204	64	38304973.1	14346.89792	63029.34221	332431.3603
17	610.7298	598515.204	68	40699033.9	15243.57904	48682.4443	251500.6994
18	610.7298	598515.204	72	43093094.7	16140.26015	33438.86526	168672.7493
19	366.43788	359109.122	76	27292293.3	10222.16476	17298.60511	84527.1748
20	240.98829	236168.524	80	18893481.9	7076.440341	7076.440341	33606.39351
		12142234.6		476745781	**178562.273**	**2296786.272**	**13816147.58**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	141859.251	924166.46
2	681.0253	667404.794	8	5339238.35	2208.780128	140807.4741	901987.565
3	681.0253	667404.794	12	8008857.53	3313.170192	138598.694	871044.2824
4	681.0253	667404.794	16	10678476.7	4417.560255	135285.5238	832846.7097
5	681.0253	667404.794	20	13348095.9	5521.950319	130867.9635	787979.8388
6	681.0253	667404.794	24	16017715.1	6626.340383	125346.0132	736724.346
7	681.0253	667404.794	28	18687334.2	7730.730447	118719.6728	679365.9112
8	681.0253	667404.794	32	21356953.4	8835.120511	110988.9424	616560.9661
9	408.61518	400442.876	36	14415943.6	5963.706345	102153.8219	549133.5664
10	389.14875	381365.775	40	15254631	6310.661482	96190.11554	506405.4604
11	389.14875	381365.775	44	16780094.1	6941.72763	89879.45406	463774.5042
12	389.14875	381365.775	48	18305557.2	7572.793778	82937.72643	419255.2413
13	389.14875	381365.775	52	19831020.3	8203.859926	75364.93266	373084.9142
14	389.14875	381365.775	56	21356483.4	8834.926074	67161.07273	325413.4508
15	366.43788	359109.122	60	21546547.3	8913.553293	58326.14666	276432.1477
16	366.43788	359109.122	64	22982983.8	9507.790179	49412.59336	229212.4929
17	366.43788	359109.122	68	24419420.3	10102.02707	39904.80318	181040.3189
18	366.43788	359109.122	72	25855856.8	10696.26395	29802.77612	132133.6163
19	366.43788	359109.122	76	27292293.3	11290.50084	19106.51217	82674.80777
20	240.98829	236168.524	80	18893481.9	7816.011328	7816.011328	32855.83595
		9646429.07		342913423	**141859.251**	**1760529.501**	**9922092.436**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	134007.4299	849000.8513
2	681.0253	667404.794	8	5339238.35	2188.764161	132965.1842	826561.8261
3	681.0253	667404.794	12	8008857.53	3283.146241	130776.4201	795686.7728
4	681.0253	667404.794	16	10678476.7	4377.528322	127493.2738	757956.4303
5	681.0253	667404.794	20	13348095.9	5471.910402	123115.7455	713746.5675
6	681.0253	667404.794	24	16017715.1	6566.292482	117643.8351	663201.477
7	408.61518	400442.876	28	11212400.5	4596.404738	111077.5426	607061.7835
8	408.61518	400442.876	32	12814172	5253.033986	106481.1379	570531.303
9	408.61518	400442.876	36	14415943.6	5909.663234	101228.1039	531663.1909
10	389.14875	381365.775	40	15254631	6253.474263	95318.44066	490441.2056
11	389.14875	381365.775	44	16780094.1	6878.821689	89064.96639	449093.2398
12	389.14875	381365.775	48	18305557.2	7504.169116	82186.1447	405864.6399
13	389.14875	381365.775	52	19831020.3	8129.516542	74681.97559	360974.9092
14	389.14875	381365.775	56	21356483.4	8754.863968	66552.45905	314663.0879
15	366.43788	359109.122	60	21546547.3	8832.778667	57797.59508	267095.0938
16	366.43788	359109.122	64	22982983.8	9421.630579	48964.81641	221311.1201
17	366.43788	359109.122	68	24419420.3	10010.48249	39543.18583	174696.69
18	366.43788	359109.122	72	25855856.8	10599.3344	29532.70334	127456.9496
19	366.43788	359109.122	76	27292293.3	11188.18631	18933.36894	79725.19216
20	240.98829	236168.524	80	18893481.9	7745.182629	7745.182629	31679.66801
		9112505.24		326895708	**134007.4299**	**1695109.512**	**9238411.998**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	126155.6088	784914.104
2	681.0253	667404.794	8	5339238.35	2137.319318	125137.8601	762379.9562
3	681.0253	667404.794	12	8008857.53	3205.978977	123000.5408	731691.3951
4	681.0253	667404.794	16	10678476.7	4274.638635	119794.5618	694543.8076
5	408.61518	400442.876	20	8008857.53	3205.978977	115519.9232	651166.0463
6	408.61518	400442.876	24	9610629.03	3847.174772	112313.9442	621703.0507
7	408.61518	400442.876	28	11212400.5	4488.370567	108466.7694	589143.1136
8	408.61518	400442.876	32	12814172	5129.566363	103978.3989	553966.6335
9	408.61518	400442.876	36	14415943.6	5770.762158	98848.83251	516374.8855
10	389.14875	381365.775	40	15254631	6106.492232	93078.07036	476383.6428
11	389.14875	381365.775	44	16780094.1	6717.141455	86971.57812	436189.8807
12	389.14875	381365.775	48	18305557.2	7327.790678	80254.43667	394155.1839
13	389.14875	381365.775	52	19831020.3	7938.439902	72926.64599	350521.7109
14	389.14875	381365.775	56	21356483.4	8549.089125	64988.20609	305516.0232
15	366.43788	359109.122	60	21546547.3	8625.172512	56439.11696	259346.7006
16	366.43788	359109.122	64	22982983.8	9200.184013	47813.94445	214914.923
17	366.43788	359109.122	68	24419420.3	9775.195514	38613.76044	169664.795
18	366.43788	359109.122	72	25855856.8	10350.20701	28838.56492	123798.0273
19	366.43788	359109.122	76	27292293.3	10925.21852	18488.35791	77442.16575
20	240.98829	236168.524	80	18893481.9	7563.139395	7563.139395	30783.44474
		8578581.4		315149383	**126155.6088**	**1629192.261**	**8744599.49**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	118303.7877	783146.5673
2	681.0253	667404.794	8	5339238.35	2052.988545	117326.1956	763375.3717
3	408.61518	400442.876	12	4805314.52	1847.68969	115273.2071	734738.9426
4	408.61518	400442.876	16	6407086.02	2463.586254	113425.5174	713158.0379
5	408.61518	400442.876	20	8008857.53	3079.482817	110961.9312	687454.0488
6	408.61518	400442.876	24	9610629.03	3695.37938	107882.4483	658070.2102
7	408.61518	400442.876	28	11212400.5	4311.275944	104187.069	625131.938
8	408.61518	400442.876	32	12814172	4927.172507	99875.79301	588987.6802
9	408.61518	400442.876	36	14415943.6	5543.069071	94948.62051	550011.7036
10	389.14875	381365.775	40	15254631	5865.552469	89405.55144	508556.6271
11	389.14875	381365.775	44	16780094.1	6452.107715	83539.99897	466861.9567
12	389.14875	381365.775	48	18305557.2	7038.662962	77087.89125	422896.1453
13	389.14875	381365.775	52	19831020.3	7625.218209	70049.22829	376872.683
14	389.14875	381365.775	56	21356483.4	8211.773456	62424.01008	329146.8129
15	366.43788	359109.122	60	21546547.3	8284.854872	54212.23662	279789.304
16	366.43788	359109.122	64	22982983.8	8837.17853	45927.38175	232084.9768
17	366.43788	359109.122	68	24419420.3	9389.502188	37090.20322	183374.8772
18	366.43788	359109.122	72	25855856.8	9941.825846	27700.70103	133880.193
19	366.43788	359109.122	76	27292293.3	10494.1495	17758.87519	83792.21098
20	240.98829	236168.524	80	18893481.9	7264.725683	7264.725683	33305.35549
		8044657.57		307674450	**118303.7877**	**1554645.373**	**9154635.643**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	184398.3284	166540.6034
2	681.0253	667404.794	8	5339238.35	1939.854608	183474.6084	169015.9365
3	681.0253	667404.794	12	8008857.53	2909.781912	181534.7538	166240.2246
4	681.0253	667404.794	16	10678476.7	3879.709217	178624.9719	158187.0685
5	681.0253	667404.794	20	13348095.9	4849.636521	174745.2627	148718.2801
6	681.0253	667404.794	24	16017715.1	5819.563825	169895.6261	145379.2297
7	681.0253	667404.794	28	18687334.2	6789.491129	164076.0623	138413.4027
8	681.0253	667404.794	32	21356953.4	7759.418433	157286.5712	131239.8801
9	681.0253	667404.794	36	24026572.6	8729.345737	149527.1528	135893.9553
10	648.58125	635609.625	40	25424385	9237.199607	140797.807	141212.3822
11	648.58125	635609.625	44	27966823.5	10160.91957	131560.6074	141169.0431
12	648.58125	635609.625	48	30509262	11084.63953	121399.6879	134721.7349
13	648.58125	635609.625	52	33051700.5	12008.35949	110315.0483	124872.2973
14	648.58125	635609.625	56	35594139	12932.07945	98306.68883	113508.3272
15	610.7298	598515.204	60	35910912.2	13047.16965	85374.60938	100137.9382
16	610.7298	598515.204	64	38304973.1	13916.98096	72327.43973	84114.02066
17	610.7298	598515.204	68	40699033.9	14786.79227	58410.45877	68358.57209
18	610.7298	598515.204	72	43093094.7	15656.60358	43623.66649	54039.73361
19	610.7298	598515.204	76	45487155.5	16526.41489	27967.06291	36054.84247
20	401.64715	393614.207	80	31489136.6	11440.64802	11440.64802	15116.4886
		12539086.3		507536298	**184398.3284**	**2445087.062**	**2372933.961**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	178562.273	177071.9416
2	681.0253	667404.794	8	5339238.35	1999.779701	177610.0179	175217.0377
3	681.0253	667404.794	12	8008857.53	2999.669552	175610.2382	168367.39
4	681.0253	667404.794	16	10678476.7	3999.559403	172610.5687	167162.6544
5	681.0253	667404.794	20	13348095.9	4999.449254	168611.0093	164663.4963
6	681.0253	667404.794	24	16017715.1	5999.339104	163611.56	157070.1272
7	681.0253	667404.794	28	18687334.2	6999.228955	157612.2209	146326.3256
8	681.0253	667404.794	32	21356953.4	7999.118806	150612.9919	140671.7403
9	681.0253	667404.794	36	24026572.6	8999.008656	142613.8731	144690.2821
10	648.58125	635609.625	40	25424385	9522.550913	133614.8645	144791.5322
11	648.58125	635609.625	44	27966823.5	10474.806	124092.3136	139851.0361
12	648.58125	635609.625	48	30509262	11427.0611	113617.5076	129350.8453
13	648.58125	635609.625	52	33051700.5	12379.31619	102190.4465	119161.0195
14	648.58125	635609.625	56	35594139	13331.57128	89811.13029	106741.1372
15	610.7298	598515.204	60	35910912.2	13450.2168	76479.55901	90376.64092
16	610.7298	598515.204	64	38304973.1	14346.89792	63029.34221	71818.29095
17	610.7298	598515.204	68	40699033.9	15243.57904	48682.4443	57494.42712
18	610.7298	598515.204	72	43093094.7	16140.26015	33438.86526	41722.00031
19	366.43788	359109.122	76	27292293.3	10222.16476	17298.60511	21934.98805
20	240.98829	236168.524	80	18893481.9	7076.440341	7076.440341	8980.28225
		12142234.6		476745781	**178562.273**	**2296786.272**	**2373463.195**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	157001.802	186575.0261
2	681.0253	667404.794	8	5339238.35	2171.210207	155967.9152	189411.5941
3	681.0253	667404.794	12	8008857.53	3256.815311	153796.705	184134.0637
4	681.0253	667404.794	16	10678476.7	4342.420415	150539.8896	185052.1958
5	681.0253	667404.794	20	13348095.9	5428.025518	146197.4692	174650.7792
6	681.0253	667404.794	24	16017715.1	6513.630622	140769.4437	156761.789
7	681.0253	667404.794	28	18687334.2	7599.235725	134255.8131	138872.9357
8	681.0253	667404.794	32	21356953.4	8684.840829	126656.5774	122076.9796
9	681.0253	667404.794	36	24026572.6	9770.445933	117971.7365	122919.9934
10	648.58125	635609.625	40	25424385	10338.86869	108201.2906	121176.0014
11	648.58125	635609.625	44	27966823.5	11372.75556	97862.42191	121446.6797
12	648.58125	635609.625	48	30509262	12406.64243	86489.66635	115064.59
13	389.14875	381365.775	52	19831020.3	8064.317578	74083.02393	100900.9897
14	389.14875	381365.775	56	21356483.4	8684.6497	66018.70635	91531.51536
15	366.43788	359109.122	60	21546547.3	8761.93952	57334.05665	80210.157
16	366.43788	359109.122	64	22982983.8	9346.068822	48572.11713	68574.42699
17	366.43788	359109.122	68	24419420.3	9930.198123	39226.04831	55589.28448
18	366.43788	359109.122	72	25855856.8	10514.32742	29295.85018	42068.60998
19	366.43788	359109.122	76	27292293.3	11098.45673	18781.52276	26958.01901
20	240.98829	236168.524	80	18893481.9	7683.066034	7683.066034	10911.43382
		10676122.5		386084240	**157001.802**	**1916705.122**	**2294887.064**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	149524.0417	193747.1107
2	681.0253	667404.794	8	5339238.35	2201.152833	148475.8968	191244.5141
3	681.0253	667404.794	12	8008857.53	3301.72925	146274.744	186674.5322
4	681.0253	667404.794	16	10678476.7	4402.305666	142973.0147	179610.4003
5	681.0253	667404.794	20	13348095.9	5502.882083	138570.709	160840.5614
6	681.0253	667404.794	24	16017715.1	6603.458499	133067.827	144159.1047
7	681.0253	667404.794	28	18687334.2	7704.034916	126464.3685	125827.6042
8	681.0253	667404.794	32	21356953.4	8804.611333	118760.3335	113339.0731
9	681.0253	667404.794	36	24026572.6	9905.187749	109955.7222	110333.7838
10	648.58125	635609.625	40	25424385	10481.44948	100050.5345	107965.8771
11	389.14875	381365.775	44	16780094.1	6917.75666	89569.08498	104224.3847
12	389.14875	381365.775	48	18305557.2	7546.643629	82651.32832	97666.32654
13	389.14875	381365.775	52	19831020.3	8175.530598	75104.68469	90222.52736
14	389.14875	381365.775	56	21356483.4	8804.417567	66929.15409	85144.72555
15	366.43788	359109.122	60	21546547.3	8882.773273	58124.73652	77856.23908
16	366.43788	359109.122	64	22982983.8	9474.958158	49241.96325	68206.57001
17	366.43788	359109.122	68	24419420.3	10067.14304	39767.00509	55497.84605
18	366.43788	359109.122	72	25855856.8	10659.32793	29699.86205	41120.69948
19	366.43788	359109.122	76	27292293.3	11251.51281	19040.53412	25736.71777
20	240.98829	236168.524	80	18893481.9	7789.021308	7789.021308	10446.25211
		10167634.8		362693806	**149524.0417**	**1832034.566**	**2169864.85**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	141859.251	183289.678
2	681.0253	667404.794	8	5339238.35	2208.780128	140807.4741	182974.0563
3	681.0253	667404.794	12	8008857.53	3313.170192	138598.694	179925.8464
4	681.0253	667404.794	16	10678476.7	4417.560255	135285.5238	166524.6538
5	681.0253	667404.794	20	13348095.9	5521.950319	130867.9635	147105.5161
6	681.0253	667404.794	24	16017715.1	6626.340383	125346.0132	129927.5255
7	681.0253	667404.794	28	18687334.2	7730.730447	118719.6728	117617.3409
8	681.0253	667404.794	32	21356953.4	8835.120511	110988.9424	106198.5573
9	408.61518	400442.876	36	14415943.6	5963.706345	102153.8219	101691.6729
10	389.14875	381365.775	40	15254631	6310.661482	96190.11554	102732.1405
11	389.14875	381365.775	44	16780094.1	6941.72763	89879.45406	101616.8748
12	389.14875	381365.775	48	18305557.2	7572.793778	82937.72643	99262.83857
13	389.14875	381365.775	52	19831020.3	8203.859926	75364.93266	95778.38313
14	389.14875	381365.775	56	21356483.4	8834.926074	67161.07273	90795.4781
15	366.43788	359109.122	60	21546547.3	8913.553293	58326.14666	83276.9294
16	366.43788	359109.122	64	22982983.8	9507.790179	49412.59336	72988.72293
17	366.43788	359109.122	68	24419420.3	10102.02707	39904.80318	59525.38966
18	366.43788	359109.122	72	25855856.8	10696.26395	29802.77612	44793.39735
19	366.43788	359109.122	76	27292293.3	11290.50084	19106.51217	29220.37631
20	240.98829	236168.524	80	18893481.9	7816.011328	7816.011328	12088.46429
		9646429.07		342913423	**141859.251**	**1760529.501**	**2107333.842**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	134007.4299	173571.9474
2	681.0253	667404.794	8	5339238.35	2188.764161	132965.1842	172376.6496
3	681.0253	667404.794	12	8008857.53	3283.146241	130776.4201	162268.8969
4	681.0253	667404.794	16	10678476.7	4377.528322	127493.2738	148628.1337
5	681.0253	667404.794	20	13348095.9	5471.910402	123115.7455	134817.3202
6	681.0253	667404.794	24	16017715.1	6566.292482	117643.8351	117881.5557
7	408.61518	400442.876	28	11212400.5	4596.404738	111077.5426	101503.8819
8	408.61518	400442.876	32	12814172	5253.033986	106481.1379	92234.1907
9	408.61518	400442.876	36	14415943.6	5909.663234	101228.1039	95328.63055
10	389.14875	381365.775	40	15254631	6253.474263	95318.44066	100791.7238
11	389.14875	381365.775	44	16780094.1	6878.821689	89064.96639	101961.2517
12	389.14875	381365.775	48	18305557.2	7504.169116	82186.1447	97944.34916
13	389.14875	381365.775	52	19831020.3	8129.516542	74681.97559	92420.56511
14	389.14875	381365.775	56	21356483.4	8754.863968	66552.45905	86679.34702
15	366.43788	359109.122	60	21546547.3	8832.778667	57797.59508	78708.79238
16	366.43788	359109.122	64	22982983.8	9421.630579	48964.81641	69186.74943
17	366.43788	359109.122	68	24419420.3	10010.48249	39543.18583	57892.44687
18	366.43788	359109.122	72	25855856.8	10599.3344	29532.70334	45179.30884
19	366.43788	359109.122	76	27292293.3	11188.18631	18933.36894	30115.66212
20	240.98829	236168.524	80	18893481.9	7745.182629	7745.182629	12465.19457
		9112505.24		326895708	**134007.4299**	**1695109.512**	**1971956.598**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	126155.6088	154950.4541
2	681.0253	667404.794	8	5339238.35	2137.319318	125137.8601	152074.002
3	681.0253	667404.794	12	8008857.53	3205.978977	123000.5408	146360.6397
4	681.0253	667404.794	16	10678476.7	4274.638635	119794.5618	136848.3046
5	408.61518	400442.876	20	8008857.53	3205.978977	115519.9232	123569.7412
6	408.61518	400442.876	24	9610629.03	3847.174772	112313.9442	114488.4765
7	408.61518	400442.876	28	11212400.5	4488.370567	108466.7694	104023.7495
8	408.61518	400442.876	32	12814172	5129.566363	103978.3989	91120.26682
9	408.61518	400442.876	36	14415943.6	5770.762158	98848.83251	87108.74991
10	389.14875	381365.775	40	15254631	6106.492232	93078.07036	91442.57443
11	389.14875	381365.775	44	16780094.1	6717.141455	86971.57812	92897.79723
12	389.14875	381365.775	48	18305557.2	7327.790678	80254.43667	90531.79435
13	389.14875	381365.775	52	19831020.3	7938.439902	72926.64599	89300.40212
14	389.14875	381365.775	56	21356483.4	8549.089125	64988.20609	86913.39483
15	366.43788	359109.122	60	21546547.3	8625.172512	56439.11696	79843.88311
16	366.43788	359109.122	64	22982983.8	9200.184013	47813.94445	69612.58468
17	366.43788	359109.122	68	24419420.3	9775.195514	38613.76044	57677.2838
18	366.43788	359109.122	72	25855856.8	10350.20701	28838.56492	43881.47686
19	366.43788	359109.122	76	27292293.3	10925.21852	18488.35791	28738.62964
20	240.98829	236168.524	80	18893481.9	7563.139395	7563.139395	11928.04362
		8578581.4		315149383	**126155.6088**	**1629192.261**	**1853312.249**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	118303.7877	136341.5622
2	681.0253	667404.794	8	5339238.35	2052.988545	117326.1956	137670.396
3	408.61518	400442.876	12	4805314.52	1847.68969	115273.2071	137013.2277
4	408.61518	400442.876	16	6407086.02	2463.586254	113425.5174	131982.8184
5	408.61518	400442.876	20	8008857.53	3079.482817	110961.9312	121857.7412
6	408.61518	400442.876	24	9610629.03	3695.37938	107882.4483	109665.2682
7	408.61518	400442.876	28	11212400.5	4311.275944	104187.069	98626.42757
8	408.61518	400442.876	32	12814172	4927.172507	99875.79301	99338.21549
9	408.61518	400442.876	36	14415943.6	5543.069071	94948.62051	103668.8619
10	389.14875	381365.775	40	15254631	5865.552469	89405.55144	106019.8827
11	389.14875	381365.775	44	16780094.1	6452.107715	83539.99897	109214.6718
12	389.14875	381365.775	48	18305557.2	7038.662962	77087.89125	107935.9361
13	389.14875	381365.775	52	19831020.3	7625.218209	70049.22829	100622.5893
14	389.14875	381365.775	56	21356483.4	8211.773456	62424.01008	90713.98319
15	366.43788	359109.122	60	21546547.3	8284.854872	54212.23662	79693.36698
16	366.43788	359109.122	64	22982983.8	8837.17853	45927.38175	66717.17635
17	366.43788	359109.122	68	24419420.3	9389.502188	37090.20322	53500.96831
18	366.43788	359109.122	72	25855856.8	9941.825846	27700.70103	40263.71411
19	366.43788	359109.122	76	27292293.3	10494.1495	17758.87519	26060.14326
20	240.98829	236168.524	80	18893481.9	7264.725683	7264.725683	10722.86965
		8044657.57		307674450	**118303.7877**	**1554645.373**	**1867629.821**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	983.8739198	171520.9177	183203.6124
2	681.0253	667404.794	8	5339238.35	2066.180703	170537.0437	185205.4576
3	681.0253	667404.794	12	8008857.53	3099.271054	168470.863	186776.5916
4	681.0253	667404.794	16	10678476.7	4132.361405	165371.592	184675.3964
5	681.0253	667404.794	20	13348095.9	5165.451756	161239.2306	176040.8271
6	681.0253	667404.794	24	16017715.1	6198.542108	156073.7788	160477.3383
7	681.0253	667404.794	28	18687334.2	7231.632459	149875.2367	153471.6764
8	681.0253	667404.794	32	21356953.4	8264.72281	142643.6043	157219.5289
9	681.0253	667404.794	36	24026572.6	9297.813161	134378.8815	156925.4065
10	648.58125	635609.625	40	25424385	9838.739198	125081.0683	162907.8059
11	648.58125	635609.625	44	27966823.5	10822.61312	115242.3291	161264.9945
12	648.58125	635609.625	48	30509262	11806.48704	104419.716	162980.409
13	648.58125	635609.625	52	33051700.5	12790.36096	92613.22894	161918.2443
14	648.58125	635609.625	56	35594139	13774.23488	79822.86798	154338.3374
15	610.7298	598515.204	60	35910912.2	13896.81992	66048.63311	138758.9087
16	610.7298	598515.204	64	38304973.1	14823.27458	52151.81319	117290.0578
17	366.43788	359109.122	68	24419420.3	9449.837545	37328.53861	89141.371
18	366.43788	359109.122	72	25855856.8	10005.71034	27878.70106	68489.25254
19	366.43788	359109.122	76	27292293.3	10561.58314	17872.99072	44523.84104
20	240.98829	236168.524	80	18893481.9	7311.407584	7311.407584	18075.91812
		11663422.4		443228930	**171520.9177**	**2145882.443**	**2823684.975**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1011.211895	164479.5623	179073.4299
2	681.0253	667404.794	8	5339238.35	2123.591714	163468.3504	180007.0272
3	681.0253	667404.794	12	8008857.53	3185.387571	161344.7587	171010.6693
4	681.0253	667404.794	16	10678476.7	4247.183428	158159.3711	166095.0687
5	681.0253	667404.794	20	13348095.9	5308.979285	153912.1877	156164.3363
6	681.0253	667404.794	24	16017715.1	6370.775142	148603.2084	146257.3311
7	681.0253	667404.794	28	18687334.2	7432.570999	142232.4333	151968.6289
8	681.0253	667404.794	32	21356953.4	8494.366855	134799.8623	155834.8171
9	681.0253	667404.794	36	24026572.6	9556.162712	126305.4954	162005.9557
10	648.58125	635609.625	40	25424385	10112.11895	116749.3327	168353.1999
11	648.58125	635609.625	44	27966823.5	11123.33084	106637.2138	166088.6377
12	648.58125	635609.625	48	30509262	12134.54274	95513.88293	156004.0365
13	648.58125	635609.625	52	33051700.5	13145.75463	83379.34019	148688.2132
14	648.58125	635609.625	56	35594139	14156.96653	70233.58556	139417.1097
15	366.43788	359109.122	60	21546547.3	8569.774636	56076.61903	122122.1924
16	366.43788	359109.122	64	22982983.8	9141.092945	47506.84439	108506.8572
17	366.43788	359109.122	68	24419420.3	9712.411254	38365.75145	91024.52621
18	366.43788	359109.122	72	25855856.8	10283.72956	28653.34019	69731.14769
19	366.43788	359109.122	76	27292293.3	10855.04787	18369.61063	45163.09521
20	240.98829	236168.524	80	18893481.9	7514.56276	7514.56276	18302.08473
		11184610.2		413542576	**164479.5623**	**2022305.313**	**2701818.365**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	157001.802	177606.8958
2	681.0253	667404.794	8	5339238.35	2171.210207	155967.9152	175078.6583
3	681.0253	667404.794	12	8008857.53	3256.815311	153796.705	165014.0499
4	681.0253	667404.794	16	10678476.7	4342.420415	150539.8896	149200.1558
5	681.0253	667404.794	20	13348095.9	5428.025518	146197.4692	140526.1976
6	681.0253	667404.794	24	16017715.1	6513.630622	140769.4437	142590.6331
7	681.0253	667404.794	28	18687334.2	7599.235725	134255.8131	142928.9868
8	681.0253	667404.794	32	21356953.4	8684.840829	126656.5774	144854.7385
9	681.0253	667404.794	36	24026572.6	9770.445933	117971.7365	154424.5097
10	648.58125	635609.625	40	25424385	10338.86869	108201.2906	157124.5045
11	648.58125	635609.625	44	27966823.5	11372.75556	97862.42191	152580.2461
12	648.58125	635609.625	48	30509262	12406.64243	86489.66635	141743.2158
13	389.14875	381365.775	52	19831020.3	8064.317578	74083.02393	139404.2276
14	389.14875	381365.775	56	21356483.4	8684.6497	66018.70635	133413.4272
15	366.43788	359109.122	60	21546547.3	8761.93952	57334.05665	122603.0658
16	366.43788	359109.122	64	22982983.8	9346.068822	48572.11713	108146.5922
17	366.43788	359109.122	68	24419420.3	9930.198123	39226.04831	89897.74727
18	366.43788	359109.122	72	25855856.8	10514.32742	29295.85018	68676.45807
19	366.43788	359109.122	76	27292293.3	11098.45673	18781.52276	44429.07564
20	240.98829	236168.524	80	18893481.9	7683.066034	7683.066034	17993.1431
		10676122.5		386084240	**157001.802**	**1916705.122**	**2568236.529**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	149524.0417	192174.1066
2	681.0253	667404.794	8	5339238.35	2201.152833	148475.8968	186928.5869
3	681.0253	667404.794	12	8008857.53	3301.72925	146274.744	174610.497
4	681.0253	667404.794	16	10678476.7	4402.305666	142973.0147	156255.2118
5	681.0253	667404.794	20	13348095.9	5502.882083	138570.709	143745.1527
6	681.0253	667404.794	24	16017715.1	6603.458499	133067.827	142347.5604
7	681.0253	667404.794	28	18687334.2	7704.034916	126464.3685	139366.516
8	681.0253	667404.794	32	21356953.4	8804.611333	118760.3335	138912.3213
9	681.0253	667404.794	36	24026572.6	9905.187749	109955.7222	140296.5414
10	648.58125	635609.625	40	25424385	10481.44948	100050.5345	142752.3767
11	389.14875	381365.775	44	16780094.1	6917.75666	89569.08498	139272.6772
12	389.14875	381365.775	48	18305557.2	7546.643629	82651.32832	136715.7629
13	389.14875	381365.775	52	19831020.3	8175.530598	75104.68469	136461.9043
14	389.14875	381365.775	56	21356483.4	8804.417567	66929.15409	131898.5376
15	366.43788	359109.122	60	21546547.3	8882.773273	58124.73652	122556.1763
16	366.43788	359109.122	64	22982983.8	9474.958158	49241.96325	109270.0075
17	366.43788	359109.122	68	24419420.3	10067.14304	39767.00509	91765.35439
18	366.43788	359109.122	72	25855856.8	10659.32793	29699.86205	70742.16876
19	366.43788	359109.122	76	27292293.3	11251.51281	19040.53412	46040.88528
20	240.98829	236168.524	80	18893481.9	7789.021308	7789.021308	18712.63366
		10167634.8		362693806	**149524.0417**	**1832034.566**	**2560824.979**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	141859.251	193915.8485
2	681.0253	667404.794	8	5339238.35	2208.780128	140807.4741	188993.9557
3	681.0253	667404.794	12	8008857.53	3313.170192	138598.694	177284.3399
4	681.0253	667404.794	16	10678476.7	4417.560255	135285.5238	159562.5204
5	681.0253	667404.794	20	13348095.9	5521.950319	130867.9635	137953.6773
6	681.0253	667404.794	24	16017715.1	6626.340383	125346.0132	131738.696
7	681.0253	667404.794	28	18687334.2	7730.730447	118719.6728	133217.415
8	681.0253	667404.794	32	21356953.4	8835.120511	110988.9424	131150.5152
9	408.61518	400442.876	36	14415943.6	5963.706345	102153.8219	133098.0954
10	389.14875	381365.775	40	15254631	6310.661482	96190.11554	137133.7478
11	389.14875	381365.775	44	16780094.1	6941.72763	89879.45406	137782.4261
12	389.14875	381365.775	48	18305557.2	7572.793778	82937.72643	134882.9752
13	389.14875	381365.775	52	19831020.3	8203.859926	75364.93266	130768.6139
14	389.14875	381365.775	56	21356483.4	8834.926074	67161.07273	127168.6071
15	366.43788	359109.122	60	21546547.3	8913.553293	58326.14666	118726.8502
16	366.43788	359109.122	64	22982983.8	9507.790179	49412.59336	106621.9838
17	366.43788	359109.122	68	24419420.3	10102.02707	39904.80318	90127.73704
18	366.43788	359109.122	72	25855856.8	10696.26395	29802.77612	69478.29535
19	366.43788	359109.122	76	27292293.3	11290.50084	19106.51217	45213.02972
20	240.98829	236168.524	80	18893481.9	7816.011328	7816.011328	18371.77081
		9646429.07		342913423	**141859.251**	**1760529.501**	**2503191.1**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	134007.4299	195424.6643
2	681.0253	667404.794	8	5339238.35	2188.764161	132965.1842	189120.0388
3	681.0253	667404.794	12	8008857.53	3283.146241	130776.4201	174818.908
4	681.0253	667404.794	16	10678476.7	4377.528322	127493.2738	153886.5288
5	681.0253	667404.794	20	13348095.9	5471.910402	123115.7455	127659.9362
6	681.0253	667404.794	24	16017715.1	6566.292482	117643.8351	124894.6469
7	408.61518	400442.876	28	11212400.5	4596.404738	111077.5426	127317.4767
8	408.61518	400442.876	32	12814172	5253.033986	106481.1379	126427.9131
9	408.61518	400442.876	36	14415943.6	5909.663234	101228.1039	128233.2816
10	389.14875	381365.775	40	15254631	6253.474263	95318.44066	134693.6215
11	389.14875	381365.775	44	16780094.1	6878.821689	89064.96639	137423.7209
12	389.14875	381365.775	48	18305557.2	7504.169116	82186.1447	136859.8956
13	389.14875	381365.775	52	19831020.3	8129.516542	74681.97559	132975.3097
14	389.14875	381365.775	56	21356483.4	8754.863968	66552.45905	125521.9762
15	366.43788	359109.122	60	21546547.3	8832.778667	57797.59508	114295.3022
16	366.43788	359109.122	64	22982983.8	9421.630579	48964.81641	102226.4901
17	366.43788	359109.122	68	24419420.3	10010.48249	39543.18583	87390.94354
18	366.43788	359109.122	72	25855856.8	10599.3344	29532.70334	68062.13207
19	366.43788	359109.122	76	27292293.3	11188.18631	18933.36894	44658.84614
20	240.98829	236168.524	80	18893481.9	7745.182629	7745.182629	18241.04721
		9112505.24		326895708	**134007.4299**	**1695109.512**	**2450132.68**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	184398.3284	84710.43687
2	681.0253	667404.794	8	5339238.35	1939.854608	183474.6084	83209.46561
3	681.0253	667404.794	12	8008857.53	2909.781912	181534.7538	81724.65373
4	681.0253	667404.794	16	10678476.7	3879.709217	178624.9719	77506.24196
5	681.0253	667404.794	20	13348095.9	4849.636521	174745.2627	72516.70553
6	681.0253	667404.794	24	16017715.1	5819.563825	169895.6261	68503.45383
7	681.0253	667404.794	28	18687334.2	6789.491129	164076.0623	67101.34497
8	681.0253	667404.794	32	21356953.4	7759.418433	157286.5712	60773.34885
9	681.0253	667404.794	36	24026572.6	8729.345737	149527.1528	50746.10263
10	648.58125	635609.625	40	25424385	9237.199607	140797.807	47592.76703
11	648.58125	635609.625	44	27966823.5	10160.91957	131560.6074	50094.48912
12	648.58125	635609.625	48	30509262	11084.63953	121399.6879	49250.60337
13	648.58125	635609.625	52	33051700.5	12008.35949	110315.0483	44438.41062
14	648.58125	635609.625	56	35594139	12932.07945	98306.68883	39727.80735
15	610.7298	598515.204	60	35910912.2	13047.16965	85374.60938	40481.71498
16	610.7298	598515.204	64	38304973.1	13916.98096	72327.43973	41946.97754
17	610.7298	598515.204	68	40699033.9	14786.79227	58410.45877	40873.07593
18	610.7298	598515.204	72	43093094.7	15656.60358	43623.66649	37015.30757
19	610.7298	598515.204	76	45487155.5	16526.41489	27967.06291	28972.49197
20	401.64715	393614.207	80	31489136.6	11440.64802	11440.64802	15958.93942
		12539086.3		507536298	**184398.3284**	**2445087.062**	**1083144.339**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	178562.273	83543.18052
2	681.0253	667404.794	8	5339238.35	1999.779701	177610.0179	82179.69833
3	681.0253	667404.794	12	8008857.53	2999.669552	175610.2382	78511.68666
4	681.0253	667404.794	16	10678476.7	3999.559403	172610.5687	75087.55523
5	681.0253	667404.794	20	13348095.9	4999.449254	168611.0093	70911.38876
6	681.0253	667404.794	24	16017715.1	5999.339104	163611.56	67637.13286
7	681.0253	667404.794	28	18687334.2	6999.228955	157612.2209	61829.84879
8	681.0253	667404.794	32	21356953.4	7999.118806	150612.9919	56446.91628
9	681.0253	667404.794	36	24026572.6	8999.008656	142613.8731	59240.1614
10	648.58125	635609.625	40	25424385	9522.550913	133614.8645	59797.55597
11	648.58125	635609.625	44	27966823.5	10474.806	124092.3136	57419.27594
12	648.58125	635609.625	48	30509262	11427.0611	113617.5076	51687.14389
13	648.58125	635609.625	52	33051700.5	12379.31619	102190.4465	44770.3837
14	648.58125	635609.625	56	35594139	13331.57128	89811.13029	43305.37148
15	610.7298	598515.204	60	35910912.2	13450.2168	76479.55901	44044.28184
16	610.7298	598515.204	64	38304973.1	14346.89792	63029.34221	42134.52259
17	610.7298	598515.204	68	40699033.9	15243.57904	48682.4443	36592.44293
18	610.7298	598515.204	72	43093094.7	16140.26015	33438.86526	28194.91915
19	366.43788	359109.122	76	27292293.3	10222.16476	17298.60511	15904.01341
20	240.98829	236168.524	80	18893481.9	7076.440341	7076.440341	8430.492145
		12142234.6		476745781	**178562.273**	**2296786.272**	**1067667.972**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	983.8739198	171520.9177	81797.96004
2	681.0253	667404.794	8	5339238.35	2066.180703	170537.0437	78365.63222
3	681.0253	667404.794	12	8008857.53	3099.271054	168470.863	73983.93888
4	681.0253	667404.794	16	10678476.7	4132.361405	165371.592	71975.87052
5	681.0253	667404.794	20	13348095.9	5165.451756	161239.2306	67781.84477
6	681.0253	667404.794	24	16017715.1	6198.542108	156073.7788	65382.51332
7	681.0253	667404.794	28	18687334.2	7231.632459	149875.2367	63108.73841
8	681.0253	667404.794	32	21356953.4	8264.72281	142643.6043	64498.0248
9	681.0253	667404.794	36	24026572.6	9297.813161	134378.8815	63450.40203
10	648.58125	635609.625	40	25424385	9838.739198	125081.0683	60150.32103
11	648.58125	635609.625	44	27966823.5	10822.61312	115242.3291	54783.20934
12	648.58125	635609.625	48	30509262	11806.48704	104419.716	47232.41554
13	648.58125	635609.625	52	33051700.5	12790.36096	92613.22894	40530.19644
14	648.58125	635609.625	56	35594139	13774.23488	79822.86798	39986.37062
15	610.7298	598515.204	60	35910912.2	13896.81992	66048.63311	39770.28571
16	610.7298	598515.204	64	38304973.1	14823.27458	52151.81319	35175.53315
17	366.43788	359109.122	68	24419420.3	9449.837545	37328.53861	27734.37651
18	366.43788	359109.122	72	25855856.8	10005.71034	27878.70106	23060.81885
19	366.43788	359109.122	76	27292293.3	10561.58314	17872.99072	16802.48926
20	240.98829	236168.524	80	18893481.9	7311.407584	7311.407584	9323.815123
		11663422.4		443228930	**171520.9177**	**2145882.443**	**1024894.757**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1011.211895	164479.5623	89319.64418
2	681.0253	667404.794	8	5339238.35	2123.591714	163468.3504	83363.51994
3	681.0253	667404.794	12	8008857.53	3185.387571	161344.7587	74714.09581
4	681.0253	667404.794	16	10678476.7	4247.183428	158159.3711	68901.49967
5	681.0253	667404.794	20	13348095.9	5308.979285	153912.1877	66822.5116
6	681.0253	667404.794	24	16017715.1	6370.775142	148603.2084	62713.07726
7	681.0253	667404.794	28	18687334.2	7432.570999	142232.4333	62052.45625
8	681.0253	667404.794	32	21356953.4	8494.366855	134799.8623	60467.74115
9	681.0253	667404.794	36	24026572.6	9556.162712	126305.4954	58569.53457
10	648.58125	635609.625	40	25424385	10112.11895	116749.3327	55083.48964
11	648.58125	635609.625	44	27966823.5	11123.33084	106637.2138	47283.50923
12	648.58125	635609.625	48	30509262	12134.54274	95513.88293	38934.39297
13	648.58125	635609.625	52	33051700.5	13145.75463	83379.34019	34896.88437
14	648.58125	635609.625	56	35594139	14156.96653	70233.58556	32184.40849
15	366.43788	359109.122	60	21546547.3	8569.774636	56076.61903	29511.12681
16	366.43788	359109.122	64	22982983.8	9141.092945	47506.84439	28822.46099
17	366.43788	359109.122	68	24419420.3	9712.411254	38365.75145	27332.96123
18	366.43788	359109.122	72	25855856.8	10283.72956	28653.34019	23811.65014
19	366.43788	359109.122	76	27292293.3	10855.04787	18369.61063	17810.02735
20	240.98829	236168.524	80	18893481.9	7514.56276	7514.56276	9545.261926
		11184610.2		413542576	**164479.5623**	**2022305.313**	**972140.2536**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	157001.802	78336.8979
2	681.0253	667404.794	8	5339238.35	2171.210207	155967.9152	69671.96991
3	681.0253	667404.794	12	8008857.53	3256.815311	153796.705	65612.62913
4	681.0253	667404.794	16	10678476.7	4342.420415	150539.8896	65196.05861
5	681.0253	667404.794	20	13348095.9	5428.025518	146197.4692	61206.25528
6	681.0253	667404.794	24	16017715.1	6513.630622	140769.4437	56894.66948
7	681.0253	667404.794	28	18687334.2	7599.235725	134255.8131	57289.12375
8	681.0253	667404.794	32	21356953.4	8684.840829	126656.5774	52171.58239
9	681.0253	667404.794	36	24026572.6	9770.445933	117971.7365	50092.92528
10	648.58125	635609.625	40	25424385	10338.86869	108201.2906	46123.24987
11	648.58125	635609.625	44	27966823.5	11372.75556	97862.42191	42832.1163
12	648.58125	635609.625	48	30509262	12406.64243	86489.66635	36571.84659
13	389.14875	381365.775	52	19831020.3	8064.317578	74083.02393	31339.44198
14	389.14875	381365.775	56	21356483.4	8684.6497	66018.70635	29108.8969
15	366.43788	359109.122	60	21546547.3	8761.93952	57334.05665	25409.9333
16	366.43788	359109.122	64	22982983.8	9346.068822	48572.11713	25380.20526
17	366.43788	359109.122	68	24419420.3	9930.198123	39226.04831	24448.05032
18	366.43788	359109.122	72	25855856.8	10514.32742	29295.85018	21440.50022
19	366.43788	359109.122	76	27292293.3	11098.45673	18781.52276	15997.82241
20	240.98829	236168.524	80	18893481.9	7683.066034	7683.066034	8789.414077
		10676122.5		386084240	**157001.802**	**1916705.122**	**863913.589**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	149524.0417	66806.8184
2	681.0253	667404.794	8	5339238.35	2201.152833	148475.8968	63180.93431
3	681.0253	667404.794	12	8008857.53	3301.72925	146274.744	61276.0326
4	681.0253	667404.794	16	10678476.7	4402.305666	142973.0147	59468.55621
5	681.0253	667404.794	20	13348095.9	5502.882083	138570.709	52076.02579
6	681.0253	667404.794	24	16017715.1	6603.458499	133067.827	49640.60708
7	681.0253	667404.794	28	18687334.2	7704.034916	126464.3685	49475.58467
8	681.0253	667404.794	32	21356953.4	8804.611333	118760.3335	45585.02423
9	681.0253	667404.794	36	24026572.6	9905.187749	109955.7222	43333.51991
10	648.58125	635609.625	40	25424385	10481.44948	100050.5345	43132.56102
11	389.14875	381365.775	44	16780094.1	6917.75666	89569.08498	37576.50976
12	389.14875	381365.775	48	18305557.2	7546.643629	82651.32832	34876.09606
13	389.14875	381365.775	52	19831020.3	8175.530598	75104.68469	30663.87998
14	389.14875	381365.775	56	21356483.4	8804.417567	66929.15409	27446.51448
15	366.43788	359109.122	60	21546547.3	8882.773273	58124.73652	24383.44875
16	366.43788	359109.122	64	22982983.8	9474.958158	49241.96325	22089.09346
17	366.43788	359109.122	68	24419420.3	10067.14304	39767.00509	21140.66554
18	366.43788	359109.122	72	25855856.8	10659.32793	29699.86205	19082.43858
19	366.43788	359109.122	76	27292293.3	11251.51281	19040.53412	15505.08686
20	240.98829	236168.524	80	18893481.9	7789.021308	7789.021308	8853.709514
		10167634.8		362693806	**149524.0417**	**1832034.566**	**775593.1072**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	141859.251	59306.93914
2	681.0253	667404.794	8	5339238.35	2208.780128	140807.4741	56174.24307
3	681.0253	667404.794	12	8008857.53	3313.170192	138598.694	56555.28486
4	681.0253	667404.794	16	10678476.7	4417.560255	135285.5238	52886.67491
5	681.0253	667404.794	20	13348095.9	5521.950319	130867.9635	48403.8373
6	681.0253	667404.794	24	16017715.1	6626.340383	125346.0132	47658.38579
7	681.0253	667404.794	28	18687334.2	7730.730447	118719.6728	45074.23414
8	681.0253	667404.794	32	21356953.4	8835.120511	110988.9424	40707.42062
9	408.61518	400442.876	36	14415943.6	5963.706345	102153.8219	42100.47036
10	389.14875	381365.775	40	15254631	6310.661482	96190.11554	40534.26779
11	389.14875	381365.775	44	16780094.1	6941.72763	89879.45406	36498.46709
12	389.14875	381365.775	48	18305557.2	7572.793778	82937.72643	34920.27321
13	389.14875	381365.775	52	19831020.3	8203.859926	75364.93266	31986.62655
14	389.14875	381365.775	56	21356483.4	8834.926074	67161.07273	28869.48298
15	366.43788	359109.122	60	21546547.3	8913.553293	58326.14666	25476.48893
16	366.43788	359109.122	64	22982983.8	9507.790179	49412.59336	21170.9458
17	366.43788	359109.122	68	24419420.3	10102.02707	39904.80318	19673.07746
18	366.43788	359109.122	72	25855856.8	10696.26395	29802.77612	18064.76271
19	366.43788	359109.122	76	27292293.3	11290.50084	19106.51217	14873.85334
20	240.98829	236168.524	80	18893481.9	7816.011328	7816.011328	8605.580054
		9646429.07		342913423	**141859.251**	**1760529.501**	**729541.3161**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	134007.4299	62080.66378
2	681.0253	667404.794	8	5339238.35	2188.764161	132965.1842	55741.95637
3	681.0253	667404.794	12	8008857.53	3283.146241	130776.4201	55182.02474
4	681.0253	667404.794	16	10678476.7	4377.528322	127493.2738	48119.38954
5	681.0253	667404.794	20	13348095.9	5471.910402	123115.7455	45044.82467
6	681.0253	667404.794	24	16017715.1	6566.292482	117643.8351	47983.36358
7	408.61518	400442.876	28	11212400.5	4596.404738	111077.5426	43756.97655
8	408.61518	400442.876	32	12814172	5253.033986	106481.1379	39366.52604
9	408.61518	400442.876	36	14415943.6	5909.663234	101228.1039	40745.19511
10	389.14875	381365.775	40	15254631	6253.474263	95318.44066	40672.54857
11	389.14875	381365.775	44	16780094.1	6878.821689	89064.96639	38379.57285
12	389.14875	381365.775	48	18305557.2	7504.169116	82186.1447	36994.77119
13	389.14875	381365.775	52	19831020.3	8129.516542	74681.97559	33896.08764
14	389.14875	381365.775	56	21356483.4	8754.863968	66552.45905	29188.86574
15	366.43788	359109.122	60	21546547.3	8832.778667	57797.59508	25917.21188
16	366.43788	359109.122	64	22982983.8	9421.630579	48964.81641	21847.99171
17	366.43788	359109.122	68	24419420.3	10010.48249	39543.18583	21254.3163
18	366.43788	359109.122	72	25855856.8	10599.3344	29532.70334	18234.11234
19	366.43788	359109.122	76	27292293.3	11188.18631	18933.36894	14438.16317
20	240.98829	236168.524	80	18893481.9	7745.182629	7745.182629	8277.899307
		9112505.24		326895708	**134007.4299**	**1695109.512**	**727122.4611**

Tabel 19 Perbandingan Gaya Geser Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	126155.6088	64182.49357
2	681.0253	667404.794	8	5339238.35	2137.319318	125137.8601	60110.99945
3	681.0253	667404.794	12	8008857.53	3205.978977	123000.5408	54322.92143
4	681.0253	667404.794	16	10678476.7	4274.638635	119794.5618	42757.04496
5	408.61518	400442.876	20	8008857.53	3205.978977	115519.9232	41032.87633
6	408.61518	400442.876	24	9610629.03	3847.174772	112313.9442	44389.78919
7	408.61518	400442.876	28	11212400.5	4488.370567	108466.7694	44657.77835
8	408.61518	400442.876	32	12814172	5129.566363	103978.3989	41528.94349
9	408.61518	400442.876	36	14415943.6	5770.762158	98848.83251	40446.71887
10	389.14875	381365.775	40	15254631	6106.492232	93078.07036	39943.85149
11	389.14875	381365.775	44	16780094.1	6717.141455	86971.57812	40514.41621
12	389.14875	381365.775	48	18305557.2	7327.790678	80254.43667	40863.49938
13	389.14875	381365.775	52	19831020.3	7938.439902	72926.64599	37780.63487
14	389.14875	381365.775	56	21356483.4	8549.089125	64988.20609	32206.5006
15	366.43788	359109.122	60	21546547.3	8625.172512	56439.11696	28682.47194
16	366.43788	359109.122	64	22982983.8	9200.184013	47813.94445	26066.33057
17	366.43788	359109.122	68	24419420.3	9775.195514	38613.76044	23908.75053
18	366.43788	359109.122	72	25855856.8	10350.20701	28838.56492	19864.42836
19	366.43788	359109.122	76	27292293.3	10925.21852	18488.35791	15547.35843
20	240.98829	236168.524	80	18893481.9	7563.139395	7563.139395	8870.350446
		8578581.4		315149383	**126155.6088**	**1629192.261**	**747678.1585**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	V Statik	V Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	118303.7877	57614.95897
2	681.0253	667404.794	8	5339238.35	2052.988545	117326.1956	52047.22328
3	408.61518	400442.876	12	4805314.52	1847.68969	115273.2071	49160.38072
4	408.61518	400442.876	16	6407086.02	2463.586254	113425.5174	47449.36386
5	408.61518	400442.876	20	8008857.53	3079.482817	110961.9312	42959.18771
6	408.61518	400442.876	24	9610629.03	3695.37938	107882.4483	37794.87831
7	408.61518	400442.876	28	11212400.5	4311.275944	104187.069	35690.66257
8	408.61518	400442.876	32	12814172	4927.172507	99875.79301	34520.05043
9	408.61518	400442.876	36	14415943.6	5543.069071	94948.62051	34272.41958
10	389.14875	381365.775	40	15254631	5865.552469	89405.55144	33117.82447
11	389.14875	381365.775	44	16780094.1	6452.107715	83539.99897	32834.71054
12	389.14875	381365.775	48	18305557.2	7038.662962	77087.89125	31222.16091
13	389.14875	381365.775	52	19831020.3	7625.218209	70049.22829	28126.63595
14	389.14875	381365.775	56	21356483.4	8211.773456	62424.01008	25029.14313
15	366.43788	359109.122	60	21546547.3	8284.854872	54212.23662	23399.35852
16	366.43788	359109.122	64	22982983.8	8837.17853	45927.38175	23460.1775
17	366.43788	359109.122	68	24419420.3	9389.502188	37090.20322	22788.14806
18	366.43788	359109.122	72	25855856.8	9941.825846	27700.70103	21400.31958
19	366.43788	359109.122	76	27292293.3	10494.1495	17758.87519	17418.99607
20	240.98829	236168.524	80	18893481.9	7264.725683	7264.725683	9965.367928
		8044657.57		307674450	**118303.7877**	**1554645.373**	**660271.9681**

Tabel 20 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa El Centro

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	322.6755	316221.99	4	1264887.96	3531.396694	1622056.882	20764.70312	2076470.312
2	322.6755	316221.99	8	2529775.92	7062.793388	1277329.776	17797.60272	1779760.272
3	322.6755	316221.99	12	3794663.88	10594.19008	946728.2568	14830.50231	1483050.231
4	322.6755	316221.99	16	5059551.84	14125.58678	644377.9112	11863.40191	1186340.191
5	322.6755	316221.99	20	6324439.8	17656.98347	384404.326	8896.301502	889630.1502
6	322.6755	316221.99	24	7589327.76	21188.38016	180933.0878	5929.201097	592920.1097
7	156.933	153794.34	28	4306241.52	12022.4459	48089.78359	2962.103519	296210.3519
		2051126.28		30868888.7	**86181.77647**	**5103920.023**	**83043.81618**	**8304381.618**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	322.6755	316221.99	4	1264887.96	3792.259125	1378845.229	14973.41001	1497341.001
2	322.6755	316221.99	8	2529775.92	7584.518251	1065715.86	12833.87111	1283387.111
3	322.6755	316221.99	12	3794663.88	11376.77738	767755.5271	10694.3322	1069433.22
4	322.6755	316221.99	16	5059551.84	15169.0365	500133.2672	8554.793299	855479.3299
5	322.6755	316221.99	20	6324439.8	18961.29563	278018.1168	6415.254395	641525.4395
6	193.6053	189733.194	24	4553596.66	13652.13285	116579.1124	4275.715489	427571.5489
7	94.1598	92276.604	28	2583744.91	7746.322623	30985.29049	2136.178146	213617.8146
		1863119.75		26110661	**78282.34235**	**4138032.403**	**59883.55465**	**5988355.465**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	322.6755	316221.99	4	1264887.96	3969.627037	1182927.724	17516.25838	1751625.838
2	322.6755	316221.99	8	2529775.92	7939.254075	912315.5973	15013.35181	1501335.181
3	322.6755	316221.99	12	3794663.88	11908.88111	657581.9784	12510.44524	1251044.524
4	193.6053	189733.194	16	3035731.1	9527.104889	434605.3758	10007.53867	1000753.867
5	193.6053	189733.194	20	3794663.88	11908.88111	259264.2976	7504.632095	750463.2095
6	193.6053	189733.194	24	4553596.66	14290.65733	122031.639	5001.725525	500172.5525
7	94.1598	92276.604	28	2583744.91	8108.626206	32434.50482	2498.821008	249882.1008
		1610142.16		21557064.3	**67653.03176**	**3601161.117**	**70052.77271**	**7005277.271**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	322.6755	316221.99	4	1264887.96	3934.841048	1115899.974	14711.96684	1471196.684
2	322.6755	316221.99	8	2529775.92	7869.682095	866546.4677	12609.72469	1260972.469
3	193.6053	189733.194	12	2276798.33	7082.713886	632932.326	10507.48253	1050748.253
4	193.6053	189733.194	16	3035731.1	9443.618514	430796.9127	8405.240381	840524.0381
5	193.6053	189733.194	20	3794663.88	11804.52314	256992.3549	6302.998228	630299.8228
6	193.6053	189733.194	24	4553596.66	14165.42777	120962.2712	4200.756076	420075.6076
7	94.1598	92276.604	28	2583744.91	8037.570013	32150.28005	2098.516305	209851.6305
		1483653.36		20039198.8	**62338.37647**	**3456280.586**	**58836.68505**	**5883668.505**

Tabel 20 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 7 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	322.6755	316221.99	4	1264887.96	3531.396694	1622056.882	22696.18902	2269618.902
2	322.6755	316221.99	8	2529775.92	7062.793388	1277329.776	19453.22098	1945322.098
3	322.6755	316221.99	12	3794663.88	10594.19008	946728.2568	16210.25294	1621025.294
4	322.6755	316221.99	16	5059551.84	14125.58678	644377.9112	12967.2849	1296728.49
5	322.6755	316221.99	20	6324439.8	17656.98347	384404.326	9724.316856	972431.6856
6	322.6755	316221.99	24	7589327.76	21188.38016	180933.0878	6481.348815	648134.8815
7	156.933	153794.34	28	4306241.52	12022.4459	48089.78359	3238.382011	323838.2011
		2051126.28		30868888.7	**86181.77647**	**5103920.023**	**90770.99552**	**9077099.552**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	322.6755	316221.99	4	1264887.96	3792.259125	1378845.229	16516.99953	1651699.953
2	322.6755	316221.99	8	2529775.92	7584.518251	1065715.86	14156.86106	1415686.106
3	322.6755	316221.99	12	3794663.88	11376.77738	767755.5271	11796.72259	1179672.259
4	322.6755	316221.99	16	5059551.84	15169.0365	500133.2672	9436.584122	943658.4122
5	322.6755	316221.99	20	6324439.8	18961.29563	278018.1168	7076.445654	707644.5654
6	193.6053	189733.194	24	4553596.66	13652.13285	116579.1124	4716.307186	471630.7186
7	94.1598	92276.604	28	2583744.91	7746.322623	30985.29049	2356.171999	235617.1999
		1863119.75		26110661	**78282.34235**	**4138032.403**	**66056.09214**	**6605609.214**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	322.6755	316221.99	4	1264887.96	3969.627037	1182927.724	14488.68648	1448868.648
2	322.6755	316221.99	8	2529775.92	7939.254075	912315.5973	12418.33936	1241833.936
3	322.6755	316221.99	12	3794663.88	11908.88111	657581.9784	10347.99225	1034799.225
4	193.6053	189733.194	16	3035731.1	9527.104889	434605.3758	8277.64513	827764.513
5	193.6053	189733.194	20	3794663.88	11908.88111	259264.2976	6207.298013	620729.8013
6	193.6053	189733.194	24	4553596.66	14290.65733	122031.639	4136.950897	413695.0897
7	94.1598	92276.604	28	2583744.91	8108.626206	32434.50482	2066.606316	206660.6316
		1610142.16		21557064.3	**67653.03176**	**3601161.117**	**57943.51845**	**5794351.845**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	322.6755	316221.99	4	1264887.96	3934.841048	1115899.974	15436.97071	1543697.071
2	322.6755	316221.99	8	2529775.92	7869.682095	866546.4677	13231.1697	1323116.97
3	193.6053	189733.194	12	2276798.33	7082.713886	632932.326	11025.3687	1102536.87
4	193.6053	189733.194	16	3035731.1	9443.618514	430796.9127	8819.567695	881956.7695
5	193.6053	189733.194	20	3794663.88	11804.52314	256992.3549	6613.76669	661376.669
6	193.6053	189733.194	24	4553596.66	14165.42777	120962.2712	4407.965686	440796.5686
7	94.1598	92276.604	28	2583744.91	8037.570013	32150.28005	2202.16631	220216.631
		1483653.36		20039198.8	**62338.37647**	**3456280.586**	**61736.97549**	**6173697.549**

Tabel 21 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	3683675.876	122052.004	12205200.4
2	501.90695	491868.811	8	3934950.49	5458.385745	3138698.193	109844.8833	10984488.33
3	501.90695	491868.811	12	5902425.73	8187.578617	2604299.144	97637.76256	9763776.256
4	501.90695	491868.811	16	7869900.98	10916.77149	2091733.638	85430.64182	8543064.182
5	486.3608	476633.584	20	9532671.68	13223.29197	1611918.446	73223.52108	7322352.108
6	486.3608	476633.584	24	11439206	15867.95037	1175770.34	61016.40034	6101640.034
7	486.3608	476633.584	28	13345740.4	18512.60876	792515.4016	48809.2796	4880927.96
8	486.3608	476633.584	32	15252274.7	21157.26716	472732.2651	36602.15885	3660215.885
9	486.3608	476633.584	36	17158809	23801.92555	226999.5635	24395.03813	2439503.813
10	302.9616	296902.368	40	11876094.7	16473.98266	65895.93066	12187.93561	1218793.561
		4632310.31		98218608	**136244.4207**	**15864238.8**	**671199.6253**	**59801449.27**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	3256910.497	61286.23041	6128623.041
2	501.90695	491868.811	8	3934950.49	5776.887918	2748334.506	55156.63697	5515663.697
3	501.90695	491868.811	12	5902425.73	8665.331877	2250954.422	49027.04353	4902704.353
4	501.90695	491868.811	16	7869900.98	11553.77584	1776681.89	42897.45009	4289745.009
5	486.3608	476633.584	20	9532671.68	13994.88406	1337070.686	36767.85665	3676785.665
6	486.3608	476633.584	24	11439206	16793.86087	943674.5843	30638.26321	3063826.321
7	486.3608	476633.584	28	13345740.4	19592.83768	606258.0192	24508.66977	2450866.977
8	486.3608	476633.584	32	15252274.7	22391.81449	336016.8976	18379.07634	1837907.634
9	291.81648	285980.15	36	10295285.4	15114.47478	144147.1267	12249.48291	1224948.291
10	181.77696	178141.421	40	7125656.83	10461.15345	41844.61379	6119.904988	611990.4988
		4322895.92		86604646.5	**127143.9978**	**13441893.24**	**337030.6149**	**30028215.06**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	2889930.021	49440.32846	4944032.846
2	501.90695	491868.811	8	3934950.49	6068.949053	2426213.661	44495.51465	4449551.465
3	501.90695	491868.811	12	5902425.73	9103.423579	1974259.238	39550.70084	3955070.084
4	501.90695	491868.811	16	7869900.98	12137.89811	1546580.612	34605.88703	3460588.703
5	486.3608	476633.584	20	9532671.68	14702.42102	1155315.679	29661.07322	2966107.322
6	486.3608	476633.584	24	11439206	17642.90522	812602.3394	24716.25942	2471625.942
7	291.81648	285980.15	28	8007444.21	12350.03366	528698.6835	19771.44561	1977144.561
8	291.81648	285980.15	32	9151364.81	14114.32418	315366.6486	14826.6318	1482663.18
9	291.81648	285980.15	36	10295285.4	15878.6147	151434.7483	9881.817993	988181.7993
10	181.77696	178141.421	40	7125656.83	10990.03619	43960.14477	4937.011664	493701.1664
		3941589.06		75165440.5	**115929.0899**	**11844361.78**	**271886.6707**	**24224120.92**

Tabel 21 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Bucharest

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	2646490.575	45036.44993	4503644.993
2	501.90695	491868.811	8	3934950.49	6170.493406	2227633.847	40532.09828	4053209.828
3	501.90695	491868.811	12	5902425.73	9255.74011	1820735.854	36027.74663	3602774.663
4	501.90695	491868.811	16	7869900.98	12340.98681	1438519.834	31523.39497	3152339.497
5	291.81648	285980.15	20	5719603.01	8969.051264	1093326.775	27019.04332	2701904.332
6	291.81648	285980.15	24	6863523.61	10762.86152	797497.6633	22514.69167	2251469.167
7	291.81648	285980.15	28	8007444.21	12556.67177	537544.7565	18010.34002	1801034.002
8	291.81648	285980.15	32	9151364.81	14350.48202	320643.2957	13505.98836	1350598.836
9	291.81648	285980.15	36	10295285.4	16144.29228	153968.5221	9001.636719	900163.6719
10	181.77696	178141.421	40	7125656.83	11173.91912	44695.67648	4497.291735	449729.1735
		3560282.19		66776689.4	**104714.1821**	**11081056.8**	**247668.6816**	**22066376.48**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	2446011.444	50918.97773	5091897.773
2	501.90695	491868.811	8	3934950.49	5982.011373	2073448.251	45826.27941	4582627.941
3	301.14417	295121.287	12	3541455.44	5383.810236	1712478.505	40733.5811	4073358.11
4	301.14417	295121.287	16	4721940.59	7178.413648	1375436.804	35640.88279	3564088.279
5	291.81648	285980.15	20	5719603.01	8695.085326	1059930.345	30548.18447	3054818.447
6	291.81648	285980.15	24	6863523.61	10434.10239	773137.5399	25455.48616	2545548.616
7	291.81648	285980.15	28	8007444.21	12173.11946	521125.0763	20362.78785	2036278.785
8	291.81648	285980.15	32	9151364.81	13912.13652	310849.0222	15270.08953	1527008.953
9	291.81648	285980.15	36	10295285.4	15651.15359	149265.446	10177.39123	1017739.123
10	181.77696	178141.421	40	7125656.83	10832.60395	43330.41581	5084.7005	508470.05
		3166787.14		61267758.7	**93140.79826**	**10465012.85**	**280018.3608**	**24948617.95**

Tabel 21 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa El Centro

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	2646490.575	36372.43431	3637243.431
2	501.90695	491868.811	8	3934950.49	6170.493406	2227633.847	32734.65488	3273465.488
3	501.90695	491868.811	12	5902425.73	9255.74011	1820735.854	29096.87545	2909687.545
4	501.90695	491868.811	16	7869900.98	12340.98681	1438519.834	25459.09602	2545909.602
5	291.81648	285980.15	20	5719603.01	8969.051264	1093326.775	21821.31659	2182131.659
6	291.81648	285980.15	24	6863523.61	10762.86152	797497.6633	18183.53717	1818353.717
7	291.81648	285980.15	28	8007444.21	12556.67177	537544.7565	14545.75774	1454575.774
8	291.81648	285980.15	32	9151364.81	14350.48202	320643.2957	10907.97831	1090797.831
9	291.81648	285980.15	36	10295285.4	16144.29228	153968.5221	7270.198884	727019.8884
10	181.77696	178141.421	40	7125656.83	11173.91912	44695.67648	3632.423698	363242.3698
		3560282.19		66776689.4	**104714.1821**	**11081056.8**	**200024.273**	**17821367.22**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	2446011.444	36710.90226	3671090.226
2	501.90695	491868.811	8	3934950.49	5982.011373	2073448.251	33039.30495	3303930.495
3	301.14417	295121.287	12	3541455.44	5383.810236	1712478.505	29367.70765	2936770.765
4	301.14417	295121.287	16	4721940.59	7178.413648	1375436.804	25696.11034	2569611.034
5	291.81648	285980.15	20	5719603.01	8695.085326	1059930.345	22024.51304	2202451.304
6	291.81648	285980.15	24	6863523.61	10434.10239	773137.5399	18352.91573	1835291.573
7	291.81648	285980.15	28	8007444.21	12173.11946	521125.0763	14681.31843	1468131.843
8	291.81648	285980.15	32	9151364.81	13912.13652	310849.0222	11009.72113	1100972.113
9	291.81648	285980.15	36	10295285.4	15651.15359	149265.446	7338.123822	733812.3822
10	181.77696	178141.421	40	7125656.83	10832.60395	43330.41581	3666.529966	366652.9966
		3166787.14		61267758.7	**93140.79826**	**10465012.85**	**201887.1473**	**17987277.24**

Tabel 21 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	3683675.876	77333.42646	7733342.646
2	501.90695	491868.811	8	3934950.49	5458.385745	3138698.193	69599.19332	6959919.332
3	501.90695	491868.811	12	5902425.73	8187.578617	2604299.144	61864.96017	6186496.017
4	501.90695	491868.811	16	7869900.98	10916.77149	2091733.638	54130.72702	5413072.702
5	486.3608	476633.584	20	9532671.68	13223.29197	1611918.446	46396.49388	4639649.388
6	486.3608	476633.584	24	11439206	15867.95037	1175770.34	38662.26073	3866226.073
7	486.3608	476633.584	28	13345740.4	18512.60876	792515.4016	30928.02759	3092802.759
8	486.3608	476633.584	32	15252274.7	21157.26716	472732.2651	23193.79444	2319379.444
9	486.3608	476633.584	36	17158809	23801.92555	226999.5635	15459.5613	1545956.13
10	302.9616	296902.368	40	11876094.7	16473.98266	65895.93066	7725.331198	772533.1198
		4632310.31		98218608	**136244.4207**	**15864238.8**	**425293.7761**	**37891508.92**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	3256910.497	49965.16306	4996516.306
2	501.90695	491868.811	8	3934950.49	5776.887918	2748334.506	44967.99591	4496799.591
3	501.90695	491868.811	12	5902425.73	8665.331877	2250954.422	39970.82877	3997082.877
4	501.90695	491868.811	16	7869900.98	11553.77584	1776681.89	34973.66162	3497366.162
5	486.3608	476633.584	20	9532671.68	13994.88406	1337070.686	29976.49448	2997649.448
6	486.3608	476633.584	24	11439206	16793.86087	943674.5843	24979.32733	2497932.733
7	486.3608	476633.584	28	13345740.4	19592.83768	606258.0192	19982.16018	1998216.018
8	486.3608	476633.584	32	15252274.7	22391.81449	336016.8976	14984.99304	1498499.304
9	291.81648	285980.15	36	10295285.4	15114.47478	144147.1267	9987.825893	998782.5893
10	181.77696	178141.421	40	7125656.83	10461.15345	41844.61379	4990.664491	499066.4491
		4322895.92		86604646.5	**127143.9978**	**13441893.24**	**274779.1148**	**24481563.14**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	2889930.021	56860.1644	5686016.44
2	501.90695	491868.811	8	3934950.49	6068.949053	2426213.661	51173.38401	5117338.401
3	501.90695	491868.811	12	5902425.73	9103.423579	1974259.238	45486.60361	4548660.361
4	501.90695	491868.811	16	7869900.98	12137.89811	1546580.612	39799.82321	3979982.321
5	486.3608	476633.584	20	9532671.68	14702.42102	1155315.679	34113.04281	3411304.281
6	486.3608	476633.584	24	11439206	17642.90522	812602.3394	28426.26241	2842626.241
7	291.81648	285980.15	28	8007444.21	12350.03366	528698.6835	22739.48201	2273948.201
8	291.81648	285980.15	32	9151364.81	14114.32418	315366.6486	17052.70161	1705270.161
9	291.81648	285980.15	36	10295285.4	15878.6147	151434.7483	11365.92122	1136592.122
10	181.77696	178141.421	40	7125656.83	10990.03619	43960.14477	5679.14547	567914.547
		3941589.06		75165440.5	**115929.0899**	**11844361.78**	**312696.5308**	**27859876.25**

Tabel 21 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Gilroy

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	2646490.575	63598.89352	6359889.352
2	501.90695	491868.811	8	3934950.49	6170.493406	2227633.847	57238.14597	5723814.597
3	501.90695	491868.811	12	5902425.73	9255.74011	1820735.854	50877.39842	5087739.842
4	501.90695	491868.811	16	7869900.98	12340.98681	1438519.834	44516.65087	4451665.087
5	291.81648	285980.15	20	5719603.01	8969.051264	1093326.775	38155.90332	3815590.332
6	291.81648	285980.15	24	6863523.61	10762.86152	797497.6633	31795.15577	3179515.577
7	291.81648	285980.15	28	8007444.21	12556.67177	537544.7565	25434.40821	2543440.821
8	291.81648	285980.15	32	9151364.81	14350.48202	320643.2957	19073.66066	1907366.066
9	291.81648	285980.15	36	10295285.4	16144.29228	153968.5221	12712.91311	1271291.311
10	181.77696	178141.421	40	7125656.83	11173.91912	44695.67648	6352.170963	635217.0963
		3560282.19		66776689.4	**104714.1821**	**11081056.8**	**349755.3008**	**31161655.61**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	2446011.444	56032.80956	5603280.956
2	501.90695	491868.811	8	3934950.49	5982.011373	2073448.251	50428.79974	5042879.974
3	301.14417	295121.287	12	3541455.44	5383.810236	1712478.505	44824.78991	4482478.991
4	301.14417	295121.287	16	4721940.59	7178.413648	1375436.804	39220.78008	3922078.008
5	291.81648	285980.15	20	5719603.01	8695.085326	1059930.345	33616.77026	3361677.026
6	291.81648	285980.15	24	6863523.61	10434.10239	773137.5399	28012.76043	2801276.043
7	291.81648	285980.15	28	8007444.21	12173.11946	521125.0763	22408.7506	2240875.06
8	291.81648	285980.15	32	9151364.81	13912.13652	310849.0222	16804.74078	1680474.078
9	291.81648	285980.15	36	10295285.4	15651.15359	149265.446	11200.73095	1120073.095
10	181.77696	178141.421	40	7125656.83	10832.60395	43330.41581	5596.725112	559672.5112
		3166787.14		61267758.7	**93140.79826**	**10465012.85**	**308147.6574**	**27454546.06**

Tabel 21 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2644.658395	3683675.876	56559.55753	5655955.753
2	501.90695	491868.811	8	3934950.49	5458.385745	3138698.193	50902.90035	5090290.035
3	501.90695	491868.811	12	5902425.73	8187.578617	2604299.144	45246.24316	4524624.316
4	501.90695	491868.811	16	7869900.98	10916.77149	2091733.638	39589.58598	3958958.598
5	486.3608	476633.584	20	9532671.68	13223.29197	1611918.446	33932.92879	3393292.879
6	486.3608	476633.584	24	11439206	15867.95037	1175770.34	28276.27161	2827627.161
7	486.3608	476633.584	28	13345740.4	18512.60876	792515.4016	22619.61442	2261961.442
8	486.3608	476633.584	32	15252274.7	21157.26716	472732.2651	16962.95724	1696295.724
9	486.3608	476633.584	36	17158809	23801.92555	226999.5635	11306.30005	1130630.005
10	302.9616	296902.368	40	11876094.7	16473.98266	65895.93066	5649.646074	564964.6074
		4632310.31		98218608	**136244.4207**	**15864238.8**	**311046.0052**	**27712710.18**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2798.976812	3256910.497	41776.97319	4177697.319
2	501.90695	491868.811	8	3934950.49	5776.887918	2748334.506	37598.72779	3759872.779
3	501.90695	491868.811	12	5902425.73	8665.331877	2250954.422	33420.48239	3342048.239
4	501.90695	491868.811	16	7869900.98	11553.77584	1776681.89	29242.23698	2924223.698
5	486.3608	476633.584	20	9532671.68	13994.88406	1337070.686	25063.99158	2506399.158
6	486.3608	476633.584	24	11439206	16793.86087	943674.5843	20885.74618	2088574.618
7	486.3608	476633.584	28	13345740.4	19592.83768	606258.0192	16707.50078	1670750.078
8	486.3608	476633.584	32	15252274.7	22391.81449	336016.8976	12529.25538	1252925.538
9	291.81648	285980.15	36	10295285.4	15114.47478	144147.1267	8351.009982	835100.9982
10	181.77696	178141.421	40	7125656.83	10461.15345	41844.61379	4172.769798	417276.9798
		4322895.92		86604646.5	**127143.9978**	**13441893.24**	**229748.6941**	**20469565.89**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2940.484204	2889930.021	36067.55723	3606755.723
2	501.90695	491868.811	8	3934950.49	6068.949053	2426213.661	32460.31663	3246031.663
3	501.90695	491868.811	12	5902425.73	9103.423579	1974259.238	28853.07603	2885307.603
4	501.90695	491868.811	16	7869900.98	12137.89811	1546580.612	25245.83543	2524583.543
5	486.3608	476633.584	20	9532671.68	14702.42102	1155315.679	21638.59483	2163859.483
6	486.3608	476633.584	24	11439206	17642.90522	812602.3394	18031.35423	1803135.423
7	291.81648	285980.15	28	8007444.21	12350.03366	528698.6835	14424.11363	1442411.363
8	291.81648	285980.15	32	9151364.81	14114.32418	315366.6486	10816.87303	1081687.303
9	291.81648	285980.15	36	10295285.4	15878.6147	151434.7483	7209.632428	720963.2428
10	181.77696	178141.421	40	7125656.83	10990.03619	43960.14477	3602.394856	360239.4856
		3941589.06		75165440.5	**115929.0899**	**11844361.78**	**198349.7483**	**17672084.8**

Tabel 21 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 10 Akibat Gempa Koyna

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2989.683755	2646490.575	35285.61861	3528561.861
2	501.90695	491868.811	8	3934950.49	6170.493406	2227633.847	31756.5821	3175658.21
3	501.90695	491868.811	12	5902425.73	9255.74011	1820735.854	28227.54559	2822754.559
4	501.90695	491868.811	16	7869900.98	12340.98681	1438519.834	24698.50908	2469850.908
5	291.81648	285980.15	20	5719603.01	8969.051264	1093326.775	21169.47257	2116947.257
6	291.81648	285980.15	24	6863523.61	10762.86152	797497.6633	17640.43606	1764043.606
7	291.81648	285980.15	28	8007444.21	12556.67177	537544.7565	14111.39955	1411139.955
8	291.81648	285980.15	32	9151364.81	14350.48202	320643.2957	10582.36304	1058236.304
9	291.81648	285980.15	36	10295285.4	16144.29228	153968.5221	7053.32653	705332.653
10	181.77696	178141.421	40	7125656.83	11173.91912	44695.67648	3524.293287	352429.3287
		3560282.19		66776689.4	**104714.1821**	**11081056.8**	**194049.5464**	**17288956.36**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	486.3608	476633.584	4	1906534.34	2898.361775	2446011.444	37520.6336	3752063.36
2	501.90695	491868.811	8	3934950.49	5982.011373	2073448.251	33768.08005	3376808.005
3	301.14417	295121.287	12	3541455.44	5383.810236	1712478.505	30015.5265	3001552.65
4	301.14417	295121.287	16	4721940.59	7178.413648	1375436.804	26262.97296	2626297.296
5	291.81648	285980.15	20	5719603.01	8695.085326	1059930.345	22510.41941	2251041.941
6	291.81648	285980.15	24	6863523.61	10434.10239	773137.5399	18757.86586	1875786.586
7	291.81648	285980.15	28	8007444.21	12173.11946	521125.0763	15005.31231	1500531.231
8	291.81648	285980.15	32	9151364.81	13912.13652	310849.0222	11252.75876	1125275.876
9	291.81648	285980.15	36	10295285.4	15651.15359	149265.446	7500.205217	750020.5217
10	181.77696	178141.421	40	7125656.83	10832.60395	43330.41581	3747.65444	374765.444
		3166787.14		61267758.7	**93140.79826**	**10465012.85**	**206341.4291**	**18384081.07**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	7239359.838	253354.8255	25335482.55
2	681.0253	667404.794	8	5339238.35	3410.473437	6515135.718	236462.8045	23646280.45
3	681.0253	667404.794	12	8008857.53	5115.710155	5797407.595	219570.7835	21957078.35
4	681.0253	667404.794	16	10678476.7	6820.946874	5093321.366	202678.7625	20267876.25
5	681.0253	667404.794	20	13348095.9	8526.183592	4409697.978	185786.7415	18578674.15
6	648.58125	635609.625	24	15254631	9743.995376	3753358.376	168894.7205	16889472.05
7	648.58125	635609.625	28	17797069.5	11367.99461	3131123.51	152002.6995	15200269.95
8	648.58125	635609.625	32	20339508	12991.99383	2547864.625	135110.6785	13511067.85
9	648.58125	635609.625	36	22881946.5	14615.99306	2010077.718	118218.6575	11821865.75
10	610.7298	598515.204	40	23940608.2	15292.22013	1524258.786	101326.6365	10132663.65
11	610.7298	598515.204	44	26334669	16821.44214	1096903.827	84434.6155	8443461.55
12	610.7298	598515.204	48	28728729.8	18350.66415	730717.7485	67542.5945	6754259.45
13	610.7298	598515.204	52	31122790.6	19879.88617	431817.4384	50650.5735	5065057.35
14	610.7298	598515.204	56	33516851.4	21409.10818	206319.785	33758.55252	3375855.252
15	401.64715	393614.207	60	23616852.4	15085.41903	60341.67612	16866.55648	1686655.648
		9233857.53		283450763	**181056.03**	**44547705.99**	**2026660.202**	**202666020.2**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	6659731.128	138056.379	13805637.9
2	681.0253	667404.794	8	5339238.35	3550.131088	5966632.637	128851.6933	12885169.33
3	681.0253	667404.794	12	8008857.53	5325.196632	5280296.151	119647.0075	11964700.75
4	681.0253	667404.794	16	10678476.7	7100.262176	4608160.19	110442.3218	11044232.18
5	681.0253	667404.794	20	13348095.9	8875.32772	3957325.015	101237.636	10123763.6
6	648.58125	635609.625	24	15254631	10143.00846	3334890.889	92032.95027	9203295.027
7	648.58125	635609.625	28	17797069.5	11833.50986	2747958.074	82828.26452	8282826.452
8	648.58125	635609.625	32	20339508	13524.01127	2201597.293	73623.57876	7362357.876
9	648.58125	635609.625	36	22881946.5	15214.51268	1702570.551	64418.89301	6441889.301
10	610.7298	598515.204	40	23940608.2	15918.431	1257639.854	55214.20726	5521420.726
11	610.7298	598515.204	44	26334669	17510.2741	873567.2078	46009.52151	4600952.151
12	610.7298	598515.204	48	28728729.8	19102.1172	553168.2858	36804.83576	3680483.576
13	610.7298	598515.204	52	31122790.6	20693.9603	302810.4601	27600.15	2760015
14	366.43788	359109.122	56	20110110.9	13371.48204	128861.1032	18395.46427	1839546.427
15	240.98829	236168.524	60	14170111.5	9421.896883	37687.58753	9190.801199	919080.1199
		8837005.76		260597282	**173274.6228**	**39612896.43**	**1104353.704**	**110435370.4**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	6105819.253	119515.0131	11951501.31
2	681.0253	667404.794	8	5339238.35	3697.454201	5450274.657	111546.5445	11154654.45
3	681.0253	667404.794	12	8008857.53	5546.181302	4801772.676	103578.0758	10357807.58
4	681.0253	667404.794	16	10678476.7	7394.908403	4168060.511	95609.60723	9560960.723
5	681.0253	667404.794	20	13348095.9	9243.635503	3556533.072	87641.1386	8764113.86
6	648.58125	635609.625	24	15254631	10563.92237	2974585.266	79672.66998	7967266.998
7	648.58125	635609.625	28	17797069.5	12324.5761	2429612.003	71704.20136	7170420.136
8	648.58125	635609.625	32	20339508	14085.22983	1926894.429	63735.73274	6373573.274
9	648.58125	635609.625	36	22881946.5	15845.88356	1473475.159	55767.26411	5576726.411
10	610.7298	598515.204	40	23940608.2	16579.01303	1076396.809	47798.79549	4779879.549
11	610.7298	598515.204	44	26334669	18236.91434	742701.9927	39830.32687	3983032.687
12	366.43788	359109.122	48	17237237.9	11936.88938	475323.2288	31861.85825	3186185.825
13	366.43788	359109.122	52	18673674.4	12931.63017	280892.1221	23893.38962	2389338.962
14	366.43788	359109.122	56	20110110.9	13926.37095	134208.5731	15924.92101	1592492.101
15	240.98829	236168.524	60	14170111.5	9812.886159	39251.54463	7956.464137	795646.4137
		8358193.6		236656674	**163886.149**	**35635801.3**	**956036.0028**	**95603600.28**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	5686612.211	104876.5396	10487653.96
2	681.0253	667404.794	8	5339238.35	3809.341983	5068621.51	97884.06783	9788406.783
3	681.0253	667404.794	12	8008857.53	5714.012975	4457886.539	90891.59612	9089159.612
4	681.0253	667404.794	16	10678476.7	7618.683966	3862388.936	83899.1244	8389912.44
5	681.0253	667404.794	20	13348095.9	9523.354958	3289747.384	76906.65268	7690665.268
6	648.58125	635609.625	24	15254631	10883.59471	2747580.569	69914.18096	6991418.096
7	648.58125	635609.625	28	17797069.5	12697.52717	2243507.173	62921.70924	6292170.924
8	648.58125	635609.625	32	20339508	14511.45962	1782968.156	55929.23753	5592923.753
9	648.58125	635609.625	36	22881946.5	16325.39207	1373219.248	48936.76581	4893676.581
10	366.43788	359109.122	40	14364364.9	10248.42396	1021516.179	41944.29409	4194429.409
11	366.43788	359109.122	44	15800801.4	11273.26636	735114.6774	34951.82237	3495182.237
12	366.43788	359109.122	48	17237237.9	12298.10875	489706.8719	27959.35065	2795935.065
13	366.43788	359109.122	52	18673674.4	13322.95115	289392.1318	20966.87893	2096687.893
14	366.43788	359109.122	56	20110110.9	14347.79354	138269.8268	13974.40723	1397440.723
15	240.98829	236168.524	60	14170111.5	10109.83157	40439.32629	6981.945793	698194.5793
		7879381.44		216546563	**154497.6752**	**33226970.74**	**838938.5732**	**83893857.32**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	5353358.099	96793.67742	9679367.742
2	681.0253	667404.794	8	5339238.35	3872.697343	4775248.786	90340.11985	9034011.985
3	681.0253	667404.794	12	8008857.53	5809.046014	4204515.878	83886.56228	8388656.228
4	681.0253	667404.794	16	10678476.7	7745.394686	3649273.758	77433.00471	7743300.471
5	681.0253	667404.794	20	13348095.9	9681.743357	3117267.823	70979.44714	7097944.714
6	648.58125	635609.625	24	15254631	11064.60604	2616243.467	64525.88958	6452588.958
7	648.58125	635609.625	28	17797069.5	12908.70705	2153946.083	58072.33201	5807233.201
8	389.14875	381365.775	32	12203704.8	8851.684835	1735907.125	51618.77444	5161877.444
9	389.14875	381365.775	36	13729167.9	9958.14544	1369502.994	45165.21687	4516521.687
10	366.43788	359109.122	40	14364364.9	10418.8714	1038505.602	38711.6593	3871165.93
11	366.43788	359109.122	44	15800801.4	11460.75854	747340.7928	32258.10173	3225810.173
12	366.43788	359109.122	48	17237237.9	12502.64568	497851.4688	25804.54416	2580454.416
13	366.43788	359109.122	52	18673674.4	13544.53282	294205.179	19350.98659	1935098.659
14	366.43788	359109.122	56	20110110.9	14586.41996	140569.4719	12897.42903	1289742.903
15	240.98829	236168.524	60	14170111.5	10277.974	41111.896	6443.880841	644388.0841
		7370893.74		199257981	**144527.3282**	**31734848.42**	**774281.6259**	**77428162.59**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Bucharest

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	5088152.361	90380.80578	9038080.578
2	681.0253	667404.794	8	5339238.35	3861.762083	4549924.437	84354.81625	8435481.625
3	681.0253	667404.794	12	8008857.53	5792.643124	4019052.088	78328.82672	7832882.672
4	681.0253	667404.794	16	10678476.7	7723.524165	3503626.787	72302.83719	7230283.719
5	681.0253	667404.794	20	13348095.9	9654.405206	3011372.059	66276.84766	6627684.766
6	389.14875	381365.775	24	9152778.6	6620.017878	2550011.427	60250.85813	6025085.813
7	389.14875	381365.775	28	10678241.7	7723.354191	2127268.417	54224.8686	5422486.86
8	389.14875	381365.775	32	12203704.8	8826.690505	1731005.477	48198.87907	4819887.907
9	389.14875	381365.775	36	13729167.9	9930.026818	1365635.955	42172.88954	4217288.954
10	366.43788	359109.122	40	14364364.9	10389.45184	1035573.194	36146.90001	3614690.001
11	366.43788	359109.122	44	15800801.4	11428.39702	745230.5411	30120.91048	3012091.048
12	366.43788	359109.122	48	17237237.9	12467.3422	496445.6953	24094.92095	2409492.095
13	366.43788	359109.122	52	18673674.4	13506.28739	293374.4375	18068.93142	1806893.142
14	366.43788	359109.122	56	20110110.9	14545.23257	140172.5486	12042.9419	1204294.19
15	240.98829	236168.524	60	14170111.5	10248.95229	40995.80914	6016.961107	601696.1107
		6862406.04		186037301	**134556.9811**	**30697841.23**	**722983.1948**	**72298319.48**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	4824704.955	86600.12588	8660012.588
2	681.0253	667404.794	8	5339238.35	3755.29842	4328353.41	80826.2073	8082620.73
3	681.0253	667404.794	12	8008857.53	5632.947629	3839154.657	75052.28872	7505228.872
4	408.61518	400442.876	16	6407086.02	4506.358103	3364977.097	69278.37014	6927837.014
5	408.61518	400442.876	20	8008857.53	5632.947629	2913331.328	63504.45156	6350445.156
6	389.14875	381365.775	24	9152778.6	6437.512758	2479710.992	57730.53297	5773053.297
7	389.14875	381365.775	28	10678241.7	7510.431551	2068622.445	51956.61439	5195661.439
8	389.14875	381365.775	32	12203704.8	8583.350345	1683283.95	46182.69581	4618269.581
9	389.14875	381365.775	36	13729167.9	9656.269138	1327987.181	40408.77723	4040877.723
10	366.43788	359109.122	40	14364364.9	10103.02842	1007023.814	34634.85865	3463485.865
11	366.43788	359109.122	44	15800801.4	11113.33126	724685.5227	28860.94007	2886094.007
12	366.43788	359109.122	48	17237237.9	12123.6341	482759.3454	23087.02149	2308702.149
13	366.43788	359109.122	52	18673674.4	13133.93694	285286.4931	17313.10291	1731310.291
14	366.43788	359109.122	56	20110110.9	14144.23978	136308.1772	11539.18433	1153918.433
15	240.98829	236168.524	60	14170111.5	9966.402253	39865.60901	5765.274114	576527.4114
		6328482.2		176426672	**124087.8863**	**29506054.98**	**692740.4456**	**69274044.56**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	7239359.838	92815.82988	9281582.988
2	681.0253	667404.794	8	5339238.35	3410.473437	6515135.718	86627.51434	8662751.434
3	681.0253	667404.794	12	8008857.53	5115.710155	5797407.595	80439.19879	8043919.879
4	681.0253	667404.794	16	10678476.7	6820.946874	5093321.366	74250.88325	7425088.325
5	681.0253	667404.794	20	13348095.9	8526.183592	4409697.978	68062.56771	6806256.771
6	648.58125	635609.625	24	15254631	9743.995376	3753358.376	61874.25216	6187425.216
7	648.58125	635609.625	28	17797069.5	11367.99461	3131123.51	55685.93662	5568593.662
8	648.58125	635609.625	32	20339508	12991.99383	2547864.625	49497.62108	4949762.108
9	648.58125	635609.625	36	22881946.5	14615.99306	2010077.718	43309.30553	4330930.553
10	610.7298	598515.204	40	23940608.2	15292.22013	1524258.786	37120.98999	3712098.999
11	610.7298	598515.204	44	26334669	16821.44214	1096903.827	30932.67445	3093267.445
12	610.7298	598515.204	48	28728729.8	18350.66415	730717.7485	24744.3589	2474435.89
13	610.7298	598515.204	52	31122790.6	19879.88617	431817.4384	18556.04336	1855604.336
14	610.7298	598515.204	56	33516851.4	21409.10818	206319.785	12367.72782	1236772.782
15	401.64715	393614.207	60	23616852.4	15085.41903	60341.67612	6179.419708	617941.9708
		9233857.53		283450763	**181056.03**	**44547705.99**	**742464.3236**	**74246432.36**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	6659731.128	64422.84295	6442284.295
2	681.0253	667404.794	8	5339238.35	3550.131088	5966632.637	60127.56611	6012756.611
3	681.0253	667404.794	12	8008857.53	5325.196632	5280296.151	55832.28927	5583228.927
4	681.0253	667404.794	16	10678476.7	7100.262176	4608160.19	51537.01244	5153701.244
5	681.0253	667404.794	20	13348095.9	8875.32772	3957325.015	47241.7356	4724173.56
6	648.58125	635609.625	24	15254631	10143.00846	3334890.889	42946.45876	4294645.876
7	648.58125	635609.625	28	17797069.5	11833.50986	2747958.074	38651.18192	3865118.192
8	648.58125	635609.625	32	20339508	13524.01127	2201597.293	34355.90509	3435590.509
9	648.58125	635609.625	36	22881946.5	15214.51268	1702570.551	30060.62825	3006062.825
10	610.7298	598515.204	40	23940608.2	15918.431	1257639.854	25765.35141	2576535.141
11	610.7298	598515.204	44	26334669	17510.2741	873567.2078	21470.07457	2147007.457
12	610.7298	598515.204	48	28728729.8	19102.1172	553168.2858	17174.79773	1717479.773
13	610.7298	598515.204	52	31122790.6	20693.9603	302810.4601	12879.5209	1287952.09
14	366.43788	359109.122	56	20110110.9	13371.48204	128861.1032	8584.244066	858424.4066
15	240.98829	236168.524	60	14170111.5	9421.896883	37687.58753	4288.976654	428897.6654
		8837005.76		260597282	**173274.6228**	**39612896.43**	**515338.5857**	**51533858.57**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	6105819.253	68834.14534	6883414.534
2	681.0253	667404.794	8	5339238.35	3697.454201	5450274.657	64244.76583	6424476.583
3	681.0253	667404.794	12	8008857.53	5546.181302	4801772.676	59655.38631	5965538.631
4	681.0253	667404.794	16	10678476.7	7394.908403	4168060.511	55066.00679	5506600.679
5	681.0253	667404.794	20	13348095.9	9243.635503	3556533.072	50476.62728	5047662.728
6	648.58125	635609.625	24	15254631	10563.92237	2974585.266	45887.24776	4588724.776
7	648.58125	635609.625	28	17797069.5	12324.5761	2429612.003	41297.86825	4129786.825
8	648.58125	635609.625	32	20339508	14085.22983	1926894.429	36708.48873	3670848.873
9	648.58125	635609.625	36	22881946.5	15845.88356	1473475.159	32119.10922	3211910.922
10	610.7298	598515.204	40	23940608.2	16579.01303	1076396.809	27529.7297	2752972.97
11	610.7298	598515.204	44	26334669	18236.91434	742701.9927	22940.35018	2294035.018
12	366.43788	359109.122	48	17237237.9	11936.88938	475323.2288	18350.97067	1835097.067
13	366.43788	359109.122	52	18673674.4	12931.63017	280892.1221	13761.59115	1376159.115
14	366.43788	359109.122	56	20110110.9	13926.37095	134208.5731	9172.21164	917221.164
15	240.98829	236168.524	60	14170111.5	9812.886159	39251.54463	4582.83773	458283.773
		8358193.6		236656674	**163886.149**	**35635801.3**	**550627.3366**	**55062733.66**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	5686612.211	71230.70812	7123070.812
2	681.0253	667404.794	8	5339238.35	3809.341983	5068621.51	66481.54077	6648154.077
3	681.0253	667404.794	12	8008857.53	5714.012975	4457886.539	61732.37342	6173237.342
4	681.0253	667404.794	16	10678476.7	7618.683966	3862388.936	56983.20606	5698320.606
5	681.0253	667404.794	20	13348095.9	9523.354958	3289747.384	52234.03871	5223403.871
6	648.58125	635609.625	24	15254631	10883.59471	2747580.569	47484.87136	4748487.136
7	648.58125	635609.625	28	17797069.5	12697.52717	2243507.173	42735.704	4273570.4
8	648.58125	635609.625	32	20339508	14511.45962	1782968.156	37986.53665	3798653.665
9	648.58125	635609.625	36	22881946.5	16325.39207	1373219.248	33237.3693	3323736.93
10	366.43788	359109.122	40	14364364.9	10248.42396	1021516.179	28488.20194	2848820.194
11	366.43788	359109.122	44	15800801.4	11273.26636	735114.6774	23739.03459	2373903.459
12	366.43788	359109.122	48	17237237.9	12298.10875	489706.8719	18989.86724	1898986.724
13	366.43788	359109.122	52	18673674.4	13322.95115	289392.1318	14240.69989	1424069.989
14	366.43788	359109.122	56	20110110.9	14347.79354	138269.8268	9491.532537	949153.2537
15	240.98829	236168.524	60	14170111.5	10109.83157	40439.32629	4742.371055	474237.1055
		7879381.44		216546563	**154497.6752**	**33226970.74**	**569798.0556**	**56979805.56**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	5353358.099	70873.37293	7087337.293
2	681.0253	667404.794	8	5339238.35	3872.697343	4775248.786	66148.02381	6614802.381
3	681.0253	667404.794	12	8008857.53	5809.046014	4204515.878	61422.67469	6142267.469
4	681.0253	667404.794	16	10678476.7	7745.394686	3649273.758	56697.32557	5669732.557
5	681.0253	667404.794	20	13348095.9	9681.743357	3117267.823	51971.97646	5197197.646
6	648.58125	635609.625	24	15254631	11064.60604	2616243.467	47246.62734	4724662.734
7	648.58125	635609.625	28	17797069.5	12908.70705	2153946.083	42521.27822	4252127.822
8	389.14875	381365.775	32	12203704.8	8851.684835	1735907.125	37795.9291	3779592.91
9	389.14875	381365.775	36	13729167.9	9958.14544	1369502.994	33070.57999	3307057.999
10	366.43788	359109.122	40	14364364.9	10418.8714	1038505.602	28345.23087	2834523.087
11	366.43788	359109.122	44	15800801.4	11460.75854	747340.7928	23619.88175	2361988.175
12	366.43788	359109.122	48	17237237.9	12502.64568	497851.4688	18894.53263	1889453.263
13	366.43788	359109.122	52	18673674.4	13544.53282	294205.179	14169.18352	1416918.352
14	366.43788	359109.122	56	20110110.9	14586.41996	140569.4719	9443.834403	944383.4403
15	240.98829	236168.524	60	14170111.5	10277.974	41111.896	4718.491393	471849.1393
		7370893.74		199257981	**144527.3282**	**31734848.42**	**566938.9427**	**56693894.27**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa El Centro

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	5088152.361	72209.15481	7220915.481
2	681.0253	667404.794	8	5339238.35	3861.762083	4549924.437	67394.7454	6739474.54
3	681.0253	667404.794	12	8008857.53	5792.643124	4019052.088	62580.33598	6258033.598
4	681.0253	667404.794	16	10678476.7	7723.524165	3503626.787	57765.92656	5776592.656
5	681.0253	667404.794	20	13348095.9	9654.405206	3011372.059	52951.51714	5295151.714
6	389.14875	381365.775	24	9152778.6	6620.017878	2550011.427	48137.10772	4813710.772
7	389.14875	381365.775	28	10678241.7	7723.354191	2127268.417	43322.6983	4332269.83
8	389.14875	381365.775	32	12203704.8	8826.690505	1731005.477	38508.28889	3850828.889
9	389.14875	381365.775	36	13729167.9	9930.026818	1365635.955	33693.87947	3369387.947
10	366.43788	359109.122	40	14364364.9	10389.45184	1035573.194	28879.47005	2887947.005
11	366.43788	359109.122	44	15800801.4	11428.39702	745230.5411	24065.06063	2406506.063
12	366.43788	359109.122	48	17237237.9	12467.3422	496445.6953	19250.65121	1925065.121
13	366.43788	359109.122	52	18673674.4	13506.28739	293374.4375	14436.2418	1443624.18
14	366.43788	359109.122	56	20110110.9	14545.23257	140172.5486	9621.832384	962183.2384
15	240.98829	236168.524	60	14170111.5	10248.95229	40995.80914	4807.42918	480742.918
		6862406.04		186037301	**134556.9811**	**30697841.23**	**577624.3395**	**57762433.95**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	4824704.955	89082.57212	8908257.212
2	681.0253	667404.794	8	5339238.35	3755.29842	4328353.41	83143.20091	8314320.091
3	681.0253	667404.794	12	8008857.53	5632.947629	3839154.657	77203.82969	7720382.969
4	408.61518	400442.876	16	6407086.02	4506.358103	3364977.097	71264.45848	7126445.848
5	408.61518	400442.876	20	8008857.53	5632.947629	2913331.328	65325.08726	6532508.726
6	389.14875	381365.775	24	9152778.6	6437.512758	2479710.992	59385.71605	5938571.605
7	389.14875	381365.775	28	10678241.7	7510.431551	2068622.445	53446.34483	5344634.483
8	389.14875	381365.775	32	12203704.8	8583.350345	1683283.95	47506.97362	4750697.362
9	389.14875	381365.775	36	13729167.9	9656.269138	1327987.181	41567.6024	4156760.24
10	366.43788	359109.122	40	14364364.9	10103.02842	1007023.814	35628.23119	3562823.119
11	366.43788	359109.122	44	15800801.4	11113.33126	724685.5227	29688.85997	2968885.997
12	366.43788	359109.122	48	17237237.9	12123.6341	482759.3454	23749.48876	2374948.876
13	366.43788	359109.122	52	18673674.4	13133.93694	285286.4931	17810.11754	1781011.754
14	366.43788	359109.122	56	20110110.9	14144.23978	136308.1772	11870.74633	1187074.633
15	240.98829	236168.524	60	14170111.5	9966.402253	39865.60901	5931.381276	593138.1276
		6328482.2		176426672	**124087.8863**	**29506054.98**	**712604.6104**	**71260461.04**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	7239359.838	151349.2358	15134923.58
2	681.0253	667404.794	8	5339238.35	3410.473437	6515135.718	141258.3804	14125838.04
3	681.0253	667404.794	12	8008857.53	5115.710155	5797407.595	131167.5249	13116752.49
4	681.0253	667404.794	16	10678476.7	6820.946874	5093321.366	121076.6694	12107666.94
5	681.0253	667404.794	20	13348095.9	8526.183592	4409697.978	110985.8139	11098581.39
6	648.58125	635609.625	24	15254631	9743.995376	3753358.376	100894.9584	10089495.84
7	648.58125	635609.625	28	17797069.5	11367.99461	3131123.51	90804.10297	9080410.297
8	648.58125	635609.625	32	20339508	12991.99383	2547864.625	80713.24749	8071324.749
9	648.58125	635609.625	36	22881946.5	14615.99306	2010077.718	70622.39201	7062239.201
10	610.7298	598515.204	40	23940608.2	15292.22013	1524258.786	60531.53653	6053153.653
11	610.7298	598515.204	44	26334669	16821.44214	1096903.827	50440.68105	5044068.105
12	610.7298	598515.204	48	28728729.8	18350.66415	730717.7485	40349.82557	4034982.557
13	610.7298	598515.204	52	31122790.6	19879.88617	431817.4384	30258.9701	3025897.01
14	610.7298	598515.204	56	33516851.4	21409.10818	206319.785	20168.11462	2016811.462
15	401.64715	393614.207	60	23616852.4	15085.41903	60341.67612	10077.26894	1007726.894
		9233857.53		283450763	**181056.03**	**44547705.99**	**1210698.722**	**121069872.2**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	6659731.128	97809.32496	9780932.496
2	681.0253	667404.794	8	5339238.35	3550.131088	5966632.637	91288.11121	9128811.121
3	681.0253	667404.794	12	8008857.53	5325.196632	5280296.151	84766.89745	8476689.745
4	681.0253	667404.794	16	10678476.7	7100.262176	4608160.19	78245.6837	7824568.37
5	681.0253	667404.794	20	13348095.9	8875.32772	3957325.015	71724.46994	7172446.994
6	648.58125	635609.625	24	15254631	10143.00846	3334890.889	65203.25619	6520325.619
7	648.58125	635609.625	28	17797069.5	11833.50986	2747958.074	58682.04243	5868204.243
8	648.58125	635609.625	32	20339508	13524.01127	2201597.293	52160.82868	5216082.868
9	648.58125	635609.625	36	22881946.5	15214.51268	1702570.551	45639.61493	4563961.493
10	610.7298	598515.204	40	23940608.2	15918.431	1257639.854	39118.40117	3911840.117
11	610.7298	598515.204	44	26334669	17510.2741	873567.2078	32597.18742	3259718.742
12	610.7298	598515.204	48	28728729.8	19102.1172	553168.2858	26075.97366	2607597.366
13	610.7298	598515.204	52	31122790.6	20693.9603	302810.4601	19554.75991	1955475.991
14	366.43788	359109.122	56	20110110.9	13371.48204	128861.1032	13033.54616	1303354.616
15	240.98829	236168.524	60	14170111.5	9421.896883	37687.58753	6512.343562	651234.3562
		8837005.76		260597282	**173274.6228**	**39612896.43**	**782412.4414**	**78241244.14**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	6105819.253	107110.9928	10711099.28
2	681.0253	667404.794	8	5339238.35	3697.454201	5450274.657	99969.59282	9996959.282
3	681.0253	667404.794	12	8008857.53	5546.181302	4801772.676	92828.19286	9282819.286
4	681.0253	667404.794	16	10678476.7	7394.908403	4168060.511	85686.79289	8568679.289
5	681.0253	667404.794	20	13348095.9	9243.635503	3556533.072	78545.39293	7854539.293
6	648.58125	635609.625	24	15254631	10563.92237	2974585.266	71403.99296	7140399.296
7	648.58125	635609.625	28	17797069.5	12324.5761	2429612.003	64262.593	6426259.3
8	648.58125	635609.625	32	20339508	14085.22983	1926894.429	57121.19303	5712119.303
9	648.58125	635609.625	36	22881946.5	15845.88356	1473475.159	49979.79307	4997979.307
10	610.7298	598515.204	40	23940608.2	16579.01303	1076396.809	42838.3931	4283839.31
11	610.7298	598515.204	44	26334669	18236.91434	742701.9927	35696.99314	3569699.314
12	366.43788	359109.122	48	17237237.9	11936.88938	475323.2288	28555.59317	2855559.317
13	366.43788	359109.122	52	18673674.4	12931.63017	280892.1221	21414.19321	2141419.321
14	366.43788	359109.122	56	20110110.9	13926.37095	134208.5731	14272.79325	1427279.325
15	240.98829	236168.524	60	14170111.5	9812.886159	39251.54463	7131.401361	713140.1361
		8358193.6		236656674	**163886.149**	**35635801.3**	**856817.9036**	**85681790.36**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1623.999229	7239359.838	151349.2358	15134923.58
2	681.0253	667404.794	8	5339238.35	3410.473437	6515135.718	141258.3804	14125838.04
3	681.0253	667404.794	12	8008857.53	5115.710155	5797407.595	131167.5249	13116752.49
4	681.0253	667404.794	16	10678476.7	6820.946874	5093321.366	121076.6694	12107666.94
5	681.0253	667404.794	20	13348095.9	8526.183592	4409697.978	110985.8139	11098581.39
6	648.58125	635609.625	24	15254631	9743.995376	3753358.376	100894.9584	10089495.84
7	648.58125	635609.625	28	17797069.5	11367.99461	3131123.51	90804.10297	9080410.297
8	648.58125	635609.625	32	20339508	12991.99383	2547864.625	80713.24749	8071324.749
9	648.58125	635609.625	36	22881946.5	14615.99306	2010077.718	70622.39201	7062239.201
10	610.7298	598515.204	40	23940608.2	15292.22013	1524258.786	60531.53653	6053153.653
11	610.7298	598515.204	44	26334669	16821.44214	1096903.827	50440.68105	5044068.105
12	610.7298	598515.204	48	28728729.8	18350.66415	730717.7485	40349.82557	4034982.557
13	610.7298	598515.204	52	31122790.6	19879.88617	431817.4384	30258.9701	3025897.01
14	610.7298	598515.204	56	33516851.4	21409.10818	206319.785	20168.11462	2016811.462
15	401.64715	393614.207	60	23616852.4	15085.41903	60341.67612	10077.26894	1007726.894
		9233857.53		283450763	**181056.03**	**44547705.99**	**1210698.722**	**121069872.2**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1690.501409	6659731.128	97809.32496	9780932.496
2	681.0253	667404.794	8	5339238.35	3550.131088	5966632.637	91288.11121	9128811.121
3	681.0253	667404.794	12	8008857.53	5325.196632	5280296.151	84766.89745	8476689.745
4	681.0253	667404.794	16	10678476.7	7100.262176	4608160.19	78245.6837	7824568.37
5	681.0253	667404.794	20	13348095.9	8875.32772	3957325.015	71724.46994	7172446.994
6	648.58125	635609.625	24	15254631	10143.00846	3334890.889	65203.25619	6520325.619
7	648.58125	635609.625	28	17797069.5	11833.50986	2747958.074	58682.04243	5868204.243
8	648.58125	635609.625	32	20339508	13524.01127	2201597.293	52160.82868	5216082.868
9	648.58125	635609.625	36	22881946.5	15214.51268	1702570.551	45639.61493	4563961.493
10	610.7298	598515.204	40	23940608.2	15918.431	1257639.854	39118.40117	3911840.117
11	610.7298	598515.204	44	26334669	17510.2741	873567.2078	32597.18742	3259718.742
12	610.7298	598515.204	48	28728729.8	19102.1172	553168.2858	26075.97366	2607597.366
13	610.7298	598515.204	52	31122790.6	20693.9603	302810.4601	19554.75991	1955475.991
14	366.43788	359109.122	56	20110110.9	13371.48204	128861.1032	13033.54616	1303354.616
15	240.98829	236168.524	60	14170111.5	9421.896883	37687.58753	6512.343562	651234.3562
		8837005.76		260597282	**173274.6228**	**39612896.43**	**782412.4414**	**78241244.14**

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1760.653729	6105819.253	107110.9928	10711099.28
2	681.0253	667404.794	8	5339238.35	3697.454201	5450274.657	99969.59282	9996959.282
3	681.0253	667404.794	12	8008857.53	5546.181302	4801772.676	92828.19286	9282819.286
4	681.0253	667404.794	16	10678476.7	7394.908403	4168060.511	85686.79289	8568679.289
5	681.0253	667404.794	20	13348095.9	9243.635503	3556533.072	78545.39293	7854539.293
6	648.58125	635609.625	24	15254631	10563.92237	2974585.266	71403.99296	7140399.296
7	648.58125	635609.625	28	17797069.5	12324.5761	2429612.003	64262.593	6426259.3
8	648.58125	635609.625	32	20339508	14085.22983	1926894.429	57121.19303	5712119.303
9	648.58125	635609.625	36	22881946.5	15845.88356	1473475.159	49979.79307	4997979.307
10	610.7298	598515.204	40	23940608.2	16579.01303	1076396.809	42838.3931	4283839.31
11	610.7298	598515.204	44	26334669	18236.91434	742701.9927	35696.99314	3569699.314
12	366.43788	359109.122	48	17237237.9	11936.88938	475323.2288	28555.59317	2855559.317
13	366.43788	359109.122	52	18673674.4	12931.63017	280892.1221	21414.19321	2141419.321
14	366.43788	359109.122	56	20110110.9	13926.37095	134208.5731	14272.79325	1427279.325
15	240.98829	236168.524	60	14170111.5	9812.886159	39251.54463	7131.401361	713140.1361
		8358193.6		236656674	**163886.149**	**35635801.3**	**856817.9036**	**85681790.36**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Gilroy

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1838.893855	5088152.361	124423.4534	12442345.34
2	681.0253	667404.794	8	5339238.35	3861.762083	4549924.437	116127.7816	11612778.16
3	681.0253	667404.794	12	8008857.53	5792.643124	4019052.088	107832.1097	10783210.97
4	681.0253	667404.794	16	10678476.7	7723.524165	3503626.787	99536.43781	9953643.781
5	681.0253	667404.794	20	13348095.9	9654.405206	3011372.059	91240.76593	9124076.593
6	389.14875	381365.775	24	9152778.6	6620.017878	2550011.427	82945.09405	8294509.405
7	389.14875	381365.775	28	10678241.7	7723.354191	2127268.417	74649.42217	7464942.217
8	389.14875	381365.775	32	12203704.8	8826.690505	1731005.477	66353.75029	6635375.029
9	389.14875	381365.775	36	13729167.9	9930.026818	1365635.955	58058.07841	5805807.841
10	366.43788	359109.122	40	14364364.9	10389.45184	1035573.194	49762.40654	4976240.654
11	366.43788	359109.122	44	15800801.4	11428.39702	745230.5411	41466.73466	4146673.466
12	366.43788	359109.122	48	17237237.9	12467.3422	496445.6953	33171.06278	3317106.278
13	366.43788	359109.122	52	18673674.4	13506.28739	293374.4375	24875.3909	2487539.09
14	366.43788	359109.122	56	20110110.9	14545.23257	140172.5486	16579.71903	1657971.903
15	240.98829	236168.524	60	14170111.5	10248.95229	40995.80914	8284.056622	828405.6622
		6862406.04		186037301	**134556.9811**	**30697841.23**	**995306.2639**	**99530626.39**

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1788.197988	4824704.955	119477.1738	11947717.38
2	681.0253	667404.794	8	5339238.35	3755.29842	4328353.41	111511.286	11151128.6
3	681.0253	667404.794	12	8008857.53	5632.947629	3839154.657	103545.3981	10354539.81
4	408.61518	400442.876	16	6407086.02	4506.358103	3364977.097	95579.51023	9557951.023
5	408.61518	400442.876	20	8008857.53	5632.947629	2913331.328	87613.62237	8761362.237
6	389.14875	381365.775	24	9152778.6	6437.512758	2479710.992	79647.73451	7964773.451
7	389.14875	381365.775	28	10678241.7	7510.431551	2068622.445	71681.84665	7168184.665
8	389.14875	381365.775	32	12203704.8	8583.350345	1683283.95	63715.95879	6371595.879
9	389.14875	381365.775	36	13729167.9	9656.269138	1327987.181	55750.07093	5575007.093
10	366.43788	359109.122	40	14364364.9	10103.02842	1007023.814	47784.18307	4778418.307
11	366.43788	359109.122	44	15800801.4	11113.33126	724685.5227	39818.29522	3981829.522
12	366.43788	359109.122	48	17237237.9	12123.6341	482759.3454	31852.40736	3185240.736
13	366.43788	359109.122	52	18673674.4	13133.93694	285286.4931	23886.5195	2388651.95
14	366.43788	359109.122	56	20110110.9	14144.23978	136308.1772	15920.63164	1592063.164
15	240.98829	236168.524	60	14170111.5	9966.402253	39865.60901	7954.752823	795475.2823
		6328482.2		176426672	**124087.8863**	**29506054.98**	**955739.391**	**95573939.1**

Tabel 22 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 15 Akibat Gempa Koyna

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1813.932452	5686612.211	69653.3648	6965336.48
2	681.0253	667404.794	8	5339238.35	3809.341983	5068621.51	65009.3543	6500935.43
3	681.0253	667404.794	12	8008857.53	5714.012975	4457886.539	60365.34379	6036534.379
4	681.0253	667404.794	16	10678476.7	7618.683966	3862388.936	55721.33329	5572133.329
5	681.0253	667404.794	20	13348095.9	9523.354958	3289747.384	51077.32278	5107732.278
6	648.58125	635609.625	24	15254631	10883.59471	2747580.569	46433.31228	4643331.228
7	648.58125	635609.625	28	17797069.5	12697.52717	2243507.173	41789.30177	4178930.177
8	648.58125	635609.625	32	20339508	14511.45962	1782968.156	37145.29127	3714529.127
9	648.58125	635609.625	36	22881946.5	16325.39207	1373219.248	32501.28076	3250128.076
10	366.43788	359109.122	40	14364364.9	10248.42396	1021516.179	27857.27026	2785727.026
11	366.43788	359109.122	44	15800801.4	11273.26636	735114.6774	23213.25975	2321325.975
12	366.43788	359109.122	48	17237237.9	12298.10875	489706.8719	18569.24925	1856924.925
13	366.43788	359109.122	52	18673674.4	13322.95115	289392.1318	13925.23874	1392523.874
14	366.43788	359109.122	56	20110110.9	14347.79354	138269.8268	9281.228242	928122.8242
15	240.98829	236168.524	60	14170111.5	10109.83157	40439.32629	4637.223822	463722.3822
		7879381.44		216546563	**154497.6752**	**33226970.74**	**557179.3751**	**55717937.51**

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1844.101007	5353358.099	65688.09195	6568809.195
2	681.0253	667404.794	8	5339238.35	3872.697343	4775248.786	61308.47985	6130847.985
3	681.0253	667404.794	12	8008857.53	5809.046014	4204515.878	56928.86775	5692886.775
4	681.0253	667404.794	16	10678476.7	7745.394686	3649273.758	52549.25565	5254925.565
5	681.0253	667404.794	20	13348095.9	9681.743357	3117267.823	48169.64355	4816964.355
6	648.58125	635609.625	24	15254631	11064.60604	2616243.467	43790.03144	4379003.144
7	648.58125	635609.625	28	17797069.5	12908.70705	2153946.083	39410.41934	3941041.934
8	389.14875	381365.775	32	12203704.8	8851.684835	1735907.125	35030.80724	3503080.724
9	389.14875	381365.775	36	13729167.9	9958.14544	1369502.994	30651.19514	3065119.514
10	366.43788	359109.122	40	14364364.9	10418.8714	1038505.602	26271.58304	2627158.304
11	366.43788	359109.122	44	15800801.4	11460.75854	747340.7928	21891.97094	2189197.094
12	366.43788	359109.122	48	17237237.9	12502.64568	497851.4688	17512.35883	1751235.883
13	366.43788	359109.122	52	18673674.4	13544.53282	294205.179	13132.74673	1313274.673
14	366.43788	359109.122	56	20110110.9	14586.41996	140569.4719	8753.134635	875313.4635
15	240.98829	236168.524	60	14170111.5	10277.974	41111.896	4373.527491	437352.7491
		7370893.74		199257981	**144527.3282**	**31734848.42**	**525462.1136**	**52546211.36**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	9780348.249	440499.5795	44049957.95
2	681.0253	667404.794	8	5339238.352	1939.854608	9042754.936	418472.9345	41847293.45
3	681.0253	667404.794	12	8008857.528	2909.781912	8308856.502	396446.2895	39644628.95
4	681.0253	667404.794	16	10678476.7	3879.709217	7582717.487	374419.6445	37441964.45
5	681.0253	667404.794	20	13348095.88	4849.636521	6868217.599	352392.9995	35239299.95
6	681.0253	667404.794	24	16017715.06	5819.563825	6169236.549	330366.3545	33036635.45
7	681.0253	667404.794	28	18687334.23	6789.491129	5489654.044	308339.7095	30833970.95
8	681.0253	667404.794	32	21356953.41	7759.418433	4833349.795	286313.0644	28631306.44
9	681.0253	667404.794	36	24026572.58	8729.345737	4204203.51	264286.4194	26428641.94
10	648.58125	635609.625	40	25424385	9237.199607	3606094.899	242259.7744	24225977.44
11	648.58125	635609.625	44	27966823.5	10160.91957	3042903.671	220233.1294	22023312.94
12	648.58125	635609.625	48	30509262	11084.63953	2516661.241	198206.4844	19820648.44
13	648.58125	635609.625	52	33051700.5	12008.35949	2031062.49	176179.8394	17617983.94
14	648.58125	635609.625	56	35594139	12932.07945	1589802.297	154153.1943	15415319.43
15	610.7298	598515.204	60	35910912.24	13047.16965	1196575.541	132126.5493	13212654.93
16	610.7298	598515.204	64	38304973.06	13916.98096	855077.1037	110099.9043	11009990.43
17	610.7298	598515.204	68	40699033.87	14786.79227	565767.3448	88073.25929	8807325.929
18	610.7298	598515.204	72	43093094.69	15656.60358	332125.5097	66046.61427	6604661.427
19	610.7298	598515.204	76	45487155.5	16526.41489	157630.8437	44019.96929	4401996.929
20	401.64715	393614.207	80	31489136.56	11440.64802	45762.59207	21993.35706	2199335.706
		12539086.3		507536298.2	**184398.3284**	**78218802.2**	**4624929.071**	**462492907.1**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	9187145.087	269238.7524	26923875.24
2	681.0253	667404.794	8	5339238.352	1999.779701	8472895.995	255775.793	25577579.3
3	681.0253	667404.794	12	8008857.528	2999.669552	7762455.923	242312.8336	24231283.36
4	681.0253	667404.794	16	10678476.7	3999.559403	7060014.97	228849.8742	22884987.42
5	681.0253	667404.794	20	13348095.88	4999.449254	6369572.695	215386.9148	21538691.48
6	681.0253	667404.794	24	16017715.06	5999.339104	5695128.658	201923.9554	20192395.54
7	681.0253	667404.794	28	18687334.23	6999.228955	5040682.418	188460.996	18846099.6
8	681.0253	667404.794	32	21356953.41	7999.118806	4410233.535	174998.0366	17499803.66
9	681.0253	667404.794	36	24026572.58	8999.008656	3807781.567	161535.0772	16153507.72
10	648.58125	635609.625	40	25424385	9522.550913	3237326.074	148072.1178	14807211.78
11	648.58125	635609.625	44	27966823.5	10474.806	2702866.616	134609.1583	13460915.83
12	648.58125	635609.625	48	30509262	11427.0611	2206497.362	121146.1989	12114619.89
13	648.58125	635609.625	52	33051700.5	12379.31619	1752027.332	107683.2395	10768323.95
14	648.58125	635609.625	56	35594139	13331.57128	1343265.546	94220.28012	9422028.012
15	610.7298	598515.204	60	35910912.24	13450.2168	984021.0249	80757.32072	8075732.072
16	610.7298	598515.204	64	38304973.06	14346.89792	678102.7889	67294.36131	6729436.131
17	610.7298	598515.204	68	40699033.87	15243.57904	425985.42	53831.4019	5383140.19
18	610.7298	598515.204	72	43093094.69	16140.26015	231255.6428	40368.44249	4036844.249
19	366.43788	359109.122	76	27292293.3	10222.16476	97500.18179	26905.48312	2690548.312
20	240.98829	236168.524	80	18893481.94	7076.440341	28305.76136	13442.5574	1344255.74
		12142234.6		476745781.3	**178562.273**	**71493064.6**	**2826812.795**	**282681279.5**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	7666820.488	268542.2645	26854226.45
2	681.0253	667404.794	8	5339238.352	2171.210207	7038813.28	255114.1326	25511413.26
3	681.0253	667404.794	12	8008857.528	3256.815311	6414941.619	241686.0006	24168600.06
4	681.0253	667404.794	16	10678476.7	4342.420415	5799754.799	228257.8686	22825786.86
5	681.0253	667404.794	20	13348095.88	5428.025518	5197595.241	214829.7366	21482973.66
6	681.0253	667404.794	24	16017715.06	6513.630622	4612805.364	201401.6046	20140160.46
7	681.0253	667404.794	28	18687334.23	7599.235725	4049727.589	187973.4727	18797347.27
8	681.0253	667404.794	32	21356953.41	8684.840829	3512704.336	174545.3407	17454534.07
9	681.0253	667404.794	36	24026572.58	9770.445933	3006078.027	161117.2087	16111720.87
10	648.58125	635609.625	40	25424385	10338.86869	2534191.081	147689.0767	14768907.67
11	648.58125	635609.625	44	27966823.5	11372.75556	2101385.918	134260.9448	13426094.48
12	648.58125	635609.625	48	30509262	12406.64243	1709936.231	120832.8128	12083281.28
13	389.14875	381365.775	52	19831020.3	8064.317578	1363977.565	107404.6808	10740468.08
14	389.14875	381365.775	56	21356483.4	8684.6497	1067645.47	93976.54883	9397654.883
15	366.43788	359109.122	60	21546547.34	8761.93952	803570.6443	80548.41685	8054841.685
16	366.43788	359109.122	64	22982983.83	9346.068822	574234.4177	67120.28488	6712028.488
17	366.43788	359109.122	68	24419420.32	9930.198123	379945.9491	53692.1529	5369215.29
18	366.43788	359109.122	72	25855856.81	10514.32742	223041.7559	40264.02092	4026402.092
19	366.43788	359109.122	76	27292293.3	11098.45673	105858.3552	26835.88897	2683588.897
20	240.98829	236168.524	80	18893481.94	7683.066034	30732.26414	13407.77723	1340777.723
		10676122.5		386084240	**157001.802**	**58193760.39**	**2819500.235**	**281950023.5**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	7328138.265	267094.7636	26709476.36
2	681.0253	667404.794	8	5339238.352	2201.152833	6730042.098	253739.0124	25373901.24
3	681.0253	667404.794	12	8008857.528	3301.72925	6136138.511	240383.2613	24038326.13
4	681.0253	667404.794	16	10678476.7	4402.305666	5551039.535	227027.5101	22702751.01
5	681.0253	667404.794	20	13348095.88	5502.882083	4979147.476	213671.7589	21367175.89
6	681.0253	667404.794	24	16017715.06	6603.458499	4424864.64	200316.0077	20031600.77
7	681.0253	667404.794	28	18687334.23	7704.034916	3892593.332	186960.2565	18696025.65
8	681.0253	667404.794	32	21356953.41	8804.611333	3386735.858	173604.5054	17360450.54
9	681.0253	667404.794	36	24026572.58	9905.187749	2911694.524	160248.7542	16024875.42
10	648.58125	635609.625	40	25424385	10481.44948	2471871.635	146893.003	14689300.3
11	389.14875	381365.775	44	16780094.1	6917.75666	2071669.498	133537.2518	13353725.18
12	389.14875	381365.775	48	18305557.2	7546.643629	1713393.158	120181.5007	12018150.07
13	389.14875	381365.775	52	19831020.3	8175.530598	1382787.844	106825.7495	10682574.95
14	389.14875	381365.775	56	21356483.4	8804.417567	1082369.106	93469.99831	9346999.831
15	366.43788	359109.122	60	21546547.34	8882.773273	814652.4893	80114.24713	8011424.713
16	366.43788	359109.122	64	22982983.83	9474.958158	582153.5433	66758.49595	6675849.595
17	366.43788	359109.122	68	24419420.32	10067.14304	385185.6903	53402.74478	5340274.478
18	366.43788	359109.122	72	25855856.81	10659.32793	226117.6699	40046.9936	4004699.36
19	366.43788	359109.122	76	27292293.3	11251.51281	107318.2217	26691.24244	2669124.244
20	240.98829	236168.524	80	18893481.94	7789.021308	31156.08523	13335.51138	1333551.138
		10167634.8		362693805.8	**149524.0417**	**56209069.18**	**2804302.569**	**280430256.9**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	7042118.004	263225.6683	26322566.83
2	681.0253	667404.794	8	5339238.352	2208.780128	6474681	250063.3865	25006338.65
3	681.0253	667404.794	12	8008857.528	3313.170192	5911451.104	236901.1047	23690110.47
4	681.0253	667404.794	16	10678476.7	4417.560255	5357056.328	223738.8229	22373882.29
5	681.0253	667404.794	20	13348095.88	5521.950319	4815914.233	210576.5412	21057654.12
6	681.0253	667404.794	24	16017715.06	6626.340383	4292442.378	197414.2594	19741425.94
7	681.0253	667404.794	28	18687334.23	7730.730447	3791058.326	184251.9776	18425197.76
8	681.0253	667404.794	32	21356953.41	8835.120511	3316179.634	171089.6958	17108969.58
9	408.61518	400442.876	36	14415943.55	5963.706345	2872223.865	157927.4141	15792741.41
10	389.14875	381365.775	40	15254631	6310.661482	2463608.577	144765.1323	14476513.23
11	389.14875	381365.775	44	16780094.1	6941.72763	2078848.115	131602.8505	13160285.05
12	389.14875	381365.775	48	18305557.2	7572.793778	1719330.299	118440.5687	11844056.87
13	389.14875	381365.775	52	19831020.3	8203.859926	1387579.393	105278.287	10527828.7
14	389.14875	381365.775	56	21356483.4	8834.926074	1086119.662	92116.0052	9211600.52
15	366.43788	359109.122	60	21546547.34	8913.553293	817475.3713	78953.72343	7895372.343
16	366.43788	359109.122	64	22982983.83	9507.790179	584170.7846	65791.44165	6579144.165
17	366.43788	359109.122	68	24419420.32	10102.02707	386520.4112	52629.15988	5262915.988
18	366.43788	359109.122	72	25855856.81	10696.26395	226901.1984	39466.87811	3946687.811
19	366.43788	359109.122	76	27292293.3	11290.50084	107690.094	26304.59635	2630459.635
20	240.98829	236168.524	80	18893481.94	7816.011328	31264.04531	13142.33438	1314233.438
		9646429.07		342913422.8	**141859.251**	**54762632.82**	**2763679.848**	**276367984.8**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	6780438.046	253802.834	25380283.4
2	681.0253	667404.794	8	5339238.352	2188.764161	6244408.327	241111.7295	24111172.95
3	681.0253	667404.794	12	8008857.528	3283.146241	5712547.59	228420.625	22842062.5
4	681.0253	667404.794	16	10678476.7	4377.528322	5189441.91	215729.5205	21572952.05
5	681.0253	667404.794	20	13348095.88	5471.910402	4679468.814	203038.4159	20303841.59
6	681.0253	667404.794	24	16017715.06	6566.292482	4187005.832	190347.3114	19034731.14
7	408.61518	400442.876	28	11212400.54	4596.404738	3716430.492	177656.2069	17765620.69
8	408.61518	400442.876	32	12814172.04	5253.033986	3272120.322	164965.1024	16496510.24
9	408.61518	400442.876	36	14415943.55	5909.663234	2846195.77	152273.9978	15227399.78
10	389.14875	381365.775	40	15254631	6253.474263	2441283.354	139582.8933	13958289.33
11	389.14875	381365.775	44	16780094.1	6878.821689	2060009.592	126891.7888	12689178.88
12	389.14875	381365.775	48	18305557.2	7504.169116	1703749.726	114200.6843	11420068.43
13	389.14875	381365.775	52	19831020.3	8129.516542	1375005.147	101509.5797	10150957.97
14	389.14875	381365.775	56	21356483.4	8754.863968	1076277.245	88818.47522	8881847.522
15	366.43788	359109.122	60	21546547.34	8832.778667	810067.4089	76127.3707	7612737.07
16	366.43788	359109.122	64	22982983.83	9421.630579	578877.0286	63436.26617	6343626.617
17	366.43788	359109.122	68	24419420.32	10010.48249	383017.763	50745.16165	5074516.165
18	366.43788	359109.122	72	25855856.81	10599.3344	224845.0196	38054.05712	3805405.712
19	366.43788	359109.122	76	27292293.3	11188.18631	106714.2063	25362.95262	2536295.262
20	240.98829	236168.524	80	18893481.94	7745.182629	30980.73051	12671.8672	1267186.72
		9112505.24		326895707.7	**134007.4299**	**53418884.33**	**2664746.84**	**266474684**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	9780348.249	121091.1589	12109115.89
2	681.0253	667404.794	8	5339238.352	1939.854608	9042754.936	115036.1815	11503618.15
3	681.0253	667404.794	12	8008857.528	2909.781912	8308856.502	108981.2042	10898120.42
4	681.0253	667404.794	16	10678476.7	3879.709217	7582717.487	102926.2268	10292622.68
5	681.0253	667404.794	20	13348095.88	4849.636521	6868217.599	96871.24942	9687124.942
6	681.0253	667404.794	24	16017715.06	5819.563825	6169236.549	90816.27205	9081627.205
7	681.0253	667404.794	28	18687334.23	6789.491129	5489654.044	84761.29468	8476129.468
8	681.0253	667404.794	32	21356953.41	7759.418433	4833349.795	78706.3173	7870631.73
9	681.0253	667404.794	36	24026572.58	8729.345737	4204203.51	72651.33993	7265133.993
10	648.58125	635609.625	40	25424385	9237.199607	3606094.899	66596.36256	6659636.256
11	648.58125	635609.625	44	27966823.5	10160.91957	3042903.671	60541.38519	6054138.519
12	648.58125	635609.625	48	30509262	11084.63953	2516661.241	54486.40782	5448640.782
13	648.58125	635609.625	52	33051700.5	12008.35949	2031062.49	48431.43045	4843143.045
14	648.58125	635609.625	56	35594139	12932.07945	1589802.297	42376.45307	4237645.307
15	610.7298	598515.204	60	35910912.24	13047.16965	1196575.541	36321.4757	3632147.57
16	610.7298	598515.204	64	38304973.06	13916.98096	855077.1037	30266.49833	3026649.833
17	610.7298	598515.204	68	40699033.87	14786.79227	565767.3448	24211.52096	2421152.096
18	610.7298	598515.204	72	43093094.69	15656.60358	332125.5097	18156.54359	1815654.359
19	610.7298	598515.204	76	45487155.5	16526.41489	157630.8437	12101.56622	1210156.622
20	401.64715	393614.207	80	31489136.56	11440.64802	45762.59207	6046.59544	604659.544
		12539086.3		507536298.2	**184398.3284**	**78218802.2**	**1271377.484**	**127137748.4**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	9187145.087	71940.84838	7194084.838
2	681.0253	667404.794	8	5339238.352	1999.779701	8472895.995	68343.54612	6834354.612
3	681.0253	667404.794	12	8008857.528	2999.669552	7762455.923	64746.24386	6474624.386
4	681.0253	667404.794	16	10678476.7	3999.559403	7060014.97	61148.9416	6114894.16
5	681.0253	667404.794	20	13348095.88	4999.449254	6369572.695	57551.63933	5755163.933
6	681.0253	667404.794	24	16017715.06	5999.339104	5695128.658	53954.33707	5395433.707
7	681.0253	667404.794	28	18687334.23	6999.228955	5040682.418	50357.03481	5035703.481
8	681.0253	667404.794	32	21356953.41	7999.118806	4410233.535	46759.73255	4675973.255
9	681.0253	667404.794	36	24026572.58	8999.008656	3807781.567	43162.43029	4316243.029
10	648.58125	635609.625	40	25424385	9522.550913	3237326.074	39565.12803	3956512.803
11	648.58125	635609.625	44	27966823.5	10474.806	2702866.616	35967.82577	3596782.577
12	648.58125	635609.625	48	30509262	11427.0611	2206497.362	32370.52351	3237052.351
13	648.58125	635609.625	52	33051700.5	12379.31619	1752027.332	28773.22124	2877322.124
14	648.58125	635609.625	56	35594139	13331.57128	1343265.546	25175.91898	2517591.898
15	610.7298	598515.204	60	35910912.24	13450.2168	984021.0249	21578.61672	2157861.672
16	610.7298	598515.204	64	38304973.06	14346.89792	678102.7889	17981.31446	1798131.446
17	610.7298	598515.204	68	40699033.87	15243.57904	425985.42	14384.0122	1438401.22
18	610.7298	598515.204	72	43093094.69	16140.26015	231255.6428	10786.70994	1078670.994
19	366.43788	359109.122	76	27292293.3	10222.16476	97500.18179	7189.407682	718940.7682
20	240.98829	236168.524	80	18893481.94	7076.440341	28305.76136	3592.1129	359211.29
		12142234.6		476745781.3	**178562.273**	**71493064.6**	**755329.5454**	**75532954.54**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Bucharest

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	6516769.044	246622.4983	24662249.83
2	681.0253	667404.794	8	5339238.352	2137.319318	6012146.609	234290.4384	23429043.84
3	681.0253	667404.794	12	8008857.528	3205.978977	5511595.169	221958.3784	22195837.84
4	681.0253	667404.794	16	10678476.7	4274.638635	5019593.005	209626.3185	20962631.85
5	408.61518	400442.876	20	8008857.528	3205.978977	4540414.758	197294.2585	19729425.85
6	408.61518	400442.876	24	9610629.034	3847.174772	4078335.065	184962.1986	18496219.86
7	408.61518	400442.876	28	11212400.54	4488.370567	3629079.289	172630.1386	17263013.86
8	408.61518	400442.876	32	12814172.04	5129.566363	3195212.211	160298.0787	16029807.87
9	408.61518	400442.876	36	14415943.55	5770.762158	2779298.615	147966.0187	14796601.87
10	389.14875	381365.775	40	15254631	6106.492232	2383903.285	135633.9588	13563395.88
11	389.14875	381365.775	44	16780094.1	6717.141455	2011591.004	123301.8988	12330189.88
12	389.14875	381365.775	48	18305557.2	7327.790678	1663704.691	110969.8389	11096983.89
13	389.14875	381365.775	52	19831020.3	7938.439902	1342686.945	98637.77895	9863777.895
14	389.14875	381365.775	56	21356483.4	8549.089125	1050980.361	86305.719	8630571.9
15	366.43788	359109.122	60	21546547.34	8625.172512	791027.5363	73973.65905	7397365.905
16	366.43788	359109.122	64	22982983.83	9200.184013	565271.0685	61641.59911	6164159.911
17	366.43788	359109.122	68	24419420.32	9775.195514	374015.2907	49309.53916	4930953.916
18	366.43788	359109.122	72	25855856.81	10350.20701	219560.2489	36977.47921	3697747.921
19	366.43788	359109.122	76	27292293.3	10925.21852	104205.9892	24645.41928	2464541.928
20	240.98829	236168.524	80	18893481.94	7563.139395	30252.55758	12313.3779	1231337.79
		8578581.4		315149383.3	**126155.6088**	**51819642.74**	**2589358.595**	**258935859.5**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	6218581.493	266826.905	26682690.5
2	681.0253	667404.794	8	5339238.352	2052.988545	5745366.343	253484.548	25348454.8
3	408.61518	400442.876	12	4805314.517	1847.68969	5276061.56	240142.191	24014219.1
4	408.61518	400442.876	16	6407086.022	2463.586254	4814968.732	226799.834	22679983.4
5	408.61518	400442.876	20	8008857.528	3079.482817	4361266.662	213457.477	21345747.7
6	408.61518	400442.876	24	9610629.034	3695.37938	3917418.937	200115.12	20011512
7	408.61518	400442.876	28	11212400.54	4311.275944	3485889.144	186772.763	18677276.3
8	408.61518	400442.876	32	12814172.04	4927.172507	3069140.868	173430.406	17343040.6
9	408.61518	400442.876	36	14415943.55	5543.069071	2669637.696	160088.049	16008804.9
10	389.14875	381365.775	40	15254631	5865.552469	2289843.214	146745.692	14674569.2
11	389.14875	381365.775	44	16780094.1	6452.107715	1932221.008	133403.335	13340333.5
12	389.14875	381365.775	48	18305557.2	7038.662962	1598061.012	120060.9781	12006097.81
13	389.14875	381365.775	52	19831020.3	7625.218209	1289709.447	106718.6211	10671862.11
14	389.14875	381365.775	56	21356483.4	8211.773456	1009512.534	93376.26407	9337626.407
15	366.43788	359109.122	60	21546547.34	8284.854872	759816.494	80033.90708	8003390.708
16	366.43788	359109.122	64	22982983.83	8837.17853	542967.5475	66691.55008	6669155.008
17	366.43788	359109.122	68	24419420.32	9389.502188	359258.0205	53349.19309	5334919.309
18	366.43788	359109.122	72	25855856.81	9941.825846	210897.2076	40006.8361	4000683.61
19	366.43788	359109.122	76	27292293.3	10494.1495	100094.4035	26664.47913	2666447.913
20	240.98829	236168.524	80	18893481.94	7264.725683	29058.90273	13322.14219	1332214.219
		8044657.57		307674449.6	**118303.7877**	**49679771.23**	**2801490.291**	**280149029.1**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	983.8739198	8583529.771	79656.21244	7965621.244
2	681.0253	667404.794	8	5339238.352	2066.180703	7897446.101	75673.11312	7567311.312
3	681.0253	667404.794	12	8008857.528	3099.271054	7215297.926	71690.0138	7169001.38
4	681.0253	667404.794	16	10678476.7	4132.361405	6541414.474	67706.91448	6770691.448
5	681.0253	667404.794	20	13348095.88	5165.451756	5879928.106	63723.81517	6372381.517
6	681.0253	667404.794	24	16017715.06	6198.542108	5234971.183	59740.71585	5974071.585
7	681.0253	667404.794	28	18687334.23	7231.632459	4610676.068	55757.61653	5575761.653
8	681.0253	667404.794	32	21356953.41	8264.72281	4011175.121	51774.51721	5177451.721
9	681.0253	667404.794	36	24026572.58	9297.813161	3440600.704	47791.41789	4779141.789
10	648.58125	635609.625	40	25424385	9838.739198	2903085.178	43808.31858	4380831.858
11	648.58125	635609.625	44	27966823.5	10822.61312	2402760.905	39825.21926	3982521.926
12	648.58125	635609.625	48	30509262	11806.48704	1941791.589	35842.11994	3584211.994
13	648.58125	635609.625	52	33051700.5	12790.36096	1524112.725	31859.02062	3185902.062
14	648.58125	635609.625	56	35594139	13774.23488	1153659.809	27875.9213	2787592.13
15	610.7298	598515.204	60	35910912.24	13896.81992	834368.3371	23892.82199	2389282.199
16	610.7298	598515.204	64	38304973.06	14823.27458	570173.8047	19909.72267	1990972.267
17	366.43788	359109.122	68	24419420.32	9449.837545	361566.5519	15926.62335	1592662.335
18	366.43788	359109.122	72	25855856.81	10005.71034	212252.3975	11943.52403	1194352.403
19	366.43788	359109.122	76	27292293.3	10561.58314	100737.5932	7960.42472	796042.472
20	240.98829	236168.524	80	18893481.94	7311.407584	29245.63034	3977.330623	397733.0623
		11663422.4		443228929.9	**171520.9177**	**65448793.97**	**836335.3836**	**83633538.36**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1011.211895	8089221.254	92519.80701	9251980.701
2	681.0253	667404.794	8	5339238.352	2123.591714	7431303.004	87893.48378	8789348.378
3	681.0253	667404.794	12	8008857.528	3185.387571	6777429.603	83267.16054	8326716.054
4	681.0253	667404.794	16	10678476.7	4247.183428	6132050.568	78640.83731	7864083.731
5	681.0253	667404.794	20	13348095.88	5308.979285	5499413.083	74014.51407	7401451.407
6	681.0253	667404.794	24	16017715.06	6370.775142	4883764.332	69388.19084	6938819.084
7	681.0253	667404.794	28	18687334.23	7432.570999	4289351.499	64761.8676	6476186.76
8	681.0253	667404.794	32	21356953.41	8494.366855	3720421.765	60135.54437	6013554.437
9	681.0253	667404.794	36	24026572.58	9556.162712	3181222.316	55509.22114	5550922.114
10	648.58125	635609.625	40	25424385	10112.11895	2676000.335	50882.8979	5088289.79
11	648.58125	635609.625	44	27966823.5	11123.33084	2209003.004	46256.57467	4625657.467
12	648.58125	635609.625	48	30509262	12134.54274	1782454.149	41630.25143	4163025.143
13	648.58125	635609.625	52	33051700.5	13145.75463	1400398.617	37003.9282	3700392.82
14	648.58125	635609.625	56	35594139	14156.96653	1066881.256	32377.60497	3237760.497
15	366.43788	359109.122	60	21546547.34	8569.774636	785946.9138	27751.28173	2775128.173
16	366.43788	359109.122	64	22982983.83	9141.092945	561640.4377	23124.9585	2312495.85
17	366.43788	359109.122	68	24419420.32	9712.411254	371613.0601	18498.63526	1849863.526
18	366.43788	359109.122	72	25855856.81	10283.72956	218150.0543	13872.31203	1387231.203
19	366.43788	359109.122	76	27292293.3	10855.04787	103536.6936	9245.988802	924598.8802
20	240.98829	236168.524	80	18893481.94	7514.56276	30058.25104	4619.671544	461967.1544
		11184610.2		413542575.8	**164479.5623**	**61209860.2**	**971394.7317**	**97139473.17**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	7666820.488	87413.52814	8741352.814
2	681.0253	667404.794	8	5339238.352	2171.210207	7038813.28	83042.53023	8304253.023
3	681.0253	667404.794	12	8008857.528	3256.815311	6414941.619	78671.53231	7867153.231
4	681.0253	667404.794	16	10678476.7	4342.420415	5799754.799	74300.5344	7430053.44
5	681.0253	667404.794	20	13348095.88	5428.025518	5197595.241	69929.53648	6992953.648
6	681.0253	667404.794	24	16017715.06	6513.630622	4612805.364	65558.53857	6555853.857
7	681.0253	667404.794	28	18687334.23	7599.235725	4049727.589	61187.54066	6118754.066
8	681.0253	667404.794	32	21356953.41	8684.840829	3512704.336	56816.54274	5681654.274
9	681.0253	667404.794	36	24026572.58	9770.445933	3006078.027	52445.54483	5244554.483
10	648.58125	635609.625	40	25424385	10338.86869	2534191.081	48074.54691	4807454.691
11	648.58125	635609.625	44	27966823.5	11372.75556	2101385.918	43703.549	4370354.9
12	648.58125	635609.625	48	30509262	12406.64243	1709936.231	39332.55109	3933255.109
13	389.14875	381365.775	52	19831020.3	8064.317578	1363977.565	34961.55317	3496155.317
14	389.14875	381365.775	56	21356483.4	8684.6497	1067645.47	30590.55526	3059055.526
15	366.43788	359109.122	60	21546547.34	8761.93952	803570.6443	26219.55734	2621955.734
16	366.43788	359109.122	64	22982983.83	9346.068822	574234.4177	21848.55943	2184855.943
17	366.43788	359109.122	68	24419420.32	9930.198123	379945.9491	17477.56151	1747756.151
18	366.43788	359109.122	72	25855856.81	10514.32742	223041.7559	13106.5636	1310656.36
19	366.43788	359109.122	76	27292293.3	11098.45673	105858.3552	8735.565691	873556.5691
20	240.98829	236168.524	80	18893481.94	7683.066034	30732.26414	4364.573528	436457.3528
		10676122.5		386084240	**157001.802**	**58193760.39**	**917780.9649**	**91778096.49**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	7328138.265	83685.76642	8368576.642
2	681.0253	667404.794	8	5339238.352	2201.152833	6730042.098	79501.1732	7950117.32
3	681.0253	667404.794	12	8008857.528	3301.72925	6136138.511	75316.57999	7531657.999
4	681.0253	667404.794	16	10678476.7	4402.305666	5551039.535	71131.98677	7113198.677
5	681.0253	667404.794	20	13348095.88	5502.882083	4979147.476	66947.39356	6694739.356
6	681.0253	667404.794	24	16017715.06	6603.458499	4424864.64	62762.80034	6276280.034
7	681.0253	667404.794	28	18687334.23	7704.034916	3892593.332	58578.20713	5857820.713
8	681.0253	667404.794	32	21356953.41	8804.611333	3386735.858	54393.61392	5439361.392
9	681.0253	667404.794	36	24026572.58	9905.187749	2911694.524	50209.0207	5020902.07
10	648.58125	635609.625	40	25424385	10481.44948	2471871.635	46024.42749	4602442.749
11	389.14875	381365.775	44	16780094.1	6917.75666	2071669.498	41839.83427	4183983.427
12	389.14875	381365.775	48	18305557.2	7546.643629	1713393.158	37655.24106	3765524.106
13	389.14875	381365.775	52	19831020.3	8175.530598	1382787.844	33470.64784	3347064.784
14	389.14875	381365.775	56	21356483.4	8804.417567	1082369.106	29286.05463	2928605.463
15	366.43788	359109.122	60	21546547.34	8882.773273	814652.4893	25101.46141	2510146.141
16	366.43788	359109.122	64	22982983.83	9474.958158	582153.5433	20916.8682	2091686.82
17	366.43788	359109.122	68	24419420.32	10067.14304	385185.6903	16732.27499	1673227.499
18	366.43788	359109.122	72	25855856.81	10659.32793	226117.6699	12547.68177	1254768.177
19	366.43788	359109.122	76	27292293.3	11251.51281	107318.2217	8363.088561	836308.8561
20	240.98829	236168.524	80	18893481.94	7789.021308	31156.08523	4178.500843	417850.0843
		10167634.8		362693805.8	**149524.0417**	**56209069.18**	**878642.6231**	**87864262.31**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa El Centro

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	6516769.044	95552.13884	9555213.884
2	681.0253	667404.794	8	5339238.352	2137.319318	6012146.609	90774.1953	9077419.53
3	681.0253	667404.794	12	8008857.528	3205.978977	5511595.169	85996.25176	8599625.176
4	681.0253	667404.794	16	10678476.7	4274.638635	5019593.005	81218.30822	8121830.822
5	408.61518	400442.876	20	8008857.528	3205.978977	4540414.758	76440.36468	7644036.468
6	408.61518	400442.876	24	9610629.034	3847.174772	4078335.065	71662.42114	7166242.114
7	408.61518	400442.876	28	11212400.54	4488.370567	3629079.289	66884.4776	6688447.76
8	408.61518	400442.876	32	12814172.04	5129.566363	3195212.211	62106.53406	6210653.406
9	408.61518	400442.876	36	14415943.55	5770.762158	2779298.615	57328.59052	5732859.052
10	389.14875	381365.775	40	15254631	6106.492232	2383903.285	52550.64698	5255064.698
11	389.14875	381365.775	44	16780094.1	6717.141455	2011591.004	47772.70344	4777270.344
12	389.14875	381365.775	48	18305557.2	7327.790678	1663704.691	42994.7599	4299475.99
13	389.14875	381365.775	52	19831020.3	7938.439902	1342686.945	38216.81636	3821681.636
14	389.14875	381365.775	56	21356483.4	8549.089125	1050980.361	33438.87282	3343887.282
15	366.43788	359109.122	60	21546547.34	8625.172512	791027.5363	28660.92928	2866092.928
16	366.43788	359109.122	64	22982983.83	9200.184013	565271.0685	23882.98574	2388298.574
17	366.43788	359109.122	68	24419420.32	9775.195514	374015.2907	19105.0422	1910504.22
18	366.43788	359109.122	72	25855856.81	10350.20701	219560.2489	14327.09866	1432709.866
19	366.43788	359109.122	76	27292293.3	10925.21852	104205.9892	9549.155126	954915.5126
20	240.98829	236168.524	80	18893481.94	7563.139395	30252.55758	4771.217447	477121.7447
		8578581.4		315149383.3	**126155.6088**	**51819642.74**	**1003233.51**	**100323351**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	6218581.493	85899.62032	8589962.032
2	681.0253	667404.794	8	5339238.352	2052.988545	5745366.343	81604.33201	8160433.201
3	408.61518	400442.876	12	4805314.517	1847.68969	5276061.56	77309.04369	7730904.369
4	408.61518	400442.876	16	6407086.022	2463.586254	4814968.732	73013.75537	7301375.537
5	408.61518	400442.876	20	8008857.528	3079.482817	4361266.662	68718.46706	6871846.706
6	408.61518	400442.876	24	9610629.034	3695.37938	3917418.937	64423.17874	6442317.874
7	408.61518	400442.876	28	11212400.54	4311.275944	3485889.144	60127.89042	6012789.042
8	408.61518	400442.876	32	12814172.04	4927.172507	3069140.868	55832.60211	5583260.211
9	408.61518	400442.876	36	14415943.55	5543.069071	2669637.696	51537.31379	5153731.379
10	389.14875	381365.775	40	15254631	5865.552469	2289843.214	47242.02547	4724202.547
11	389.14875	381365.775	44	16780094.1	6452.107715	1932221.008	42946.73716	4294673.716
12	389.14875	381365.775	48	18305557.2	7038.662962	1598061.012	38651.44884	3865144.884
13	389.14875	381365.775	52	19831020.3	7625.218209	1289709.447	34356.16052	3435616.052
14	389.14875	381365.775	56	21356483.4	8211.773456	1009512.534	30060.87221	3006087.221
15	366.43788	359109.122	60	21546547.34	8284.854872	759816.494	25765.58389	2576558.389
16	366.43788	359109.122	64	22982983.83	8837.17853	542967.5475	21470.29557	2147029.557
17	366.43788	359109.122	68	24419420.32	9389.502188	359258.0205	17175.00726	1717500.726
18	366.43788	359109.122	72	25855856.81	9941.825846	210897.2076	12879.71894	1287971.894
19	366.43788	359109.122	76	27292293.3	10494.1495	100094.4035	8584.430627	858443.0627
20	240.98829	236168.524	80	18893481.94	7264.725683	29058.90273	4289.147859	428914.7859
		8044657.57		307674449.6	**118303.7877**	**49679771.23**	**901887.6318**	**90188763.18**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	9780348.249	206895.1631	20689516.31
2	681.0253	667404.794	8	5339238.352	1939.854608	9042754.936	196549.6577	19654965.77
3	681.0253	667404.794	12	8008857.528	2909.781912	8308856.502	186204.1524	18620415.24
4	681.0253	667404.794	16	10678476.7	3879.709217	7582717.487	175858.647	17585864.7
5	681.0253	667404.794	20	13348095.88	4849.636521	6868217.599	165513.1417	16551314.17
6	681.0253	667404.794	24	16017715.06	5819.563825	6169236.549	155167.6363	15516763.63
7	681.0253	667404.794	28	18687334.23	6789.491129	5489654.044	144822.131	14482213.1
8	681.0253	667404.794	32	21356953.41	7759.418433	4833349.795	134476.6256	13447662.56
9	681.0253	667404.794	36	24026572.58	8729.345737	4204203.51	124131.1202	12413112.02
10	648.58125	635609.625	40	25424385	9237.199607	3606094.899	113785.6149	11378561.49
11	648.58125	635609.625	44	27966823.5	10160.91957	3042903.671	103440.1095	10344010.95
12	648.58125	635609.625	48	30509262	11084.63953	2516661.241	93094.60419	9309460.419
13	648.58125	635609.625	52	33051700.5	12008.35949	2031062.49	82749.09883	8274909.883
14	648.58125	635609.625	56	35594139	12932.07945	1589802.297	72403.59348	7240359.348
15	610.7298	598515.204	60	35910912.24	13047.16965	1196575.541	62058.08812	6205808.812
16	610.7298	598515.204	64	38304973.06	13916.98096	855077.1037	51712.58277	5171258.277
17	610.7298	598515.204	68	40699033.87	14786.79227	565767.3448	41367.07741	4136707.741
18	610.7298	598515.204	72	43093094.69	15656.60358	332125.5097	31021.57206	3102157.206
19	610.7298	598515.204	76	45487155.5	16526.41489	157630.8437	20676.06672	2067606.672
20	401.64715	393614.207	80	31489136.56	11440.64802	45762.59207	10330.57445	1033057.445
		12539086.3		507536298.2	**184398.3284**	**78218802.2**	**2172257.257**	**217225725.7**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	9187145.087	130923.5865	13092358.65
2	681.0253	667404.794	8	5339238.352	1999.779701	8472895.995	124376.9257	12437692.57
3	681.0253	667404.794	12	8008857.528	2999.669552	7762455.923	117830.2649	11783026.49
4	681.0253	667404.794	16	10678476.7	3999.559403	7060014.97	111283.6041	11128360.41
5	681.0253	667404.794	20	13348095.88	4999.449254	6369572.695	104736.9434	10473694.34
6	681.0253	667404.794	24	16017715.06	5999.339104	5695128.658	98190.28257	9819028.257
7	681.0253	667404.794	28	18687334.23	6999.228955	5040682.418	91643.62178	9164362.178
8	681.0253	667404.794	32	21356953.41	7999.118806	4410233.535	85096.961	8509696.1
9	681.0253	667404.794	36	24026572.58	8999.008656	3807781.567	78550.30021	7855030.021
10	648.58125	635609.625	40	25424385	9522.550913	3237326.074	72003.63943	7200363.943
11	648.58125	635609.625	44	27966823.5	10474.806	2702866.616	65456.97864	6545697.864
12	648.58125	635609.625	48	30509262	11427.0611	2206497.362	58910.31786	5891031.786
13	648.58125	635609.625	52	33051700.5	12379.31619	1752027.332	52363.65708	5236365.708
14	648.58125	635609.625	56	35594139	13331.57128	1343265.546	45816.99629	4581699.629
15	610.7298	598515.204	60	35910912.24	13450.2168	984021.0249	39270.33551	3927033.551
16	610.7298	598515.204	64	38304973.06	14346.89792	678102.7889	32723.67472	3272367.472
17	610.7298	598515.204	68	40699033.87	15243.57904	425985.42	26177.01394	2617701.394
18	610.7298	598515.204	72	43093094.69	16140.26015	231255.6428	19630.35315	1963035.315
19	366.43788	359109.122	76	27292293.3	10222.16476	97500.18179	13083.69238	1308369.238
20	240.98829	236168.524	80	18893481.94	7076.440341	28305.76136	6537.046241	653704.6241
		12142234.6		476745781.3	**178562.273**	**71493064.6**	**1374606.195**	**137460619.5**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	7042118.004	147178.3349	14717833.49
2	681.0253	667404.794	8	5339238.352	2208.780128	6474681	139818.8803	13981888.03
3	681.0253	667404.794	12	8008857.528	3313.170192	5911451.104	132459.4258	13245942.58
4	681.0253	667404.794	16	10678476.7	4417.560255	5357056.328	125099.9712	12509997.12
5	681.0253	667404.794	20	13348095.88	5521.950319	4815914.233	117740.5167	11774051.67
6	681.0253	667404.794	24	16017715.06	6626.340383	4292442.378	110381.0622	11038106.22
7	681.0253	667404.794	28	18687334.23	7730.730447	3791058.326	103021.6076	10302160.76
8	681.0253	667404.794	32	21356953.41	8835.120511	3316179.634	95662.15308	9566215.308
9	408.61518	400442.876	36	14415943.55	5963.706345	2872223.865	88302.69854	8830269.854
10	389.14875	381365.775	40	15254631	6310.661482	2463608.577	80943.244	8094324.4
11	389.14875	381365.775	44	16780094.1	6941.72763	2078848.115	73583.78946	7358378.946
12	389.14875	381365.775	48	18305557.2	7572.793778	1719330.299	66224.33492	6622433.492
13	389.14875	381365.775	52	19831020.3	8203.859926	1387579.393	58864.88038	5886488.038
14	389.14875	381365.775	56	21356483.4	8834.926074	1086119.662	51505.42584	5150542.584
15	366.43788	359109.122	60	21546547.34	8913.553293	817475.3713	44145.9713	4414597.13
16	366.43788	359109.122	64	22982983.83	9507.790179	584170.7846	36786.51676	3678651.676
17	366.43788	359109.122	68	24419420.32	10102.02707	386520.4112	29427.06222	2942706.222
18	366.43788	359109.122	72	25855856.81	10696.26395	226901.1984	22067.60768	2206760.768
19	366.43788	359109.122	76	27292293.3	11290.50084	107690.094	14708.15315	1470815.315
20	240.98829	236168.524	80	18893481.94	7816.011328	31264.04531	7348.708322	734870.8322
		9646429.07		342913422.8	**141859.251**	**54762632.82**	**1545270.344**	**154527034.4**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	6780438.046	146129.3216	14612932.16
2	681.0253	667404.794	8	5339238.352	2188.764161	6244408.327	138822.3262	13882232.62
3	681.0253	667404.794	12	8008857.528	3283.146241	5712547.59	131515.3308	13151533.08
4	681.0253	667404.794	16	10678476.7	4377.528322	5189441.91	124208.3354	12420833.54
5	681.0253	667404.794	20	13348095.88	5471.910402	4679468.814	116901.3401	11690134.01
6	681.0253	667404.794	24	16017715.06	6566.292482	4187005.832	109594.3447	10959434.47
7	408.61518	400442.876	28	11212400.54	4596.404738	3716430.492	102287.3493	10228734.93
8	408.61518	400442.876	32	12814172.04	5253.033986	3272120.322	94980.35396	9498035.396
9	408.61518	400442.876	36	14415943.55	5909.663234	2846195.77	87673.35859	8767335.859
10	389.14875	381365.775	40	15254631	6253.474263	2441283.354	80366.36322	8036636.322
11	389.14875	381365.775	44	16780094.1	6878.821689	2060009.592	73059.36785	7305936.785
12	389.14875	381365.775	48	18305557.2	7504.169116	1703749.726	65752.37248	6575237.248
13	389.14875	381365.775	52	19831020.3	8129.516542	1375005.147	58445.37711	5844537.711
14	389.14875	381365.775	56	21356483.4	8754.863968	1076277.245	51138.38173	5113838.173
15	366.43788	359109.122	60	21546547.34	8832.778667	810067.4089	43831.38636	4383138.636
16	366.43788	359109.122	64	22982983.83	9421.630579	578877.0286	36524.39099	3652439.099
17	366.43788	359109.122	68	24419420.32	10010.48249	383017.763	29217.39562	2921739.562
18	366.43788	359109.122	72	25855856.81	10599.3344	224845.0196	21910.40025	2191040.025
19	366.43788	359109.122	76	27292293.3	11188.18631	106714.2063	14603.40489	1460340.489
20	240.98829	236168.524	80	18893481.94	7745.182629	30980.73051	7296.418883	729641.8883
		9112505.24		326895707.7	**134007.4299**	**53418884.33**	**1534257.32**	**153425732**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Gilroy

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	6516769.044	138911.1032	13891110.32
2	681.0253	667404.794	8	5339238.352	2137.319318	6012146.609	131965.0309	13196503.09
3	681.0253	667404.794	12	8008857.528	3205.978977	5511595.169	125018.9586	12501895.86
4	681.0253	667404.794	16	10678476.7	4274.638635	5019593.005	118072.8864	11807288.64
5	408.61518	400442.876	20	8008857.528	3205.978977	4540414.758	111126.8141	11112681.41
6	408.61518	400442.876	24	9610629.034	3847.174772	4078335.065	104180.7418	10418074.18
7	408.61518	400442.876	28	11212400.54	4488.370567	3629079.289	97234.66956	9723466.956
8	408.61518	400442.876	32	12814172.04	5129.566363	3195212.211	90288.59729	9028859.729
9	408.61518	400442.876	36	14415943.55	5770.762158	2779298.615	83342.52502	8334252.502
10	389.14875	381365.775	40	15254631	6106.492232	2383903.285	76396.45275	7639645.275
11	389.14875	381365.775	44	16780094.1	6717.141455	2011591.004	69450.38048	6945038.048
12	389.14875	381365.775	48	18305557.2	7327.790678	1663704.691	62504.30821	6250430.821
13	389.14875	381365.775	52	19831020.3	7938.439902	1342686.945	55558.23594	5555823.594
14	389.14875	381365.775	56	21356483.4	8549.089125	1050980.361	48612.16367	4861216.367
15	366.43788	359109.122	60	21546547.34	8625.172512	791027.5363	41666.0914	4166609.14
16	366.43788	359109.122	64	22982983.83	9200.184013	565271.0685	34720.01913	3472001.913
17	366.43788	359109.122	68	24419420.32	9775.195514	374015.2907	27773.94686	2777394.686
18	366.43788	359109.122	72	25855856.81	10350.20701	219560.2489	20827.87459	2082787.459
19	366.43788	359109.122	76	27292293.3	10925.21852	104205.9892	13881.80232	1388180.232
20	240.98829	236168.524	80	18893481.94	7563.139395	30252.55758	6935.739809	693573.9809
		8578581.4		315149383.3	**126155.6088**	**51819642.74**	**1458468.342**	**145846834.2**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	6218581.493	146372.215	14637221.5
2	681.0253	667404.794	8	5339238.352	2052.988545	5745366.343	139053.0767	13905307.67
3	408.61518	400442.876	12	4805314.517	1847.68969	5276061.56	131733.9384	13173393.84
4	408.61518	400442.876	16	6407086.022	2463.586254	4814968.732	124414.8002	12441480.02
5	408.61518	400442.876	20	8008857.528	3079.482817	4361266.662	117095.6619	11709566.19
6	408.61518	400442.876	24	9610629.034	3695.37938	3917418.937	109776.5237	10977652.37
7	408.61518	400442.876	28	11212400.54	4311.275944	3485889.144	102457.3854	10245738.54
8	408.61518	400442.876	32	12814172.04	4927.172507	3069140.868	95138.24715	9513824.715
9	408.61518	400442.876	36	14415943.55	5543.069071	2669637.696	87819.10889	8781910.889
10	389.14875	381365.775	40	15254631	5865.552469	2289843.214	80499.97063	8049997.063
11	389.14875	381365.775	44	16780094.1	6452.107715	1932221.008	73180.83238	7318083.238
12	389.14875	381365.775	48	18305557.2	7038.662962	1598061.012	65861.69412	6586169.412
13	389.14875	381365.775	52	19831020.3	7625.218209	1289709.447	58542.55586	5854255.586
14	389.14875	381365.775	56	21356483.4	8211.773456	1009512.534	51223.4176	5122341.76
15	366.43788	359109.122	60	21546547.34	8284.854872	759816.494	43904.27934	4390427.934
16	366.43788	359109.122	64	22982983.83	8837.17853	542967.5475	36585.14108	3658514.108
17	366.43788	359109.122	68	24419420.32	9389.502188	359258.0205	29266.00282	2926600.282
18	366.43788	359109.122	72	25855856.81	9941.825846	210897.2076	21946.86457	2194686.457
19	366.43788	359109.122	76	27292293.3	10494.1495	100094.4035	14627.72632	1462772.632
20	240.98829	236168.524	80	18893481.94	7264.725683	29058.90273	7308.597268	730859.7268
		8044657.57		307674449.6	**118303.7877**	**49679771.23**	**1536808.039**	**153680803.9**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Tipikal

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	923.7199607	9780348.249	121381.947	12138194.7
2	681.0253	667404.794	8	5339238.352	1939.854608	9042754.936	115312.6021	11531260.21
3	681.0253	667404.794	12	8008857.528	2909.781912	8308856.502	109243.2572	10924325.72
4	681.0253	667404.794	16	10678476.7	3879.709217	7582717.487	103173.9124	10317391.24
5	681.0253	667404.794	20	13348095.88	4849.636521	6868217.599	97104.56747	9710456.747
6	681.0253	667404.794	24	16017715.06	5819.563825	6169236.549	91035.22259	9103522.259
7	681.0253	667404.794	28	18687334.23	6789.491129	5489654.044	84965.87771	8496587.771
8	681.0253	667404.794	32	21356953.41	7759.418433	4833349.795	78896.53282	7889653.282
9	681.0253	667404.794	36	24026572.58	8729.345737	4204203.51	72827.18794	7282718.794
10	648.58125	635609.625	40	25424385	9237.199607	3606094.899	66757.84306	6675784.306
11	648.58125	635609.625	44	27966823.5	10160.91957	3042903.671	60688.49817	6068849.817
12	648.58125	635609.625	48	30509262	11084.63953	2516661.241	54619.15329	5461915.329
13	648.58125	635609.625	52	33051700.5	12008.35949	2031062.49	48549.80841	4854980.841
14	648.58125	635609.625	56	35594139	12932.07945	1589802.297	42480.46353	4248046.353
15	610.7298	598515.204	60	35910912.24	13047.16965	1196575.541	36411.11864	3641111.864
16	610.7298	598515.204	64	38304973.06	13916.98096	855077.1037	30341.77376	3034177.376
17	610.7298	598515.204	68	40699033.87	14786.79227	565767.3448	24272.42888	2427242.888
18	610.7298	598515.204	72	43093094.69	15656.60358	332125.5097	18203.08399	1820308.399
19	610.7298	598515.204	76	45487155.5	16526.41489	157630.8437	12133.73911	1213373.911
20	401.64715	393614.207	80	31489136.56	11440.64802	45762.59207	6064.39698	606439.698
		12539086.3		507536298.2	**184398.3284**	**78218802.2**	**1274463.415**	**127446341.5**

Setback 1

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	952.2550913	9187145.087	64120.30852	6412030.852
2	681.0253	667404.794	8	5339238.352	1999.779701	8472895.995	60914.16513	6091416.513
3	681.0253	667404.794	12	8008857.528	2999.669552	7762455.923	57708.02174	5770802.174
4	681.0253	667404.794	16	10678476.7	3999.559403	7060014.97	54501.87835	5450187.835
5	681.0253	667404.794	20	13348095.88	4999.449254	6369572.695	51295.73496	5129573.496
6	681.0253	667404.794	24	16017715.06	5999.339104	5695128.658	48089.59157	4808959.157
7	681.0253	667404.794	28	18687334.23	6999.228955	5040682.418	44883.44818	4488344.818
8	681.0253	667404.794	32	21356953.41	7999.118806	4410233.535	41677.30479	4167730.479
9	681.0253	667404.794	36	24026572.58	8999.008656	3807781.567	38471.1614	3847116.14
10	648.58125	635609.625	40	25424385	9522.550913	3237326.074	35265.01801	3526501.801
11	648.58125	635609.625	44	27966823.5	10474.806	2702866.616	32058.87462	3205887.462
12	648.58125	635609.625	48	30509262	11427.0611	2206497.362	28852.73123	2885273.123
13	648.58125	635609.625	52	33051700.5	12379.31619	1752027.332	25646.58784	2564658.784
14	648.58125	635609.625	56	35594139	13331.57128	1343265.546	22440.44445	2244044.445
15	610.7298	598515.204	60	35910912.24	13450.2168	984021.0249	19234.30106	1923430.106
16	610.7298	598515.204	64	38304973.06	14346.89792	678102.7889	16028.15767	1602815.767
17	610.7298	598515.204	68	40699033.87	15243.57904	425985.42	12822.01428	1282201.428
18	610.7298	598515.204	72	43093094.69	16140.26015	231255.6428	9615.870888	961587.0888
19	366.43788	359109.122	76	27292293.3	10222.16476	97500.18179	6409.727498	640972.7498
20	240.98829	236168.524	80	18893481.94	7076.440341	28305.76136	3203.587015	320358.7015
		12142234.6		476745781.3	**178562.273**	**71493064.6**	**673238.9292**	**67323892.92**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 2

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	983.8739198	8583529.771	70915.02034	7091502.034
2	681.0253	667404.794	8	5339238.352	2066.180703	7897446.101	67369.12706	6736912.706
3	681.0253	667404.794	12	8008857.528	3099.271054	7215297.926	63823.23379	6382323.379
4	681.0253	667404.794	16	10678476.7	4132.361405	6541414.474	60277.34051	6027734.051
5	681.0253	667404.794	20	13348095.88	5165.451756	5879928.106	56731.44724	5673144.724
6	681.0253	667404.794	24	16017715.06	6198.542108	5234971.183	53185.55396	5318555.396
7	681.0253	667404.794	28	18687334.23	7231.632459	4610676.068	49639.66069	4963966.069
8	681.0253	667404.794	32	21356953.41	8264.72281	4011175.121	46093.76741	4609376.741
9	681.0253	667404.794	36	24026572.58	9297.813161	3440600.704	42547.87414	4254787.414
10	648.58125	635609.625	40	25424385	9838.739198	2903085.178	39001.98086	3900198.086
11	648.58125	635609.625	44	27966823.5	10822.61312	2402760.905	35456.08759	3545608.759
12	648.58125	635609.625	48	30509262	11806.48704	1941791.589	31910.19431	3191019.431
13	648.58125	635609.625	52	33051700.5	12790.36096	1524112.725	28364.30104	2836430.104
14	648.58125	635609.625	56	35594139	13774.23488	1153659.809	24818.40776	2481840.776
15	610.7298	598515.204	60	35910912.24	13896.81992	834368.3371	21272.51449	2127251.449
16	610.7298	598515.204	64	38304973.06	14823.27458	570173.8047	17726.62121	1772662.121
17	366.43788	359109.122	68	24419420.32	9449.837545	361566.5519	14180.72794	1418072.794
18	366.43788	359109.122	72	25855856.81	10005.71034	212252.3975	10634.83466	1063483.466
19	366.43788	359109.122	76	27292293.3	10561.58314	100737.5932	7088.94139	708894.139
20	240.98829	236168.524	80	18893481.94	7311.407584	29245.63034	3543.049747	354304.9747
		11663422.4		443228929.9	**171520.9177**	**65448793.97**	**744580.6861**	**74458068.61**

Setback 3

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1011.211895	8089221.254	72602.63897	7260263.897
2	681.0253	667404.794	8	5339238.352	2123.591714	7431303.004	68972.35257	6897235.257
3	681.0253	667404.794	12	8008857.528	3185.387571	6777429.603	65342.06618	6534206.618
4	681.0253	667404.794	16	10678476.7	4247.183428	6132050.568	61711.77978	6171177.978
5	681.0253	667404.794	20	13348095.88	5308.979285	5499413.083	58081.49338	5808149.338
6	681.0253	667404.794	24	16017715.06	6370.775142	4883764.332	54451.20698	5445120.698
7	681.0253	667404.794	28	18687334.23	7432.570999	4289351.499	50820.92058	5082092.058
8	681.0253	667404.794	32	21356953.41	8494.366855	3720421.765	47190.63419	4719063.419
9	681.0253	667404.794	36	24026572.58	9556.162712	3181222.316	43560.34779	4356034.779
10	648.58125	635609.625	40	25424385	10112.11895	2676000.335	39930.06139	3993006.139
11	648.58125	635609.625	44	27966823.5	11123.33084	2209003.004	36299.77499	3629977.499
12	648.58125	635609.625	48	30509262	12134.54274	1782454.149	32669.48859	3266948.859
13	648.58125	635609.625	52	33051700.5	13145.75463	1400398.617	29039.2022	2903920.22
14	648.58125	635609.625	56	35594139	14156.96653	1066881.256	25408.9158	2540891.58
15	366.43788	359109.122	60	21546547.34	8569.774636	785946.9138	21778.6294	2177862.94
16	366.43788	359109.122	64	22982983.83	9141.092945	561640.4377	18148.343	1814834.3
17	366.43788	359109.122	68	24419420.32	9712.411254	371613.0601	14518.0566	1451805.66
18	366.43788	359109.122	72	25855856.81	10283.72956	218150.0543	10887.77021	1088777.021
19	366.43788	359109.122	76	27292293.3	10855.04787	103536.6936	7257.483809	725748.3809
20	240.98829	236168.524	80	18893481.94	7514.56276	30058.25104	3627.199532	362719.9532
		11184610.2		413542575.8	**164479.5623**	**61209860.2**	**762298.3659**	**76229836.59**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 4

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1033.886869	7666820.488	66848.14022	6684814.022
2	681.0253	667404.794	8	5339238.352	2171.210207	7038813.28	63505.60525	6350560.525
3	681.0253	667404.794	12	8008857.528	3256.815311	6414941.619	60163.07029	6016307.029
4	681.0253	667404.794	16	10678476.7	4342.420415	5799754.799	56820.53532	5682053.532
5	681.0253	667404.794	20	13348095.88	5428.025518	5197595.241	53478.00035	5347800.035
6	681.0253	667404.794	24	16017715.06	6513.630622	4612805.364	50135.46539	5013546.539
7	681.0253	667404.794	28	18687334.23	7599.235725	4049727.589	46792.93042	4679293.042
8	681.0253	667404.794	32	21356953.41	8684.840829	3512704.336	43450.39546	4345039.546
9	681.0253	667404.794	36	24026572.58	9770.445933	3006078.027	40107.86049	4010786.049
10	648.58125	635609.625	40	25424385	10338.86869	2534191.081	36765.32553	3676532.553
11	648.58125	635609.625	44	27966823.5	11372.75556	2101385.918	33422.79056	3342279.056
12	648.58125	635609.625	48	30509262	12406.64243	1709936.231	30080.25559	3008025.559
13	389.14875	381365.775	52	19831020.3	8064.317578	1363977.565	26737.72063	2673772.063
14	389.14875	381365.775	56	21356483.4	8684.6497	1067645.47	23395.18566	2339518.566
15	366.43788	359109.122	60	21546547.34	8761.93952	803570.6443	20052.6507	2005265.07
16	366.43788	359109.122	64	22982983.83	9346.068822	574234.4177	16710.11573	1671011.573
17	366.43788	359109.122	68	24419420.32	9930.198123	379945.9491	13367.58077	1336758.077
18	366.43788	359109.122	72	25855856.81	10514.32742	223041.7559	10025.0458	1002504.58
19	366.43788	359109.122	76	27292293.3	11098.45673	105858.3552	6682.510835	668251.0835
20	240.98829	236168.524	80	18893481.94	7683.066034	30732.26414	3339.977349	333997.7349
		10676122.5		386084240	**157001.802**	**58193760.39**	**701881.1623**	**70188116.23**

Setback 5

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1048.144948	7328138.265	67336.23973	6733623.973
2	681.0253	667404.794	8	5339238.352	2201.152833	6730042.098	63969.30123	6396930.123
3	681.0253	667404.794	12	8008857.528	3301.72925	6136138.511	60602.36273	6060236.273
4	681.0253	667404.794	16	10678476.7	4402.305666	5551039.535	57235.42423	5723542.423
5	681.0253	667404.794	20	13348095.88	5502.882083	4979147.476	53868.48573	5386848.573
6	681.0253	667404.794	24	16017715.06	6603.458499	4424864.64	50501.54724	5050154.724
7	681.0253	667404.794	28	18687334.23	7704.034916	3892593.332	47134.60874	4713460.874
8	681.0253	667404.794	32	21356953.41	8804.611333	3386735.858	43767.67024	4376767.024
9	681.0253	667404.794	36	24026572.58	9905.187749	2911694.524	40400.73174	4040073.174
10	648.58125	635609.625	40	25424385	10481.44948	2471871.635	37033.79324	3703379.324
11	389.14875	381365.775	44	16780094.1	6917.75666	2071669.498	33666.85474	3366685.474
12	389.14875	381365.775	48	18305557.2	7546.643629	1713393.158	30299.91624	3029991.624
13	389.14875	381365.775	52	19831020.3	8175.530598	1382787.844	26932.97775	2693297.775
14	389.14875	381365.775	56	21356483.4	8804.417567	1082369.106	23566.03925	2356603.925
15	366.43788	359109.122	60	21546547.34	8882.773273	814652.4893	20199.10075	2019910.075
16	366.43788	359109.122	64	22982983.83	9474.958158	582153.5433	16832.16225	1683216.225
17	366.43788	359109.122	68	24419420.32	10067.14304	385185.6903	13465.22375	1346522.375
18	366.43788	359109.122	72	25855856.81	10659.32793	226117.6699	10098.28525	1009828.525
19	366.43788	359109.122	76	27292293.3	11251.51281	107318.2217	6731.346754	673134.6754
20	240.98829	236168.524	80	18893481.94	7789.021308	31156.08523	3364.409615	336440.9615
		10167634.8		362693805.8	**149524.0417**	**56209069.18**	**707006.4812**	**70700648.12**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 6

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1051.776914	7042118.004	65447.68717	6544768.717
2	681.0253	667404.794	8	5339238.352	2208.780128	6474681	62175.1836	6217518.36
3	681.0253	667404.794	12	8008857.528	3313.170192	5911451.104	58902.68002	5890268.002
4	681.0253	667404.794	16	10678476.7	4417.560255	5357056.328	55630.17644	5563017.644
5	681.0253	667404.794	20	13348095.88	5521.950319	4815914.233	52357.67286	5235767.286
6	681.0253	667404.794	24	16017715.06	6626.340383	4292442.378	49085.16929	4908516.929
7	681.0253	667404.794	28	18687334.23	7730.730447	3791058.326	45812.66571	4581266.571
8	681.0253	667404.794	32	21356953.41	8835.120511	3316179.634	42540.16213	4254016.213
9	408.61518	400442.876	36	14415943.55	5963.706345	2872223.865	39267.65856	3926765.856
10	389.14875	381365.775	40	15254631	6310.661482	2463608.577	35995.15498	3599515.498
11	389.14875	381365.775	44	16780094.1	6941.72763	2078848.115	32722.6514	3272265.14
12	389.14875	381365.775	48	18305557.2	7572.793778	1719330.299	29450.14782	2945014.782
13	389.14875	381365.775	52	19831020.3	8203.859926	1387579.393	26177.64425	2617764.425
14	389.14875	381365.775	56	21356483.4	8834.926074	1086119.662	22905.14067	2290514.067
15	366.43788	359109.122	60	21546547.34	8913.553293	817475.3713	19632.63709	1963263.709
16	366.43788	359109.122	64	22982983.83	9507.790179	584170.7846	16360.13352	1636013.352
17	366.43788	359109.122	68	24419420.32	10102.02707	386520.4112	13087.62994	1308762.994
18	366.43788	359109.122	72	25855856.81	10696.26395	226901.1984	9815.126362	981512.6362
19	366.43788	359109.122	76	27292293.3	11290.50084	107690.094	6542.622785	654262.2785
20	240.98829	236168.524	80	18893481.94	7816.011328	31264.04531	3270.12042	327012.042
		9646429.07		342913422.8	**141859.251**	**54762632.82**	**687178.065**	**68717806.5**

Setback 7

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1042.245711	6780438.046	62956.53409	6295653.409
2	681.0253	667404.794	8	5339238.352	2188.764161	6244408.327	59808.59022	5980859.022
3	681.0253	667404.794	12	8008857.528	3283.146241	5712547.59	56660.64635	5666064.635
4	681.0253	667404.794	16	10678476.7	4377.528322	5189441.91	53512.70247	5351270.247
5	681.0253	667404.794	20	13348095.88	5471.910402	4679468.814	50364.7586	5036475.86
6	681.0253	667404.794	24	16017715.06	6566.292482	4187005.832	47216.81473	4721681.473
7	408.61518	400442.876	28	11212400.54	4596.404738	3716430.492	44068.87085	4406887.085
8	408.61518	400442.876	32	12814172.04	5253.033986	3272120.322	40920.92698	4092092.698
9	408.61518	400442.876	36	14415943.55	5909.663234	2846195.77	37772.98311	3777298.311
10	389.14875	381365.775	40	15254631	6253.474263	2441283.354	34625.03923	3462503.923
11	389.14875	381365.775	44	16780094.1	6878.821689	2060009.592	31477.09536	3147709.536
12	389.14875	381365.775	48	18305557.2	7504.169116	1703749.726	28329.15149	2832915.149
13	389.14875	381365.775	52	19831020.3	8129.516542	1375005.147	25181.20761	2518120.761
14	389.14875	381365.775	56	21356483.4	8754.863968	1076277.245	22033.26374	2203326.374
15	366.43788	359109.122	60	21546547.34	8832.778667	810067.4089	18885.31987	1888531.987
16	366.43788	359109.122	64	22982983.83	9421.630579	578877.0286	15737.37599	1573737.599
17	366.43788	359109.122	68	24419420.32	10010.48249	383017.763	12589.43212	1258943.212
18	366.43788	359109.122	72	25855856.81	10599.3344	224845.0196	9441.488247	944148.8247
19	366.43788	359109.122	76	27292293.3	11188.18631	106714.2063	6293.544374	629354.4374
20	240.98829	236168.524	80	18893481.94	7745.182629	30980.73051	3145.601737	314560.1737
		9112505.24		326895707.7	**134007.4299**	**53418884.33**	**661021.3472**	**66102134.72**

Tabel 23 Perbandingan Momen Guling Statik Dan Dinamik Struktur Tingkat 20 Akibat Gempa Koyna

Setback 8

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	1017.748705	6516769.044	67461.74716	6746174.716
2	681.0253	667404.794	8	5339238.352	2137.319318	6012146.609	64088.53583	6408853.583
3	681.0253	667404.794	12	8008857.528	3205.978977	5511595.169	60715.32449	6071532.449
4	681.0253	667404.794	16	10678476.7	4274.638635	5019593.005	57342.11316	5734211.316
5	408.61518	400442.876	20	8008857.528	3205.978977	4540414.758	53968.90182	5396890.182
6	408.61518	400442.876	24	9610629.034	3847.174772	4078335.065	50595.69049	5059569.049
7	408.61518	400442.876	28	11212400.54	4488.370567	3629079.289	47222.47916	4722247.916
8	408.61518	400442.876	32	12814172.04	5129.566363	3195212.211	43849.26782	4384926.782
9	408.61518	400442.876	36	14415943.55	5770.762158	2779298.615	40476.05649	4047605.649
10	389.14875	381365.775	40	15254631	6106.492232	2383903.285	37102.84515	3710284.515
11	389.14875	381365.775	44	16780094.1	6717.141455	2011591.004	33729.63382	3372963.382
12	389.14875	381365.775	48	18305557.2	7327.790678	1663704.691	30356.42248	3035642.248
13	389.14875	381365.775	52	19831020.3	7938.439902	1342686.945	26983.21115	2698321.115
14	389.14875	381365.775	56	21356483.4	8549.089125	1050980.361	23609.99981	2360999.981
15	366.43788	359109.122	60	21546547.34	8625.172512	791027.5363	20236.78848	2023678.848
16	366.43788	359109.122	64	22982983.83	9200.184013	565271.0685	16863.57714	1686357.714
17	366.43788	359109.122	68	24419420.32	9775.195514	374015.2907	13490.36581	1349036.581
18	366.43788	359109.122	72	25855856.81	10350.20701	219560.2489	10117.15448	1011715.448
19	366.43788	359109.122	76	27292293.3	10925.21852	104205.9892	6743.943142	674394.3142
20	240.98829	236168.524	80	18893481.94	7563.139395	30252.55758	3370.733169	337073.3169
		8578581.4		315149383.3	**126155.6088**	**51819642.74**	**708324.7911**	**70832479.11**

Setback 9

Tingkat	M (Kg)	W (Kg)	H (m)	W.H	F Statik	MG Statik	MG Dinamik	MG Dinamik
1	648.58125	635609.625	4	2542438.5	977.5920781	6218581.493	75790.63869	7579063.869
2	681.0253	667404.794	8	5339238.352	2052.988545	5745366.343	72000.96499	7200096.499
3	408.61518	400442.876	12	4805314.517	1847.68969	5276061.56	68211.29128	6821129.128
4	408.61518	400442.876	16	6407086.022	2463.586254	4814968.732	64421.61758	6442161.758
5	408.61518	400442.876	20	8008857.528	3079.482817	4361266.662	60631.94387	6063194.387
6	408.61518	400442.876	24	9610629.034	3695.37938	3917418.937	56842.27017	5684227.017
7	408.61518	400442.876	28	11212400.54	4311.275944	3485889.144	53052.59646	5305259.646
8	408.61518	400442.876	32	12814172.04	4927.172507	3069140.868	49262.92276	4926292.276
9	408.61518	400442.876	36	14415943.55	5543.069071	2669637.696	45473.24905	4547324.905
10	389.14875	381365.775	40	15254631	5865.552469	2289843.214	41683.57535	4168357.535
11	389.14875	381365.775	44	16780094.1	6452.107715	1932221.008	37893.90164	3789390.164
12	389.14875	381365.775	48	18305557.2	7038.662962	1598061.012	34104.22794	3410422.794
13	389.14875	381365.775	52	19831020.3	7625.218209	1289709.447	30314.55423	3031455.423
14	389.14875	381365.775	56	21356483.4	8211.773456	1009512.534	26524.88053	2652488.053
15	366.43788	359109.122	60	21546547.34	8284.854872	759816.494	22735.20682	2273520.682
16	366.43788	359109.122	64	22982983.83	8837.17853	542967.5475	18945.53312	1894553.312
17	366.43788	359109.122	68	24419420.32	9389.502188	359258.0205	15155.85941	1515585.941
18	366.43788	359109.122	72	25855856.81	9941.825846	210897.2076	11366.18571	1136618.571
19	366.43788	359109.122	76	27292293.3	10494.1495	100094.4035	7576.512004	757651.2004
20	240.98829	236168.524	80	18893481.94	7264.725683	29058.90273	3786.839813	378683.9813
		8044657.57		307674449.6	**118303.7877**	**49679771.23**	**795774.7714**	**79577477.14**

VERIFIKASI

Untuk struktur yang digunakan adalah struktur 7 tingkat dengan beban gempa Bucharest, dihitung degan cara manual dan program PROGSIP 2006.

DATA STRUKTUR

Struktur yang ditinjau merupakan suatu model *shear building* 7 tingkat. Perhitungan kekakuan struktur sudah dihitung terlebih dahulu dengan manual dan PROGSIP 2006 yang hasilnya sebagai berikut :

Bangunan Tingkat	Tinggi antar tingkat(cm)	Kekakuan (kg/cm)
7	400	78125
10	400	135000
15	400	375156.25

PERHITUNGAN MANUAL

Dalam perhitungan ini dalam mencari besarnya omega (ω), kami menggunakan metode polinomial. Untuk mencari besarnya simpangan, kecepatan, percepatan, simpangan antar tingkat, gaya horisontal tingkat, gaya horisontal tingkat kumulatif dan momen guling menggunakan prinsip metode Modal Analis (*Central Difference*).

PENYELESAIAN :

a. Perhitungan *mode shape* struktur 7 tingkat

Matrik Massa

$$[M] = \begin{bmatrix} m_1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & m_3 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & m_3 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & m_4 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & m_5 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & m_6 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & m_7 \end{bmatrix}$$

$$[M] = \begin{bmatrix} 322.6755 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 322.6755 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 322.6755 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 322.6755 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 322.6755 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 322.6755 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 156.933 \end{bmatrix}$$

misal dipakai unit massa m = 322,6755 $kg.dt^2/cm$, maka :

$$[M] = \begin{bmatrix} 1m & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1m & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1m & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1m & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1m & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1m & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.486349m \end{bmatrix}$$

Matrik Kekakuan

$$[K] = \begin{bmatrix} k_1+k_2 & -k_2 & 0 & 0 & 0 & 0 & 0 \\ -k_2 & k_2+k_3 & -k_3 & 0 & 0 & 0 & 0 \\ 0 & -k_3 & k_3+k_4 & -k_4 & 0 & 0 & 0 \\ 0 & 0 & -k_4 & k_4+k_5 & -k_5 & 0 & 0 \\ 0 & 0 & 0 & -k_5 & k_5+k_6 & -k_6 & 0 \\ 0 & 0 & 0 & 0 & -k_6 & k_6+k_7 & -k_7 \\ & & & & & -k_7 & k_7 \end{bmatrix}$$

$$[K] = \begin{bmatrix} 156250 & -78125 & 0 & 0 & 0 & 0 & 0 \\ -78125 & 156250 & -78125 & 0 & 0 & 0 & 0 \\ 0 & -78125 & 156250 & -78125 & 0 & 0 & 0 \\ 0 & 0 & -78125 & 156250 & -78125 & 0 & 0 \\ 0 & 0 & 0 & -78125 & 156250 & -78125 & 0 \\ 0 & 0 & 0 & 0 & -78125 & 156250 & -78125 \\ 0 & 0 & 0 & 0 & 0 & -78125 & 78125 \end{bmatrix}$$

misal dipakai unit kekakuan K = 78125 $^{kg}/_{cm}$, maka :

$$[K] = \begin{bmatrix} 2k & -1k & 0 & 0 & 0 & 0 & 0 \\ -1k & 2k & -1k & 0 & 0 & 0 & 0 \\ 0 & -1k & 2k & -1k & 0 & 0 & 0 \\ 0 & 0 & -1k & 2k & -1k & 0 & 0 \\ 0 & 0 & 0 & -1k & 2k & -1k & 0 \\ 0 & 0 & 0 & 0 & -1k & 2k & -1k \\ 0 & 0 & 0 & 0 & 0 & -1k & 1k \end{bmatrix}$$

Dengan memperhatikan matrik-matrik diatas, maka persamaan *eigenproblem* dapat disusun sebagai berikut :

$$\begin{bmatrix} 2k-1\omega^2 m & -1k & 0 & 0 & 0 & 0 & 0 \\ -1k & 2k-1\omega^2 m & -1k & 0 & 0 & 0 & 0 \\ 0 & -1k & 2k-1\omega^2 m & -1k & 0 & 0 & 0 \\ 0 & 0 & -1k & 2k-1\omega^2 m & -1k & 0 & 0 \\ 0 & 0 & 0 & -1k & 2k-1\omega^2 m & -1k & 0 \\ 0 & 0 & 0 & 0 & -1k & 2k-1\omega^2 m & -1k \\ 0 & 0 & 0 & 0 & 0 & -1k & 1k-0.486349\omega^2 m \end{bmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \\ \phi_5 \\ \phi_6 \\ \phi_7 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{Bmatrix}$$

Persamaan diatas dapat ditulis sebagai berikut :

$$\begin{bmatrix} 2-\frac{1\omega^2}{k/m} & -1 & 0 & 0 & 0 & 0 & 0 \\ -1 & 2-\frac{1\omega^2}{k/m} & -1 & 0 & 0 & 0 & 0 \\ 0 & -1 & 2-\frac{1\omega^2}{k/m} & -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 2-\frac{1\omega^2}{k/m} & -1 & 0 & 0 \\ 0 & 0 & 0 & -1 & 2-\frac{1\omega^2}{k/m} & -1 & 0 \\ 0 & 0 & 0 & 0 & -1 & 2-\frac{1\omega^2}{k/m} & -1 \\ 0 & 0 & 0 & 0 & 0 & -1 & 1-\frac{0,486349\ \omega^2}{k/m} \end{bmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \\ \phi_5 \\ \phi_6 \\ \phi_7 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{Bmatrix}$$

apabila diambil notasi bahwa $\lambda = \frac{\omega^2}{k/m}$ maka persamaan diatas menjadi :

$$\begin{bmatrix} 2-1\lambda & -1 & 0 & 0 & 0 & 0 & 0 \\ -1 & 2-1\lambda & -1 & 0 & 0 & 0 & 0 \\ 0 & -1 & 2-1\lambda & -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 2-1\lambda & -1 & 0 & 0 \\ 0 & 0 & 0 & -1 & 2-1\lambda & -1 & 0 \\ 0 & 0 & 0 & 0 & -1 & 2-1\lambda & -1 \\ 0 & 0 & 0 & 0 & 0 & -1 & 1-0{,}486349\ \lambda \end{bmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \\ \phi_5 \\ \phi_6 \\ \phi_7 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{Bmatrix}$$

dan apabila persamaan tersebut disederhanakan akan diperoleh :

$(2 - 1\lambda)\ \phi_1 - \phi_2 = 0$ .....(1.1)

$-\phi_1 + (2 - 1\lambda)\ \phi_2 - \phi_3 = 0$ .....(1.2)

$-\phi_2 + (2 - 1\lambda)\ \phi_3 - \phi_4 = 0$ .....(1.3)

$-\phi_3 + (2 - 1\lambda)\ \phi_4 - \phi_5 = 0$ .....(1.4)

$-\phi_4 + (2 - 1\lambda)\ \phi_5 - \phi_6 = 0$ .....(1.5)

$-\phi_5 + (2 - 1\lambda)\ \phi_6 - \phi_7 = 0$ .....(1.6)

$-\phi_6 + (1 - 0{,}486349\lambda)\ \phi_7 = 0$ .....(1.7)

dengan mengambil nilai:

$\phi_1 = 1$

Dengan mensubstitusikan nilai tersebut pada persamaan (1.1) diatas akan diperoleh :

$\phi_2 = (2 - 1\lambda)$

Selanjutnya dengan mensubstitusikan nilai tersebut pada persamaan (1.2), maka diperoleh :

$\phi_3 = -1 + (2 - 1\lambda) \phi_2 = \lambda^2 - 4\lambda + 3$

Selanjutnya dengan mensubstitusikan nilai tersebut pada persamaan (1.3), maka diperoleh :

$\phi_4 = - \phi_2 + (2 - 1\lambda) \phi_3 = -\lambda^3 + 6\lambda^2 - 12\lambda + 8$

Selanjutnya dengan mensubstitusikan nilai tersebut pada persamaan (1.4), maka diperoleh :

$\phi_5 = - \phi_3 + (2 - 1\lambda) \phi_4 = \lambda^4 - 8\lambda^3 + 23\lambda^2 - 28\lambda + 13$

Selanjutnya dengan mensubstitusikan nilai tersebut pada persamaan (1.5), maka diperoleh :

$\phi_6 = - \phi_4 + (2 - 1\lambda) \phi_5 = -\lambda^5 + 10\lambda^4 - 38\lambda^3 + 68\lambda^2 - 57\lambda + 18$

Sehingga dengan memasukkan nilai persamaan ϕ_5 dan ϕ_6 ke persamaan (1.6) akan diperoleh :

$\phi_7 = - \phi_5 + (2 - 1\lambda) \phi_6$

$= \lambda^6 - 12\lambda^5 + 57\lambda^4 - 136\lambda^3 + 170\lambda^2 - 104\lambda + 13$

Persamaan diatas merupakan persamaan polinomial pangkat 6. Akar-akar yang dicari adalah nilai λ dari persamaan tersebut. Maka akar-akar persamaan polinomial diatas adalah :

$\lambda_1 = 0{,}30204$

$\lambda_2 = 2{,}62824$

$\lambda_3 = 6{,}81996$

$\lambda_4 = 12{,}04698$

I. MENCARI PARTISIPASI MODE (Γ)

Berdasarkan data massa dan kekakuan tingkat, setelah dicari dengan metode polinomial seperti di atas, maka modal matriknya adalah:

$$[\phi] = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1{,}94966 & 1{,}56196 & 0{,}86334 & -0{,}00783 & -0{,}87901 & -1{,}57769 & -1{,}96657 \\ 2{,}80117 & 1{,}43971 & -0{,}25465 & -0{,}99994 & -0{,}22735 & 1{,}4891 & 2{,}86739 \\ 3{,}51167 & 0{,}6868 & -1{,}08319 & 0{,}01566 & 1{,}07885 & -0{,}77165 & -3{,}67234 \\ 4{,}0454 & -0{,}36695 & -0{,}68051 & 0{,}99982 & -0{,}72096 & -0{,}27168 & 4{,}3545 \\ 4{,}37547 & -1{,}25996 & 0{,}49568 & -0{,}02349 & -0{,}44511 & 1{,}20028 & -4{,}89107 \\ 4{,}48528 & -1{,}60106 & 1{,}10844 & -0{,}99963 & 1{,}11222 & -1{,}62198 & 5{,}2641 \end{bmatrix}$$

sedangkan vektor frekuensi sudutnya adalah.

$$\omega = \begin{Bmatrix} 8{,}551538 \\ 25{,}22578 \\ 40{,}63525 \\ 54{,}00713 \\ 64{,}67095 \\ 72{,}09232 \\ 75{,}90934 \end{Bmatrix} {}^{rad}/_{dt}$$

$$P_1^* = \{1 \quad 1{,}94966 \quad 2{,}80117 \quad 3{,}51167 \quad 4{,}0454 \quad 4{,}37547 \quad 4{,}48528\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0{,}486349 \end{bmatrix} 322{,}6755$$

$$= 6409{,}879 \; {kg.dt^2}/{cm}$$

$$P_2^* = \{1 \quad 1{,}56196 \quad 1{,}43971 \quad 0{,}6868 \quad -0{,}36695 \quad -1{,}25996 \quad -1{,}60106\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0{,}486349 \end{bmatrix} 322{,}6755$$

$$= 736{,}6313 \; {kg.dt^2}/{cm}$$

Kemudian.

$$M_1^* = \{1 \quad 1.94966 \quad 2.80117 \quad 3.51167 \quad 4.0454 \quad 4.37547 \quad 4.48528\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0,486349 \end{bmatrix} \begin{Bmatrix} 1 \\ 1,94966 \\ 2,80117 \\ 3,51167 \\ 4,0454 \\ 4,37547 \\ 4,48528 \end{Bmatrix}$$

$$= 22675,63 \; kg.dt^2/cm$$

$$M_2^* = \{1 \quad 1.56196 \quad 1,43971 \quad 0,6868 \quad -0,36695 \quad -1,25996 \quad -1,60106\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0,486349 \end{bmatrix} \begin{Bmatrix} 1 \\ 1,56196 \\ 1,43971 \\ 0,6868 \\ -0,36695 \\ -1,25996 \\ -1,60106 \end{Bmatrix}$$

$$= 2888,925 \; kg.dt^2/cm$$

$$M_3^* = \{1 \quad 0.86334 \quad -0,25465 \quad -1,08319 \quad -0,68051 \quad 0,49568 \quad 1,10844\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0,486349 \end{bmatrix} \begin{Bmatrix} 1 \\ 0.86334 \\ -0,25465 \\ -1,08319 \\ -0,68051 \\ 0,49568 \\ 1,10844 \end{Bmatrix}$$

$$= 1384,227 \; kg.dt^2/cm$$

$$M_4^* = \{1 \quad -0,00783 \quad -0,99994 \quad 0,01566 \quad 0,99982 \quad -0,02349 \quad -0,99963\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0,486349 \end{bmatrix} \begin{Bmatrix} 1 \\ -0,00783 \\ -0,99994 \\ 0,01566 \\ 0,99982 \\ -0,02349 \\ -0,99963 \end{Bmatrix}$$

$$= 1124,965 \; kg.dt^2/cm$$

$$M_5^* = \{1 \quad -0,87901 \quad -0,22735 \quad 1,07885 \quad -0,72096 \quad -0,44511 \quad 1,11222\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0,486349 \end{bmatrix} \begin{Bmatrix} 1 \\ -087901 \\ -0,22735 \\ 1,07885 \\ -0,72096 \\ -0,44511 \\ 1,11222 \end{Bmatrix}$$

$\Gamma_1+\Gamma_2+\Gamma_3+\Gamma_4+\Gamma_5+\Gamma_6+\Gamma_7 = 1$

0,282677 + 0,254985 + 0,20508 + 0,142857 + 0,080632 + 0,030729 + 0,00304 = 1

II. MENCARI KONSTANTA "a"

$$a = \left[\omega_j^2 - \frac{2}{(\Delta t)^2} \right]$$

$$a_1 = \left[8{,}551538^2 - \frac{2}{(0{,}01)^2} \right] = -19926{,}9$$

$$a_2 = \left[25{,}22578^2 - \frac{2}{(0{,}01)^2} \right] = -19363{,}7$$

$$a_3 = \left[40{,}63525^2 - \frac{2}{(0{,}01)^2} \right] = -18348{,}8$$

$$a_4 = \left[54{,}00713^2 - \frac{2}{(0{,}01)^2} \right] = -17083{,}2$$

$$a_5 = \left[64{,}67095^2 - \frac{2}{(0{,}01)^2} \right] = -15817{,}7$$

$$a_6 = \left[72{,}09232^2 - \frac{2}{(0{,}01)^2} \right] = -14802{,}7$$

$$a_7 = \left[75{,}90934^2 - \frac{2}{(0{,}01)^2} \right] = -14237{,}8$$

III. MENCARI KONSTANTA "b"

$$b = \left[\frac{1}{(\Delta t)^2} - \frac{2\xi\omega_j}{2\Delta t} \right]$$

dengan nilai rasio redaman / *dumping ratio* (ξ) = 5 %

$$b_1 = \left[\frac{1}{(0{,}01)^2} - \frac{2 \times 0{,}05 \times 8{,}551538}{2 \times 0{,}01} \right] = 9957{,}242$$

$$b_2 = \left[\frac{1}{(0{,}01)^2} - \frac{2 \times 0{,}05 \times 25{,}22578}{2 \times 0{,}01} \right] = 9873{,}871$$

$$b_3 = \left[\frac{1}{(0{,}01)^2} - \frac{2 \times 0{,}05 \times 40{,}63525}{2 \times 0{,}01} \right] = 9796{,}824$$

$Z_4 = g_4 \times \Gamma_4 = -0{,}0001162 \times 0{,}142857 = -0{,}000016599$

$Z_5 = g_5 \times \Gamma_5 = -0{,}0001156 \times 0{,}080632 = -0{,}000009321$

$Z_6 = g_6 \times \Gamma_6 = -0{,}0001152 \times 0{,}030729 = -0{,}000003539$

$Z_7 = g_7 \times \Gamma_7 = -0{,}0001149 \times 0{,}00304 = -0{,}000003492$

a) Menghitung Simpangan (y)

$$Y_j = \sum_{j=1}^{n} [\phi_n Z_1]$$

$Y_1 = (1 \times -0{,}000033582) + (1 \times -0{,}000030037) + (1 \times -0{,}000023973) + (1 \times -0{,}000016599) +$
$(1 \times -0{,}000009321) + (1 \times -0{,}000003539) + (1 \times -0{,}000003492)$
$= -0.000117462$

$Y_2 = (1{,}94966 \times -0{,}000033582) + (1{,}56196 \times -0{,}000030037) + (0{,}86334 \times -0{,}000023973) +$
$(-0{,}00783 \times -0{,}000016599) + (-0{,}87901 \times -0{,}000009321) + (-1{,}.57769 \times -0{,}000003539) +$
$(-1{,}96657 \times -0{,}000003492)$
$= -0{,}000118566$

$Y_3 = (2{,}80117 \times -0{,}000033582) + (1{,}43971 \times -0{,}000030037) + (-0.25465 \times -0{,}000023973) +$
$(-0{,}99994 \times -0{,}000016599) + (-0{,}22735 \times -0{,}000009321) + (1{,}4891 \times -0{,}000003539) +$
$(2{,}86739 \times -0{,}000003492)$
$= -0{,}000118828$

$Y_4 = (3{,}51167 \times -0{,}000033582) + (0{,}6868 \times -0{,}000030037) + (-1{,}08319 \times -0{,}000023973) +$
$(0{,}01566 \times -0{,}000016599) + (1{,}07885 \times -0{,}000009321) + (-0{,}77165 \times -0{,}000003539) +$
$(-3{,}67234 \times -0{,}000003492)$
$= -0{,}000118942$

$Y_5 = (4{,}0454 \times -0{,}000033582) + (-0{,}36695 \times -0{,}000030037) + (-0{,}68051 \times -0{,}000023973) +$
$(0{,}99982 \times -0{,}000016599) + (-0{,}72096 \times -0{,}000009321) + (-0{,}27168 \times -0{,}000003539) +$
$(4{,}3545 \times -0{,}000003492)$
$= -0{,}000118999$

$Y_6 = (4{,}37547 \times -0{,}000033582) + (-1{,}25996 \times -0{,}000030037) + (0{,}49568 \times -0{,}000023973) +$
$(-0{,}02349 \times -0{,}000016599) + (-0{,}44511 \times -0{,}000009321) + (1{,}20028 \times -0{,}000003539) +$
$(-4{,}89107 \times -0{,}000003492)$

= -0,000119027

Y_7 = (4,48528 × -0,000033582)+(-1,60106 × -0,000030037)+(1,10844 × -0,000023973)+ (-0,99963 × -0,000016599)+(1,11222 × -0,000009321)+ (-1,62198 × -0,000003539)+ (5,2641 × -0,000003492)

= -0,000119035

b) Menghitung Simpangan Antar Tingkat / *interstorey drift* (yy)

Simpangan Antar Tingkat dihitung dengan rumus sebagai berikut :

$$yy_j(t) = \frac{y_j(t) - y_{j-1}(t)}{h} \times 100\%$$

$$yy_1 = \frac{-0.000117462 - 0}{4{,}0} \times 100\%$$

= -2.93655E-05 %

$$yy_2 = \frac{-0.000118566 - -0.000117462}{4{,}0} \times 100\%$$

= -2.760E-07 %

$$yy_3 = \frac{-0{,}000118828 - -0{,}000118566}{4{,}0} \times 100\%$$

= -6.55E-08 %

$$Yy_4 = \frac{-0{,}000118942 - -0{,}000118828}{4{,}0} \times 100\%$$

= -2.85E-08 %

$$Yy_5 = \frac{-0{,}000118999 - -0{,}000118942}{4{,}0} \times 100\%$$

= -1.425E-08 %

$$Yy_6 = \frac{-0{,}000119027 - -0{,}000118999}{4{,}0} \times 100\%$$

= -7.000E-09 %

$$Yy_7 = \frac{-0{,}000119035 - -0{,}000119027}{4{,}0} \times 100\%$$

= -2.000E-09 %

c) Menghitung Gaya Horisontal Tingkat (F)

Gaya Horisontal Tingkat dihitung dengan rumus sebagai berikut :

$$F_j = k_j \times y_j\,(t)$$

$$F_i = \begin{bmatrix} 156250 & -78125 & 0 & 0 & 0 & 0 & 0 \\ -78125 & 156250 & -78125 & 0 & 0 & 0 & 0 \\ 0 & -78125 & 156250 & -78125 & 0 & 0 & 0 \\ 0 & 0 & -78125 & 156250 & -78125 & 0 & 0 \\ 0 & 0 & 0 & -78125 & 156250 & -78125 & 0 \\ 0 & 0 & 0 & 0 & -78125 & 156250 & -78125 \\ 0 & 0 & 0 & 0 & 0 & -78125 & 78125 \end{bmatrix} \times \begin{bmatrix} -0.000117463 \\ -0.000118567 \\ -0.000118829 \\ -0.000118943 \\ -0.000119 \\ -0.000119028 \\ -0.000119036 \end{bmatrix} = \begin{bmatrix} -9.09055 \\ -0.06575 \\ -0.01160 \\ -0.00439 \\ -0.00230 \\ -0.00155 \\ -0.00061 \end{bmatrix} \text{ kg}$$

$F_1 = -9.09055$ kg

$F_2 = -0.06575$ kg

$F_3 = -0.01160$ kg

$F_4 = -0.00439$ kg

$F_5 = -0.00230$ kg

$F_6 = -0.00155$ kg

$F_7 = -0.00061$ kg

d) Menghitung Gaya Geser Tingkat (V)

Gaya Geser Tingkat merupakan jumlah Gaya Horizontal Tingkat pada tingkat yang ditinjau, dihitung dengan rumus sebagai berikut :

$$V\,(t) = \sum_{j=1}^{n} F(t)$$

1. Lantai 1, $V_1 = F_1 + F_2 + F_3 + F_4 + F_5 + F_6 + F_7$

   = -9,09055+ -0,06576+ -0,0116+ -0,0044+ -0,00231+ -0,00155+ -0,00062

   = -9,17679 kg

2. Lantai 2, $V_2 = F_2 + F_3 + F_4 + F_5 + F_6 + F_7$

   = -0.06576+ -0,0116+ -0,0044+ -0,00231+ -0,00155+ -0,00062

   = -0,08624 kg

3. Lantai 3, $V_3 = F_3 + F_4 + F_5 + F_6 + F_7$

   = -0,0116+ -0,0044+ -0,00231+ -0,00155+ -0,00062

   = -0,02048 kg

4. Lantai 4, $V_4 = F_4 + F_5 + F_6 + F_7$

   = -0,0044+ -0,00231+ -0,00155+ -0,00062

   = -0,00888 kg

5. Lantai 5, $V_5 = F_5 + F_6 + F_7$

   = -0,00231+ -0,00155+ -0,00062

   = -0,00448 kg

6. Lantai 6, $V_6 = F_6 + F_7$

   = -0,00155+ -0,00062

   = -0,00217 kg

7. Lantai 7, $V_7 = F_7$

   = -0,00062 kg

e) Menghitung Momen Guling (Mg)

Momen Guling merupakan pekalian antara Gaya Horisontal Tingkat dengan tinggi tingkat yang ditinjau, dihitung dengan rumus sebagai berikut :

$$Mg_j = \sum_{j=1}^{n} F_j H_j$$

1) $Mg_1 = (F_1 \times H_1)+(F_2 \times (H_1+H_2))+(F_3 \times (H_1+H_2+H_3))+(F_4 \times (H_1+H_2+H_3+H_4))+$
$(F_5 \times (H_1+H_2+H_3+H_4+H_5))+(F_6 \times (H_1+H_2+H_3+H_4+H_5+H_6))+(F_7 \times (H_1+H_2+H_3+$
$H_4+H_5+H_6+H_7))$

$= (-9,09055 \times 4)+(-0,06576 \times 8)+(-0,0116 \times 12)+(-0,0044 \times 16)+(-0,00231 \times 20)+$
$(-0,00155 \times 24) + (-0,00062 \times 28)$

$=$ -0,001738 kg.m

2) $Mg_2 = (F_2 \times (H_1+H_2))+(F_3 \times (H_1+H_2+H_3))+(F_4 \times (H_1+H_2+H_3+H_4))+$
$(F_5 \times (H_1+H_2+H_3+H_4+H_5))+(F_6 \times (H_1+H_2+H_3+H_4+H_5+H_6))+(F_7 \times (H_1+H_2+H_3+$
$H_4+H_5+H_6+H_7))$

$= (-0,06576 \times 8)+(-0,0116 \times 12)+(-0,0044 \times 16)+(-0,00231 \times 20)+(-0,00155 \times 24)+$
$(-0,00062 \times 28)$

$=$ -0,001489 kg.m

3) $Mg_3 = (F_3 \times (H_1+H_2+H_3))+(F_4 \times (H_1+H_2+H_3+H_4))+(F_5 \times (H_1+H_2+H_3+H_4+H_5))+$
$(F_6 \times (H_1+H_2+H_3+H_4+H_5+H_6))+(F_7 \times (H_1+H_2+H_3+H_4+H_5+H_6+H_7))$

$= (-0,0116 \times 12)+(-0,0044 \times 16)+(-0,00231 \times 20)+(-0,00155 \times 24)+(-0,00062 \times 28)$

$=$ -0,001241 kg.m

4) $Mg_4 = (F_4 \times (H_1+H_2+H_3+H_4))+(F_5 \times (H_1+H_2+H_3+H_4+H_5))+$
$(F_6 \times (H_1+H_2+H_3+H_4+H_5+H_6))+(F_7 \times (H_1+H_2+H_3+H_4+H_5+H_6+H_7))$

$= (-0{,}0044 \times 16)+(-0{,}00231 \times 20)+(-0{,}00155 \times 24)+(-0{,}00062 \times 28)$

$= -0{,}0009929$ kg.m

5) $Mg_5 = (F_5 \times (H_1+H_2+H_3+H_4+H_5))+(F_6 \times (H_1+H_2+H_3+H_4+H_5+H_6))+$
$(F_7 \times (H_1+H_2+H_3+H_4+H_5+H_6+H_7))$

$= (-0{,}00231 \times 20) + (-0{,}00155 \times 24) + (-0{,}00062 \times 28)$

$= -0{,}0007445$ kg.m

6) $Mg_6 = (F_6 \times (H_1+H_2+H_3+H_4+H_5+H_6))+(F_7 \times (H_1+H_2+H_3+H_4+H_5+H_6+H_7))$

$= (-0{,}00155 \times 24) + (-0{,}00062 \times 28)$

$= -0{,}0004961$ kg.m

7) $Mg_7 = (F_7 \times (H_1+H_2+H_3+H_4+H_5+H_6+H_7))$

$= (-0{,}00062 \times 28)$

$= -0{,}0002477$ kg.m

2. Langkah 2 (saat 0,02 detik)

Kondisi pertama diketahui $g_{0-1} = 0$; $g_0 = 0$

$$g_1 = \frac{-\ddot{y}_b - a_1.g_0 - b_1.g_{0-1}}{\hat{k}_1}$$

$$= \frac{-2{,}38728 - (-19926{,}9 \times -0{,}0001188) - (9957{,}242 \times 0)}{10042.76} = -0{,}0004734$$

$$g_2 = \frac{-2{,}38728 - (-19363{,}7 \times -0{,}0001178) - (9873{,}871 \times 0)}{10126{,}13} = -0{,}0004610$$

$$g_3 = \frac{-2{,}38728 - (-18348{,}8 \times -0{,}0001169) - (9796{,}824 \times 0)}{10203{,}18} = -0{,}0004442$$

$$g_4 = \frac{-2{,}38728 - (-17083{,}2 \times -0{,}0001162) - (9729{,}964 \times 0)}{10270{,}04} = -0{,}0004257$$

$$g_5 = \frac{-2{,}38728 - (-15817{,}7 \times -0{,}0001156) - (9676{,}645 \times 0)}{10323{,}35} = -0{,}0004084$$

$$g_6 = \frac{-2{,}38728 - (-14802{,}7 \times -0{,}0001152) - (9639{,}538 \times 0)}{10360{,}46} = -0{,}0003950$$

$$g_7 = \frac{-2{,}38728 - (-14237{,}8 \times -0{,}0001149) - (9620{,}453 \times 0)}{10379{,}55} = -0{,}0003876$$

$$Y_5 = (4{,}0454 \times -0{,}000133819)+(-0{,}36695 \times -0{,}000117548)+(-0{,}68051 \times -0{,}000091096)+ (0{,}99982 \times -0{,}000060814)+(-0{,}72096 \times -0{,}000032930)+ (-0{,}27168 \times -0{,}000012138)+ (4{,}3545 \times -0{,}000001178)$$

$$= -0{,}00047526$$

$$Y_6 = (4{,}37547 \times -0{,}000133819)+(-1{,}25996 \times -0{,}000117548)+(0{,}49568 \times -0{,}000091096)+ (-0{,}02349 \times -0{,}000060814)+(-0{,}44511 \times -0{,}000032930)+ (1{,}20028 \times -0{,}000012138)+ (-4{,}89107 \times -0{,}000001178)$$

$$= -0{,}00047543$$

$$Y_7 = (4{,}48528 \times -0{,}000133819)+(-1{,}60106 \times -0{,}000117548)+(1{,}10844 \times -0{,}000091096)+ (-0{,}99963 \times -0{,}000060814)+(1{,}11222 \times -0{,}000032930)+ (-1{,}62198 \times -0{,}000012138)+ (5{,}2641 \times -0{,}000001178)$$

$$= -0{,}00047548$$

b) Menghitung Simpanga Antar Tingkat / *interstorey drift* (yy)

Simpangan Antar Tingkat dihitung dengan rumus sebagai berikut :

$$yy_j(t) = \frac{y_j(t) - y_{j-1}(t)}{h} \times 100\%$$

$$yy_1 = \frac{-0{,}00044965 - 0}{4{,}0} \times 100\%$$

$$= -0.0001124\ \%$$

$$yy_2 = \frac{-0{,}00047243 - -0{,}00044965}{4{,}0} \times 100\%$$

$$= -5.6954681E\text{-}06\ \%$$

$$yy_3 = \frac{-0{,}00047420 - -0{,}00047243}{4{,}0} \times 100\%$$

$$= -4.417349E\text{-}07\ \%$$

$$Yy_4 = \frac{-0{,}00047491 - -0{,}00047420}{4{,}0} \times 100\%$$

$$= -1.769698E\text{-}07\ \%$$

$$Yy_5 = \frac{-0{,}00047526 - -0{,}00047491}{4{,}0} \times 100\%$$

$$= -8.809193E\text{-}08\ \%$$

$$Yy_6 = \frac{-0{,}00047543 - -0{,}00047526}{4.0} \times 100\%$$

$$= -4.2620E\text{-}08\ \%$$

$$Yy_7 = \frac{-0{,}000119035 - -0{,}00047543}{4.0} \times 100\%$$

$$= -1.233971E\text{-}08\ \%$$

c) Menghitung Gaya Horisontal Tingkat (F)

Gaya Horisontal Tingkat dihitung dengan rumus sebagai berikut :

$$F_j = k_j \times y_j\,(t)$$

$$F_i = \begin{bmatrix} 156250 & -78125 & 0 & 0 & 0 & 0 & 0 \\ -78125 & 156250 & -78125 & 0 & 0 & 0 & 0 \\ 0 & -78125 & 156250 & -78125 & 0 & 0 & 0 \\ 0 & 0 & -78125 & 156250 & -78125 & 0 & 0 \\ 0 & 0 & 0 & -78125 & 156250 & -78125 & 0 \\ 0 & 0 & 0 & 0 & -78125 & 156250 & -78125 \\ 0 & 0 & 0 & 0 & 0 & -78125 & 78125 \end{bmatrix} \times \begin{bmatrix} -0.00044965 \\ -0.00047243 \\ -0.00047420 \\ -0.00047491 \\ -0.00047526 \\ -0.00047543 \\ -0.00047548 \end{bmatrix} = \begin{bmatrix} -33.3493 \\ -1.64179 \\ -0.08274 \\ -0.02777 \\ -0.01421 \\ -0.00946 \\ -0.00385 \end{bmatrix} \text{kg}$$

F_1= -33,3493 kg

F_2= -1,64179 kg

F_3= -0,08274 kg

F_4= -0,02777 kg

F_5= -0,01421 kg

F_6= -0,00946 kg

F_7= -0.00385 kg

d) Menghitung Gaya Geser Tingkat (V)

Gaya Geser Tingkat merupakan jumlah Gaya Horizontal Tingkat pada tingkat yang ditinjau, dihitung dengan rumus sebagai berikut :

$$V(t) = \sum_{j=1}^{n} F(t)$$

1. Lantai 1, $V_1 = F_1 + F_2 + F_3 + F_4 + F_5 + F_6 + F_7$

   = - 33,3493 + - 1,64179 + - 0,08274 + - 0,02777 + -0,01421 + -0,00946 + -0,00385

   = -35,12917 kg

2. Lantai 2, $V_2 = F_2 + F_3 + F_4 + F_5 + F_6 + F_7$

   = - 1,64179 + - 0,08274 + - 0,02777 + -0,01421 + -0,00946 + -0,00385

Variabel Hitungan

```
Option Explicit
Public fso As New FileSystemObject
' Deklarasikan variabel global
Public intJumlahData As Integer
Public DenganBase As Boolean
Public intJumlahTinggi As Integer
Public intJumlahBentang As Integer
Public decLTepi As Double
Public decLTengah As Double
Public decTinggiTingkat As Double
Public decBTepi As Double
Public decBTengah As Double
Public decHTepi As Double
Public decHTengah As Double
Public decInertiaKolomTepi, decInertiaKolomTengah As
Double
Public decKekakuanTepi, decKekakuanTengah As Double
Public decKekakuanTotal As Double
Public decKhh, decChh As Double
Public decSkalaGempa As Double
Type arrMass
    arrData() As Double
End Type
Public Const intUnitMassa = 1000
Public Const decG = 9.81
Public Const E = 2 * 10 ^ 5
Public Const TOLERANCE = 1E-24
Public Const DT = 0.01
Public arrTinggi() As Integer
Public arrBentang() As arrMass
Public arrW() As Double
Public arrM() As Double
Public arrA() As Double
Public arrB() As Double
Public arrKB() As Double
Public arrT() As Double
Public arrKaksen() As Double
Public arrPx() As Double
Public arrMx() As Double
Public arrRx() As Double
Public arrW0() As Double ' Omega
Public MatrikMassa() As Double
Public MatrikKekakuan() As Double
Public MatrikEigen() As Double
Public MatrikModeShape1() As Double
Public MatrikMassa1() As Double
Public MatrikTM() As Double
Public ArraySumRow()  As Double
Public ArrayTMT() As Double
Public MatrikOrtogonal() As Double
Public ArrDataGempa() As Double
Public MatrikK() As Double
Public MatrikKx() As Double
Public arrKekakuanTotal() As Double
Public arrAkarPolinomial() As Double
Public decU0, decV0 As Double
Public decDR As Double
Public matrikModeShape() As Double
Public matrikModeShape2() As Double
Public MatrikInvModeShape() As Double
Public lamda() As Double
Public Type matrikIterasi
    arrG() As Double
    arrZ() As Double
    arrY() As Double
    arrYY() As Double
    arrF() As Double
    arrV() As Double
    arrM() As Double
    arrG1() As Double
    arrZ1() As Double
    arrY1() As Double
    arrYx() As Double
End Type
Public Type effectiveType
    arrA() As Double
    arrB() As Double
    arrC() As Double
    arrD() As Double
    arrE() As Double
    arrF() As Double
End Type
Public MatrikIT() As matrikIterasi
Public arrSumMS() As Double
Public arrSumMS2() As Double
Public arrEffectiveEw As effectiveType
Public arrEffectiveEm As effectiveType
Public ArrayMaxIT() As Double
```

Module Analisis

```
Option Explicit

Public Sub InvertTop(arrSource, ByRef arrRes)
Dim i, j As Integer

ReDim arrRes(UBound(arrSource), UBound(arrSource))

For i = 0 To UBound(arrSource) - 1
    For j = 0 To UBound(arrSource) - 1
        arrRes(i, j) = arrSource(i, j) /
arrSource(UBound(arrSource) - 1, j)
    Next j
Next i
End Sub

Public Function kaliMatrik(a() As Double, b() As Double)
Dim Matrik As New matrix
Dim i, j As Integer
Dim tmp() As Double
Dim temp() As Double
Dim res() As Double

ReDim res(UBound(a), UBound(a))
ReDim temp(1, UBound(a, 2))

For i = 0 To UBound(b) - 1
    For j = 0 To UBound(a, 2) - 1
        temp(0, j) = a(i, j)
    Next j

    Matrik.SetMatrixA temp
    Matrik.SetMatrixB b
    Matrik.Multiplication tmp

    For j = 0 To UBound(tmp, 2) - 1
        res(i, j) = tmp(0, j)
    Next j
Next i

kaliMatrik = res
End Function

Public Function kalimatrikC(a() As Double, b() As Double)
Dim Matrik As New matrix
Dim tmp() As Double

Matrik.SetMatrixA a
Matrik.SetMatrixB b
Matrik.Multiplication tmp

kalimatrikC = tmp
End Function

Public Function kaliMatrikKolom(a() As Double, b() As
Double)
Dim Matrik As New matrix
Dim i, j As Integer
Dim res() As Double
Dim tmp() As Double
```

$$P_3^* = \{1 \quad 0.86334 \quad -0.25465 \quad -1.08319 \quad -0.68051 \quad 0.49568 \quad 1.10844\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.486349 \end{bmatrix} 322.6755$$

$$= 283,8767 \ kg.dt^2/cm$$

$$P_4^* = \{1 \quad -0.00783 \quad -0.99994 \quad 0.01566 \quad 0.99982 \quad -0.02349 \quad -0.99963\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.486349 \end{bmatrix} 322.6755$$

$$= 160,7087 \ kg.dt^2/cm$$

$$P_5^* = \{1 \quad -0.87901 \quad -0.22735 \quad 1.07885 \quad -0.72096 \quad -0.44511 \quad 1.11222\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.486349 \end{bmatrix} 322.6755$$

$$= 112,0805 \ kg.dt^2/cm$$

$$P_6^* = \{1 \quad -1,57769 \quad 1,4891 \quad -0,77165 \quad -0.27168 \quad 1.20028 \quad -1.62198\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.486349 \end{bmatrix} 322.6755$$

$$= 90,19141 \ kg.dt^2/cm$$

$$P_7^* = \{1 \quad -1.96657 \quad 2.86739 \quad -3.67234 \quad 4.3545 \quad -4.89107 \quad 5.2641\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.486349 \end{bmatrix} 322.6755$$

$$= 81,34691 \ kg.dt^2/cm$$

$$= 1390{,}022 \; {}^{kg.dt^2}/_{cm}$$

$$M_6^* = \{1 \;\; -1{,}57769 \;\; 1{,}4891 \;\; -0{,}77165 \;\; -0{,}27168 \;\; 1{,}20028 \;\; -1{,}62198\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0{,}486349 \end{bmatrix} \begin{Bmatrix} 1 \\ -1{,}57769 \\ 1{,}4891 \\ -0{,}77165 \\ -0{,}27168 \\ 1{,}20028 \\ -1{,}62198 \end{Bmatrix}$$

$$= 2935{,}039 \; {}^{kg.dt^2}/_{cm}$$

$$M_7^* = \{1 \;\; -1{,}96657 \;\; 2{,}86739 \;\; -3{,}67234 \;\; 4{,}3545 \;\; -4{,}89107 \;\; 5{,}2641\} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0{,}486349 \end{bmatrix} \begin{Bmatrix} 1 \\ -1{,}96657 \\ 2{,}86739 \\ -3{,}67234 \\ 4{,}3545 \\ -4{,}89107 \\ 5{,}2641 \end{Bmatrix}$$

$$= 26761{,}66 \; {}^{kg.dt^2}/_{cm}$$

Maka partisipasi setiap mode adalah,

$$\Gamma_j = \frac{P_j^*}{\mathrm{M}_j^*}$$

$$\Gamma_1 = \frac{6409{,}879}{22675{,}63} = 0{,}282677$$

$$\Gamma_2 = \frac{736{,}6313}{2888{,}925} = 0{,}254985$$

$$\Gamma_3 = \frac{283{,}8767}{1384{,}227} = 0{,}20508$$

$$\Gamma_4 = \frac{160{,}7087}{1124{,}965} = 0{,}142857$$

$$\Gamma_5 = \frac{112{,}0805}{1390{,}022} = 0{,}080632$$

$$\Gamma_6 = \frac{90{,}19141}{2935{,}039} = 0{,}030729$$

$$\Gamma_7 = \frac{81{,}34691}{26761{,}66} = 0{,}00304$$

$$b_4 = \left[\frac{1}{(0{,}01)^2} - \frac{2\times 0{,}05\times 54{,}00713}{2\times 0{,}01}\right] = 9729{,}964$$

$$b_5 = \left[\frac{1}{(0{,}01)^2} - \frac{2\times 0{,}05\times 64{,}67095}{2\times 0{,}01}\right] = 9676{,}645$$

$$b_6 = \left[\frac{1}{(0{,}01)^2} - \frac{2\times 0{,}05\times 72{,}09232}{2\times 0{,}01}\right] = 9639{,}538$$

$$b_7 = \left[\frac{1}{(0{,}01)^2} - \frac{2\times 0{,}05\times 75{,}90934}{2\times 0{,}01}\right] = 9620{,}453$$

IV. MENCARI KONSTANTA "$\hat{k}$"

$$\hat{k} = \left[\frac{1}{(\Delta t)^2} + \frac{2\xi\omega_j}{2\Delta t}\right]$$

$$\hat{k}_1 = \left[\frac{1}{(0{,}01)^2} + \frac{2\times 0{,}05\times 8{,}551538}{2\times 0{,}01}\right] = 10042{,}76$$

$$\hat{k}_2 = \left[\frac{1}{(0{,}01)^2} + \frac{2\times 0{,}05\times 25{,}22578}{2\times 0{,}01}\right] = 10126{,}13$$

$$\hat{k}_3 = \left[\frac{1}{(0{,}01)^2} + \frac{2\times 0{,}05\times 40{,}63525}{2\times 0{,}01}\right] = 10203{,}18$$

$$\hat{k}_4 = \left[\frac{1}{(0{,}01)^2} + \frac{2\times 0{,}05\times 54{,}00713}{2\times 0{,}01}\right] = 10270{,}04$$

$$\hat{k}_5 = \left[\frac{1}{(0{,}01)^2} + \frac{2\times 0{,}05\times 64{,}67095}{2\times 0{,}01}\right] = 10323{,}35$$

$$\hat{k}_6 = \left[\frac{1}{(0{,}01)^2} + \frac{2\times 0{,}05\times 72{,}09232}{2\times 0{,}01}\right] = 10360{,}46$$

$$\hat{k}_7 = \left[\frac{1}{(0{,}01)^2} + \frac{2\times 0{,}05\times 75{,}90934}{2\times 0{,}01}\right] = 10379{,}55$$

Pada integrasi numerik persamaan diferensial yang dimaksud adalah:

$$\ddot{y} + 2\xi\omega_i y + \omega_j^2 g_j = -\ddot{y}_t$$

Nilai yang dicari adalah nilai g_j yangmana j merupakan suatu mode.

$$g_{i+1} = \frac{-\ddot{y}_i - a.g_i - b.g_{i-1}}{\hat{k}}$$

V. PERCEPATAN GEMPA BUCHAREST

Percepatan tanah menggunakan beban gempa Bucharest, dimana percepatan gempa ($\ddot{y}_b$) adalah sebagai berikut :

- Untuk selang waktu 0,01 detik = 1,19364 m/dt^2

- Untuk selang waktu 0,02 detik = 2,38728 m/dt^2

1. Langkah 1.(saat 0,01 detik)

Kondisi pertama diketahui $g_{0-1} = 0$; $g_0 = 0$

$$g_1 = \frac{-\ddot{y}_b - a_1.g_0 - b_1.g_{0-1}}{\hat{k}_1}$$

$$g_1 = \frac{-1,19364 - (-19926,9 \times 0) - (9957,242 \times 0)}{10042,76} = -0,0001188$$

$$g_2 = \frac{-1,19364 - (-19363,7 \times 0) - (9873,871 \times 0)}{10126,13} = -0,0001178$$

$$g_3 = \frac{-1,19364 - (-18348,8 \times 0) - (9796,824 \times 0)}{10203,18} = -0,0001169$$

$$g_4 = \frac{-1,19364 - (-17083,2 \times 0) - (9729,964 \times 0)}{10270,04} = -0,0001162$$

$$g_5 = \frac{-1,19364 - (-15817,7 \times 0) - (9676,645 \times 0)}{10323,35} = -0,0001156$$

$$g_6 = \frac{-1,19364 - (-14802,7 \times 0) - (9639,538 \times 0)}{10360,46} = -0,0001152$$

$$g_7 = \frac{-1,19364 - (-14237,8 \times 0) - (9620,453 \times 0)}{10379,55} = -0,0001149$$

Kemudian.

$$g_j = \frac{Z_j}{\Gamma_j} \qquad \rightarrow \qquad Z_j = g_j \times \Gamma_j$$

$Z_1 = g_1 \times \Gamma_1$ = -0,0001188 × 0,282677 = -0,000033582

$Z_2 = g_2 \times \Gamma_2$ = -0,0001178 × 0,254985 = -0,000030037

$Z_3 = g_3 \times \Gamma_3$ = -0,0001169 × 0,20508 = -0,000023973

```
End Function

Public Sub SetM()
  Dim i, j As Integer
  For i = 0 To intJumlahBentang - 1
    For j = 0 To UBound(arrBentang(i).arrData) - 1
      arrM(j) = arrM(j) + arrBentang(i).arrData(j)
    Next j
  Next i

End Sub

Public Sub cariInertiaKolomTepi()
  decInertiaKolomTepi = (decBTepi * decHTepi ^ 3) / 12
End Sub

Public Sub cariInertiaKolomTengah()
  decInertiaKolomTengah = (decBTengah * decHTengah ^
3) / 12
End Sub

Public Sub setK()
  Dim i, j As Integer
  Dim lDecKekakuan As Double
  ' cari nilai kekakuan tepi
  ReDim arrKekakuanTotal(intJumlahTinggi)

  For i = 0 To intJumlahTinggi - 1
    lDecKekakuan = (12 * E * decInertiaKolomTepi) /
decTinggiTingkat ^ 3
    For j = 1 To intJumlahBentang - 1
      If j < UBound(arrBentang(j).arrData) - 1 Then
        lDecKekakuan = lDecKekakuan + (12 * E *
decInertiaKolomTengah) / (decTinggiTingkat ^ 3)
      ElseIf j = UBound(arrBentang(j).arrData) Then
        lDecKekakuan = lDecKekakuan + (12 * E *
decInertiaKolomTepi) / (decTinggiTingkat ^ 3)
      End If
    Next j

    arrKekakuanTotal(i) = lDecKekakuan

  Next i
End Sub

Public Sub SetMatrikMassa()
  Dim i, j As Integer
  ReDim MatrikMassa(intJumlahTinggi, intJumlahTinggi)
  ' set nilai matrik massa
    For i = 0 To intJumlahTinggi - 1
      For j = 0 To intJumlahTinggi - 1
        If i = j Then
          MatrikMassa(i, j) = arrM(i)
        Else
          MatrikMassa(i, j) = 0
        End If
      Next j
    Next i
End Sub

Public Sub SetMatrikKekakuan()
  Dim i, j As Integer
  ReDim MatrikKekakuan(intJumlahTinggi + 1,
intJumlahTinggi + 1)
  ' set nilai matrik kekakuan
  For i = 0 To intJumlahTinggi
    For j = 0 To intJumlahTinggi
      If i = j Then
        If i = 0 Then
          MatrikKekakuan(i, j) = decKekakuanTotal
        ElseIf i > 0 And i < intJumlahTinggi Then
          MatrikKekakuan(i, j) = 2
        Else
          MatrikKekakuan(i, j) = 1
        End If
      ElseIf (j - 1 = i) Or (i - 1 = j) Then
        MatrikKekakuan(i, j) = -1
      Else
        MatrikKekakuan(i, j) = 0
      End If
    Next j
  Next i
End Sub

Public Sub SetW()
  Dim i, j As Integer
  ReDim arrW(intJumlahTinggi)
  ' set nilai matrik massa
  For i = 0 To intJumlahTinggi - 1
    arrW(i) = (lamda(i) * (arrKekakuanTotal(0) / arrM(0)))
^ 0.5
  Next i
End Sub

Public Sub ShowMatrik(Matrik() As Double, Optional
strCaption As String = "Matrik")
  frmMatrik.Caption = strCaption
  Dim i, j  As Integer
  Dim lvItem As ListItem
  Dim lvSItem As ListSubItem
  Dim lvColHeader As ColumnHeader
  frmMatrik.lvMatrik.ListItems.Clear

  For j = 0 To UBound(Matrik, 2) - 1
    Set lvColHeader =
frmMatrik.lvMatrik.ColumnHeaders.Add(, , "Colom " & j +
1)
  Next j

  For i = 0 To UBound(Matrik) - 1
    Set lvItem = frmMatrik.lvMatrik.ListItems.Add(, ,
Format(Matrik(i, 0), "##0.###00"))

    If UBound(Matrik, 2) > 1 Then
      For j = 1 To UBound(Matrik, 2) - 1
        Set lvSItem = lvItem.ListSubItems.Add(, ,
Format(Matrik(i, j), "##0.###00"))
      Next j
    End If
  Next i
  frmMatrik.Show vbModal
End Sub

Public Sub ShowArray(arr() As Double, Optional strCaption
As String = "Array")
  Dim lvSItem As ListSubItem
  frmMatrik.Caption = strCaption
  Dim i As Integer
  Dim lvItem As ListItem
  Dim lvColHeader As ColumnHeader
  Set lvColHeader =
frmMatrik.lvMatrik.ColumnHeaders.Add
  lvColHeader.Text = "Colom 1"
  frmMatrik.lvMatrik.ListItems.Clear
  For i = 0 To UBound(arr) - 1
    Set lvItem = frmMatrik.lvMatrik.ListItems.Add(, ,
Format(arr(i), "##0.###00"))
  Next i
  frmMatrik.Show vbModal
End Sub

Public Function getData(namaFile)
  Dim i, cnt As Integer
  Dim strTmp As String

  If Not fso.FileExists(namaFile) Then
    getData = False
  End If

'   cnt = RowCount(namaFile)
  cnt = frmBentangTinggi.txtJumlahBentang.Text
  If cnt > 0 Then
```

```
      ReDim arrBentang(cnt)
'     ReDim arrMassaTengah(cnt - 3)
    Else
      MsgBox "File tujuan kosong", vbCritical + vbOKOnly,
App.title
      Exit Function
    End If


    i = 0
    ReDim arrTinggi(cnt)
    Open namaFile For Input As #1
      Do While Not EOF(1)
        Input #1, strTmp
        ReDim arrBentang(i).arrData(1)
        Explode strTmp, arrBentang(i), arrTinggi(i)
        i = i + 1
        If i >= cnt Then Exit Do
      Loop
    Close #1

    'redim arrW, arrM
    If intJumlahTinggi > 0 Then
      'ReDim arrW(intJumlahTinggi)
      ReDim arrM(intJumlahTinggi)
    End If
End Function

Public Sub Explode(stAll, ByRef arrData As arrMass,
ByRef arrT)
    'Dim arrData(1) As String
    Dim i, intRes As Integer
    Dim strTmp As String

    i = 0
    Do While stAll <> ""
      intRes = InStr(stAll, " ")
      If UBound(arrData.arrData) <= i Then
        ReDim Preserve arrData.arrData(i + 1)
      End If
      If i = 0 Then
        arrData.arrData(i) = Trim(Left(stAll, intRes))
      Else
        If intRes > 0 Then
          arrData.arrData(i) = Trim(Left(stAll, intRes))
        ElseIf intRes = 0 And Len(stAll) > 0 Then
          arrData.arrData(i) = Trim(stAll)
          stAll = ""
        End If
      End If
      stAll = Trim(Right(stAll, Len(stAll) - intRes))

      i = i + 1
      'set arrTinggi
      If (arrData.arrData(i - 1) > 0) Then
        arrT = arrT + 1
      End If
      'set jumlah tinggi
      If i > intJumlahTinggi Then
        intJumlahTinggi = i
      End If
    Loop

    'Explode = arrData
End Sub

Public Sub SetMatrikEigen()
    Dim i, j As Integer
    ReDim MatrikEigen(intJumlahTinggi, intJumlahTinggi)
    ' set nilai matrik massa
    For i = 0 To intJumlahTinggi - 1
      For j = 0 To intJumlahTinggi - 1
        MatrikEigen(i, j) = MatrikKekakuan(i, j) /
MatrikMassa(i, i)
      Next j
    Next i
End Sub

Public Sub SetA()
    Dim i As Integer
    ReDim arrA(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      arrA(i) = arrW(i) ^ 2 - (2 / DT ^ 2)
    Next i
End Sub

Public Sub setB()
    Dim i As Integer
    ReDim arrB(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      arrB(i) = (1 / DT ^ 2) - (2 * decDR * arrW(i) / (2 *
DT))
    Next i
End Sub

Public Sub setKB()
    Dim i As Integer
    ReDim arrKB(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      arrKB(i) = (1 / DT ^ 2) + (2 * decDR * arrW(i) / (2 *
DT))
    Next i
End Sub
Public Sub setT()
    Dim i As Integer
    ReDim arrT(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      arrT(i) = (2 * 3.14159) / arrW(i)
    Next i
End Sub
Public Function getMin(arrData() As Double)
    Dim tmp As Double
    Dim i As Integer

    tmp = arrData(0)
    For i = 1 To UBound(arrData) - 1
      If arrData(i) < tmp Then
        tmp = arrData(i)
      End If
    Next i

    getMin = tmp
End Function

Public Function getMax(arrData() As Double)
    Dim tmp As Double
    Dim i As Integer

    tmp = arrData(0)
    For i = 1 To UBound(arrData) - 1
      If arrData(i) > tmp Then
        tmp = arrData(i)
      End If
    Next i

    getMax = tmp
End Function

Public Function getBentang(cnt As Integer)
    Dim tmp, i, j As Integer

    For i = 0 To UBound(arrBentang) - 1
'     For j = 0 To UBound(arrBentang(i).arrData(cnt)) - 1
      If cnt < UBound(arrBentang(i).arrData) Then
        tmp = tmp + 1
      End If
'     Next j
    Next i
```

```
    getBentang = tmp
  End Function

  Public Sub setKaksen()
    Dim maks As Double
    Dim rerata As Double
    Dim i As Integer
    ReDim arrKaksen(intJumlahTinggi)

    maks = getMax(arrKekakuanTotal)
'   rerata = average(arrKekakuanTotal)
    For i = 0 To intJumlahTinggi - 1
'     If maks = rerata Then
'       arrKaksen(i) = Round(arrKekakuanTotal(i) / maks)
+ 1
'     Else
'       arrKaksen(i) = (arrKekakuanTotal(i) / maks) *
(intJumlahBentang + 1) '/ min
        arrKaksen(i) = (arrKekakuanTotal(i) / maks) *
(getBentang(i) + 1) '/ min
'     End If
    Next i
  End Sub

  Public Function average(arrData() As Double)
    Dim i As Integer
    Dim tmp As Double
    For i = 0 To UBound(arrData) - 1
      tmp = tmp + arrData(i)
    Next i
    average = tmp / UBound(arrData)
  End Function

  Public Sub set_into_excel(pbE As ProgressBar, strFile As
  String, strGempa As String)
    Dim aX As New AppExcel
'   aX.SetM MatrikMassa1
'   aX.SetArrMassa arrM
'   aX.SetK MatrikKekakuan
'   aX.SetModeShape MatrikInvModeShape
'   aX.SetOrthogonal res
'   aX.SetLamda lamda
    aX.ClearExcel
    aX.export pbE, strGempa
    If strFile <> "" Then
      aX.saveExcel strFile
    Else
      aX.saveExcel App.Path + "\hasil.xls"
    End If
    aX.ClearExcel
'   Set aX = Null
  End Sub

  Public Sub setW0()
    Dim i As Integer
    Dim strTmp As Double

    i = 0
    ReDim arrW0(intJumlahTinggi)
    Open "C:\TMP_Hasil.EGN" For Input As #1
    Do While Not EOF(1)
      If i < intJumlahTinggi Then
        Input #1, strTmp
        arrW0(i) = strTmp
      Else
        Exit Do
      End If
      i = i + 1
    Loop
    Close #1
  End Sub

  Public Sub get_lamda()
    ReDim lamda(intJumlahTinggi)
    Dim i As Integer
    Dim tmp As Double
    Dim tmp1 As Double
    Dim tmp2 As Double
    tmp = MatrikMassa1(0, 0) / MatrikK(0, 1)
    tmp1 = -MatrikK(0, 0) / MatrikK(0, 1)

    For i = 0 To intJumlahTinggi - 1
      tmp2 = matrikModeShape(1, i) - tmp1
      tmp2 = tmp2 / tmp
      lamda(i) = tmp2
    Next i
  End Sub

  Public Sub setPx()
    Dim i As Integer
    ReDim arrPx(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      arrPx(i) = arrM(0) * ArraySumRow(i)
    Next i
  End Sub

  Public Sub setMx()
    Dim i As Integer
    ReDim arrMx(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      arrMx(i) = arrM(0) * ArrayTMT(i)
    Next i
  End Sub

  Public Sub setRx()
    Dim i As Integer
    ReDim arrRx(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      arrRx(i) = arrPx(i) / arrMx(i)
    Next i
  End Sub

  Public Sub setK1()
    Dim i, j As Integer
    ReDim MatrikK(intJumlahTinggi, intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      For j = 0 To intJumlahTinggi - 1
        If (i <> j) And (i + 1 <> j) Then
          MatrikK(i, j) = 0
        ElseIf i = j Then
          If i = 0 And j = 0 Then
            MatrikK(i, j) = arrKaksen(i) + arrKaksen(i + 1)
            MatrikK(i, j + 1) = -arrKaksen(i)
          ElseIf i = intJumlahTinggi - 1 And j =
intJumlahTinggi - 1 Then
            MatrikK(i, j - 1) = -arrKaksen(i)
            MatrikK(i, j) = arrKaksen(i)
          Else
            MatrikK(i, j - 1) = -arrKaksen(i)
            MatrikK(i, j) = arrKaksen(i) + arrKaksen(i + 1)
            MatrikK(i, j + 1) = -arrKaksen(i + 1)
          End If
        End If
      Next j
    Next i
  End Sub

  Public Sub setKx()
    Dim i, j As Integer
    ReDim MatrikKx(intJumlahTinggi, intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      For j = 0 To intJumlahTinggi - 1
        If (i <> j) And (i + 1 <> j) Then
          MatrikKx(i, j) = 0
        ElseIf i = j Then
          If i = 0 And j = 0 Then
```

```
                MatrikKx(i, j) = arrKekakuanTotal(i) +
arrKekakuanTotal(i + 1)
                MatrikKx(i, j + 1) = -arrKekakuanTotal(i)
            ElseIf i = intJumlahTinggi - 1 And j =
intJumlahTinggi - 1 Then
                MatrikKx(i, j - 1) = -arrKekakuanTotal(i)
                MatrikKx(i, j) = arrKekakuanTotal(i)
            Else
                MatrikKx(i, j - 1) = -arrKekakuanTotal(i)
                MatrikKx(i, j) = arrKekakuanTotal(i) +
arrKekakuanTotal(i + 1)
                MatrikKx(i, j + 1) = -arrKekakuanTotal(i + 1)
            End If
        End If
      Next j
    Next i
End Sub
```

Input Data

```
Option Explicit
Dim x As Integer
Private Declare Function ShellExecute Lib "shell32.dll"
Alias "ShellExecuteA" (ByVal hwnd As Long, ByVal
lpOperation As String, ByVal lpFile As String, ByVal
lpParameters As String, ByVal lpDirectory As String,
ByVal nShowCmd As Long) As Long
Private Declare Sub Sleep Lib "kernel32" (ByVal
dwMilliseconds As Long)

Private Function cForm() As Boolean
  If txtJumlahBentang.Text = "" Then
    x = MsgBox("Masukan jumlah bentang", vbOKOnly +
vbInformation, App.Comments)
    txtJumlahBentang.SetFocus
    cForm = False
    Exit Function
  End If
  If txtBentangTepi.Text = "" Then
    x = MsgBox("Masukan bentang tepi", vbOKOnly +
vbInformation, App.Comments)
    txtBentangTepi.SetFocus
    cForm = False
    Exit Function
  End If
  If txtBentangTengah.Enabled And
txtBentangTengah.Text = "" Then
    x = MsgBox("Masukan jumlah bentang", vbOKOnly +
vbInformation, App.Comments)
    txtBentangTengah.SetFocus
    cForm = False
    Exit Function
  End If
  If txtTinggi1.Text = "" Then
    x = MsgBox("Masukan tinggi ke 1", vbOKOnly +
vbInformation, App.Comments)
    txtTinggi1.SetFocus
    cForm = False
    Exit Function
  End If
  cForm = True
End Function

Private Sub cmdFile_Click()
  If txtJumlahBentang.Text = "" Then
    MsgBox "Masukan Jumlah Bentang dan Jumlah
Tinggi", vbOKOnly + vbInformation
    Exit Sub
  End If

  cd.filename = ""
  cd.InitDir = App.Path & "\Data Struktur"
  cd.Filter = "Data Struktur|*.txt"
  cd.ShowOpen
  If cd.filename = "" Then Exit Sub
  txtFile.Text = cd.filename
End Sub

Private Sub cmdLoad_Click()
  Dim xx As Boolean
  If txtFile.Text <> "" Then
    xx = getData(txtFile.Text)
    cmdMap.Enabled = True
  Else
    MsgBox "Silahkan pilih Data terlebih dahulu"
  End If
End Sub

Private Sub cmdLoadDataGempa_Click()
  Dim strTemp As String
  Dim i As Integer
  Dim cl As ColumnHeader
  Dim it As ListItem
  Dim li As ListSubItem
  cd.filename = ""
  cd.InitDir = App.Path & "\Data Gempa"
  cd.Filter = "Data Gempa|*.txt"
  cd.ShowOpen
  If cd.filename = "" Then Exit Sub
  txtDatGempa.Text = cd.filename
  decSkalaGempa = txtSkalaGempa.Text
  loadDataGempa
End Sub

Private Sub loadDataGempa()
  Dim i As Integer
  Dim strTemp As String

  'Open cd.FileName For Input As #1
  Open txtDatGempa.Text For Input As #1
  i = 0
  Do While Not EOF(1)
    Input #1, strTemp

    i = i + 1
  Loop
  Close #1
  ReDim ArrDataGempa(i)
  'Open cd.FileName For Input As #1
  Open txtDatGempa.Text For Input As #1
  i = 0

  Do While Not EOF(1)
    Input #1, strTemp
    If i > 1 Then
      If strTemp <> "" Then
'       ArrDataGempa(i - 2) = (CDbl(strTemp) / 100) *
decSkalaGempa
        ArrDataGempa(i - 2) = CDbl(strTemp) *
decSkalaGempa
      End If
    End If
    i = i + 1
'   If i = 1003 Then Exit Do
  Loop
  Close #1
End Sub

Private Sub cmdMap_Click()
  frmGambar.Gambar
  frmGambar.Caption = "Gambar Gedung " &
Str(intJumlahTinggi) & " Tingkat Dengan Bentang " &
frmBentangTinggi.txtJumlahBentang.Text
  frmGambar.Show vbModal
End Sub

Private Sub cmdOK_Click()
  Unload Me
End Sub

Private Function DecToStr(dec As Double)
  DecToStr Replace(dec, ",", ".")
```

```
    Open "C:\TMP_Hasil.MDS" For Input As #1
    'i = 0
    i = intJumlahTinggi - 1
    Do While Not EOF(1)
      If i <= intJumlahTinggi Then
        Input #1, strTmp
        For j = 0 To intJumlahTinggi
          x = InStr(strTmp, " ")
          If x > 0 Then
            matrikModeShape(i, j) = Trim(Left(strTmp, x))
          Else
            matrikModeShape(i, j) = Trim(strTmp)
          End If
          strTmp = Trim(Right(strTmp, Len(strTmp) - x))
        Next j
      Else
        Exit Do
      End If
      i = i - 1
    Loop
    Close #1
End Sub

Private Sub cmdSave_Click()
    cd.filename = ""
    cd.InitDir = App.Path & "\Hasil"
    cd.Filter = "Output File(*.xls)|*.xls"
    cd.ShowSave
    If cd.filename = "" Then Exit Sub
    txtSave.Text = cd.filename
End Sub

Private Sub Form_Activate()
    ReDim ArrDataGempa(0)
End Sub

Private Sub txtBalokTengah_KeyPress(KeyAscii As
Integer)
If Not ((KeyAscii >= Asc("0") And KeyAscii <= Asc("9"))
Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or KeyAscii
= 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtBalokTepi_KeyPress(KeyAscii As Integer)
If Not ((KeyAscii >= Asc("0") And KeyAscii <= Asc("9"))
Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or KeyAscii
= 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtBebanMerata1_KeyPress(KeyAscii As
Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtBebanMerataN_KeyPress(KeyAscii As
Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtBentangTengah_KeyPress(KeyAscii As
Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtBentangTengah_Validate(Cancel As
Boolean)
   If txtBentangTengah.Text = "" Then Exit Sub
   On Error GoTo Err
      CDec (txtBentangTengah.Text)
      Exit Sub
Err:
   x = MsgBox("Masukan bilangan desimal", vbOKOnly +
vbInformation, App.Comments)
   txtBentangTengah.SetFocus
   Cancel = True
End Sub

Private Sub txtBentangTepi_KeyPress(KeyAscii As Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtBentangTepi_Validate(Cancel As Boolean)
   If txtBentangTepi.Text = "" Then Exit Sub
   On Error GoTo Err
      CDec (txtBentangTepi.Text)
      Exit Sub
Err:
   x = MsgBox("Masukan bilangan desimal", vbOKOnly +
vbInformation, App.Comments)
   txtBentangTepi.SetFocus
   Cancel = True
End Sub

Private Sub txtChh_KeyPress(KeyAscii As Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtDR_KeyPress(KeyAscii As Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtJumlahBentang_Change()
If Len(txtJumlahBentang.Text) > 0 Then
   Command3.Enabled = True
End If
End Sub

Private Sub txtJumlahBentang_KeyPress(KeyAscii As
Integer)
   If Not (KeyAscii >= Asc("0") And KeyAscii <= Asc("9")
Or KeyAscii = vbKeyBack) Then
      Beep
      KeyAscii = 0
   End If
End Sub
```

```
Private Sub txtKekakuanBase_KeyPress(KeyAscii As
Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtKhh_KeyPress(KeyAscii As Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub
Private Sub txtKolomTengah_KeyPress(KeyAscii As
Integer)
If Not ((KeyAscii >= Asc("0") And KeyAscii <= Asc("9"))
Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or KeyAscii
= 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtKolomTepi_KeyPress(KeyAscii As Integer)
If Not ((KeyAscii >= Asc("0") And KeyAscii <= Asc("9"))
Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or KeyAscii
= 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtMasaBase_KeyPress(KeyAscii As Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtSkalaGempa_KeyPress(KeyAscii As Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtTinggi_KeyPress(KeyAscii As Integer)
   If Not (KeyAscii >= Asc("0") And KeyAscii <= Asc("9")
Or KeyAscii = vbKeyBack) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtTinggi1_KeyPress(KeyAscii As Integer)
   If Not ((KeyAscii >= Asc("0") And KeyAscii <=
Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
KeyAscii = 44) Then
      Beep
      KeyAscii = 0
   End If
End Sub

Private Sub txtTinggi1_Validate(Cancel As Boolean)
   If txtTinggi1.Text = "" Then Exit Sub
   On Error GoTo Err
      CDec (txtTinggi1.Text)
      Exit Sub
   Err:
      x = MsgBox("Masukan bilangan desimal", vbOKOnly +
   vbInformation, App.Comments)
      txtTinggi1.SetFocus
      Cancel = True
   End Sub

   Private Sub txtTinggiN_KeyPress(KeyAscii As Integer)
      If Not ((KeyAscii >= Asc("0") And KeyAscii <=
   Asc("9")) Or KeyAscii = vbKeyBack Or KeyAscii = 46 Or
   KeyAscii = 44) Then
         Beep
         KeyAscii = 0
      End If
   End Sub

   Gambar Struktur

   Option Explicit
   Sub Gambar()
      Dim x
      Dim LebarForm, TinggiForm, Tinggi, Bentang, MaxX,
   MinX, i, j, k As Integer
      LebarForm = Width
      TinggiForm = Height
      MinX = LebarForm
      If LebarForm > TinggiForm Then
         MinX = TinggiForm
      End If
      Dim Kiri, bwh, bawah, atas, Dx As Integer
   '   If frmBentangTinggi.txtJumlahBentang.Text = "" Or
   frmBentangTinggi.txtTinggi.Text = "" Then
   '      x = MsgBox("Masukan jumlah Bentang & Tinggi",
   vbOKOnly + vbInformation)
   '      Exit Sub
   '   End If

      'Tinggi = CInt(frmBentangTinggi.txtTinggi.Text)
      Tinggi = intJumlahTinggi
      Bentang =
   CInt(frmBentangTinggi.txtJumlahBentang.Text)
      MaxX = Tinggi
      If Tinggi < Bentang Then
         MaxX = Bentang
      End If
      Dx = (MinX - 700) / MaxX 'lebar/tinggi bentang
      Kiri = (LebarForm - (Dx * Bentang)) / 2
      'atas = Round((TinggiForm - (Dx * Tinggi)) / 2) - 200
      bawah = TinggiForm - Dx - 200

      'MsgBox Kiri & " " & Dx
      Cls
      For i = 0 To Bentang - 1
         'gambar garis vertikal kiri
         Line (Kiri + (i * Dx), bawah)- _
            (Kiri + (i * Dx), bawah - Dx * arrTinggi(i)), _
            RGB(0, 0, 255)
         'gambar garis vertikal kanan
         Line (Kiri + ((i + 1) * Dx), bawah)-(Kiri + ((i + 1) *
   Dx), _
            bawah - Dx * arrTinggi(i)), RGB(0, 0, 255)

         'gambar base
         Line (Kiri + (i * Dx) - 100, bawah)-((Kiri + (i * Dx) +
   150), _
            bawah), RGB(0, 0, 255), B
         Line (Kiri + ((i + 1) * Dx) - 100, bawah)-((Kiri + ((i +
   1) * Dx) + 150), _
            bawah), RGB(0, 0, 255), B

         'gambar garis horizontal
         For j = 1 To arrTinggi(i)
            Line (Kiri + (i * Dx), bawah - (j * Dx))-(Kiri + Dx
   + (i * Dx), _
```

```
        Line (Kiri, atas + (Dx * i))-(Kiri + (Dx * Bentang), atas
    + (Dx * i)), RGB(0, 255, 0)
        Line (Kiri + (Dx * Bentang), atas + (Dx * i))-(Kiri +
    (Dx * Bentang) + (Dx * 2), atas + (Dx * i) - (Dx / 2)),
    RGB(0, 255, 0)
      Next i
      Line (Kiri, atas + (Dx * idxSimulasi))-(Kiri + (Dx / 2) +
    (Dx * 2), atas + (Dx * idxSimulasi) - (Dx / 2)), RGB(0, 255,
    0)
      Line (Kiri + (Dx / 2) + (Dx * 2), atas + (Dx *
    idxSimulasi) - (Dx / 2))-(Kiri + (Dx * Bentang) + (Dx * 2),
    atas + (Dx * idxSimulasi) - (Dx / 2)), RGB(0, 255, 0)

      Line (Kiri + (0 * Dx), atas + (Dx * idxSimulasi))-(Kiri +
    (0 * Dx), atas + (Dx * Tinggi) + (Dx / 5)), RGB(0, 255, 0)
      Line (Kiri + (1 * Dx), atas + (Dx * idxSimulasi))-(Kiri +
    (1 * Dx), atas + (Dx * Tinggi) + (Dx / 5)), RGB(0, 255, 0)
      Line (Kiri + (2 * Dx), atas + (Dx * idxSimulasi))-(Kiri +
    (2 * Dx), atas + (Dx * Tinggi) + (Dx / 5)), RGB(0, 255, 0)
      Line (Kiri + (3 * Dx), atas + (Dx * idxSimulasi))-(Kiri +
    (3 * Dx), atas + (Dx * Tinggi) + (Dx / 5)), RGB(0, 255, 0)
      Line (Kiri + (4 * Dx), atas + (Dx * idxSimulasi))-(Kiri +
    (4 * Dx), atas + (Dx * Tinggi) + (Dx / 5)), RGB(0, 255, 0)
      Line (Kiri + (5 * Dx), atas + (Dx * idxSimulasi))-(Kiri +
    (5 * Dx), atas + (Dx * Tinggi) + (Dx / 5)), RGB(0, 255, 0)
      Line (Kiri + (6 * Dx), atas + (Dx * idxSimulasi))-(Kiri +
    (6 * Dx), atas + (Dx * Tinggi) + (Dx / 5)), RGB(0, 255, 0)
      Line (Kiri + (7 * Dx), atas + (Dx * idxSimulasi) - (Dx /
    4))-(Kiri + (7 * Dx), atas + (Dx * Tinggi) + (Dx / 5) - (Dx /
    4)), RGB(0, 255, 0)
      Line (Kiri + (8 * Dx), atas + (Dx * idxSimulasi) - (Dx /
    2))-(Kiri + (8 * Dx), atas + (Dx * Tinggi) + (Dx / 5) - (Dx /
    2)), RGB(0, 255, 0)
      Refresh
      If idxSimulasi = 0 Then
        idxSimulasi = 15
        tmSimulasi.Enabled = False
        tmWaitSim.Enabled = True
      End If
    End Sub

    Private Sub tmWait_Timer()
      tmInfo.Enabled = True
    End Sub

    Private Sub tmWaitSim_Timer()
      tmSimulasi.Enabled = True
      tmWaitSim.Enabled = False
    End Sub

    Private Sub tmWalk_Timer()
      lbWalkInfo.Left = lbWalkInfo.Left - 500
      If lbWalkInfo.Left < -lbWalkInfo.Width Then
        lbWalkInfo.Left = Width
      End If
    End Sub

    'Perhitungan Matriks

    Option Explicit

    Private MatrixA() As Double
    Private MatrixB() As Double    ' Our two Matrices

    Public Property Get MatrixARows() As Integer
      MatrixARows = UBound(MatrixA, 1)
    End Property

    Public Property Get MatrixBRows() As Integer
      MatrixBRows = UBound(MatrixB, 1)
    End Property

    Public Property Get MatrixACols() As Integer
      MatrixACols = UBound(MatrixA, 2)
    End Property

    Public Property Get MatrixBCols() As Integer
      MatrixBCols = UBound(MatrixB, 2)
    End Property

    Public Function SetMatrixA(InputArray() As Double)
      On Error Resume Next
      Dim i, j As Integer
      ReDim MatrixA(UBound(InputArray, 1),
    UBound(InputArray, 2))

      For i = 0 To UBound(InputArray(), 1)
        For j = 0 To UBound(InputArray(), 2)
          MatrixA(i, j) = InputArray(i, j)
        Next j
      Next i
    End Function

    Public Function SetMatrixB(InputArray() As Double)
      On Error Resume Next
      Dim i, j As Integer
      ReDim MatrixB(UBound(InputArray, 1),
    UBound(InputArray, 2))

      For i = 0 To UBound(InputArray(), 1)
        For j = 0 To UBound(InputArray(), 2)
          MatrixB(i, j) = InputArray(i, j)
        Next j
      Next i
    End Function

    Public Function SetArrayA(InputArray() As Double, col As
    Integer)
      On Error Resume Next
      Dim i As Integer
      If UBound(MatrixA, 1) < 1 Then
        ReDim MatrixA(UBound(InputArray()), col)
      Else
        ReDim Preserve MatrixA(UBound(InputArray()), col)
      End If
      For i = 0 To UBound(InputArray())
        MatrixA(i, col) = InputArray(i)
      Next i
    End Function

    Public Function SetArrayB(InputArray() As Double, col As
    Integer)
      On Error Resume Next
      Dim i As Integer
      If UBound(MatrixB, 1) < 1 Then
        ReDim MatrixB(UBound(InputArray()), col)
      Else
        ReDim Preserve MatrixB(UBound(InputArray()), col)
      End If
      For i = 0 To UBound(InputArray())
        MatrixB(i, col) = InputArray(i)
      Next i
    End Function

    Public Function GetArrayA(OutputArray() As Double, col
    As _
    Integer)
      On Error Resume Next
      Dim i As Integer
      ReDim OutputArray(UBound(MatrixA, 1))
      For i = 0 To UBound(MatrixA, 1)
        OutputArray(i) = MatrixA(i, col)
      Next i
    End Function

    Public Function GetArrayB(OutputArray() As Double, col
    As _
    Integer)
      On Error Resume Next
      Dim i As Integer
      ReDim OutputArray(UBound(MatrixB, 1))
      For i = 0 To UBound(MatrixB, 1)
```

```
        OutputArray(i) = MatrixB(i, col)
      Next i
    End Function

    Function Addition(Result() As Double) As Boolean
    On Error GoTo errhandler
      Dim Row1() As Double, Row2() As Double, tmpRow1()
    As Double
      Dim tmpRow2() As Double
      Dim i As Integer
      Dim j As Integer

      If (MatrixARows <> MatrixBRows) Or _
        (MatrixACols <> MatrixBCols) Then GoTo errhandler

      ReDim Row1(MatrixARows, MatrixACols)
      ReDim Row2(MatrixBRows, MatrixBCols)
      For i = 0 To MatrixACols
        GetArrayA tmpRow1(), i
        For j = 0 To UBound(tmpRow1())
          Row1(j, i) = tmpRow1(j)
        Next j
      Next i
      For i = 0 To MatrixBCols
        GetArrayB tmpRow2(), i
        For j = 0 To UBound(tmpRow2())
          Row2(j, i) = tmpRow2(j)
        Next j
      Next i

      ReDim Result(MatrixARows, MatrixACols)
      For i = 0 To MatrixARows
        For j = 0 To MatrixACols
          Result(i, j) = Row1(i, j) + Row2(i, j)
        Next j
      Next i
      Addition = True
      Exit Function
    errhandler:
      Addition = False
    End Function

    Function Subtraction(Result() As Double) As Boolean
    On Error GoTo errhandler
      Dim Row1() As Double, Row2() As Double, tmpRow1()
    As Double
      Dim tmpRow2() As Double
      Dim i As Integer
      Dim j As Integer

      If (MatrixARows <> MatrixBRows) Or _
        (MatrixACols <> MatrixBCols) Then GoTo errhandler
      ReDim Row1(MatrixARows, MatrixACols)
      ReDim Row2(MatrixBRows, MatrixBCols)
      For i = 0 To MatrixACols
        GetArrayA tmpRow1(), i
        For j = 0 To UBound(tmpRow1())
          Row1(j, i) = tmpRow1(j)
        Next j
      Next i
      For i = 0 To MatrixBCols
        GetArrayB tmpRow2(), i
        For j = 0 To UBound(tmpRow2())
          Row2(j, i) = tmpRow2(j)
        Next j
      Next i
      ReDim Result(MatrixARows, MatrixACols)
      For i = 0 To MatrixARows
        For j = 0 To MatrixACols
          Result(i, j) = Row1(i, j) - Row2(i, j)
        Next j
      Next i
      Subtraction = True
      Exit Function
    errhandler:
      Subtraction = False
    End Function

    Function Multiplication(Result() As Double) As Boolean
    On Error GoTo errhandler

      Dim Row1() As Double, Row2() As Double, tmpRow1()
    As Double
      Dim tmpRow2() As Double
      Dim x As Integer
      Dim y As Integer
      Dim z As Integer
      Dim i As Integer, j As Integer, k As Integer
      If (MatrixACols <> MatrixBRows) Then GoTo
    errhandler

      i = MatrixARows: j = MatrixBCols: k = MatrixACols

      ReDim Row1(i, k) ' first Matrix
      ReDim Row2(k, j) ' second Matrix
      For x = 0 To k
        GetArrayA tmpRow1(), x
        For y = 0 To UBound(tmpRow1())
          Row1(y, x) = tmpRow1(y)
        Next y
      Next x
      For x = 0 To j
        GetArrayB tmpRow2(), x
        For y = 0 To UBound(tmpRow2())
          Row2(y, x) = tmpRow2(y)
        Next y
      Next x

      ReDim Result(i, j)
      Dim Sum As Double
      Sum = 0
      For x = 0 To i
        For y = 0 To j
          For z = 0 To k
            Sum = Sum + (Row1(x, z) * Row2(z, y))
          Next z
          Result(x, y) = Sum
          Sum = 0
        Next y
      Next x

      ' Everything fine
      Multiplication = True
      Exit Function

    errhandler:
      ' Error
      Multiplication = False
    End Function

    Private Sub ClearUp()
      ReDim MatrixA(0, 0)
      ReDim MatrixB(0, 0)
    End Sub

    Private Sub Class_Initialize()
      ClearUp
    End Sub
```

Perhitungan Respons Dinamik

```
    Private Function SetZero(arrData() As Double)
      Dim i As Integer

      For i = 0 To intJumlahTinggi
        arrData(i) = 0
      Next i

      SetZero = arrData
    End Function
```

```
Private Sub SetG(i As Integer)
  Dim j As Integer
  ReDim Preserve MatrikIT(i).arrG(intJumlahTinggi)

  If i = 0 Then
    MatrikIT(i).arrG = SetZero(MatrikIT(i).arrG)
  ElseIf i = 1 Then
    For j = 0 To intJumlahTinggi - 1
      MatrikIT(i).arrG(j) = (-ArrDataGempa(i - 1) -
(arrA(j) * MatrikIT(i - 1).arrG(j)) - (arrB(j) * 0)) / arrKB(j)
    Next j
  Else
    For j = 0 To intJumlahTinggi - 1
      MatrikIT(i).arrG(j) = (-ArrDataGempa(i - 1) -
(arrA(j) * MatrikIT(i - 1).arrG(j)) - (arrB(j) * MatrikIT(i -
2).arrG(j))) / arrKB(j)
    Next j
  End If
End Sub

Private Sub SetZ(i As Integer)
  Dim j As Integer
  ReDim Preserve MatrikIT(i).arrZ(intJumlahTinggi)

  If i = 0 Then
    MatrikIT(i).arrZ = SetZero(MatrikIT(i).arrZ)
  Else
    For j = 0 To intJumlahTinggi - 1
      MatrikIT(i).arrZ(j) = arrRx(j) * MatrikIT(i).arrG(j)
    Next j
  End If
End Sub

Private Sub SetY(i As Integer)
  Dim j As Integer
  ReDim Preserve MatrikIT(i).arrY(intJumlahTinggi)

  If i = 0 Then
    MatrikIT(i).arrY = SetZero(MatrikIT(i).arrY)
  Else
    For j = 0 To intJumlahTinggi - 1
      For k = 0 To intJumlahTinggi - 1
        MatrikIT(i).arrY(j) = MatrikIT(i).arrY(j) +
MatrikIT(i).arrZ(k) * matrikModeShape(j, k)
      Next k
    Next j
  End If
End Sub

Private Sub SetYY(i As Integer)
  Dim j As Integer
  ReDim Preserve MatrikIT(i).arrYY(intJumlahTinggi)

  If i = 0 Then
    MatrikIT(i).arrYY = SetZero(MatrikIT(i).arrYY)
  Else
    For j = 0 To intJumlahTinggi - 1
      If (j > 0) Then
        MatrikIT(i).arrYY(j) = ((MatrikIT(i).arrY(j) -
MatrikIT(i).arrY(j - 1)) / decTinggiTingkat) * 100
      Else
        MatrikIT(i).arrYY(j) = (MatrikIT(i).arrY(j) /
decTinggiTingkat) * 100
      End If
    Next j
  End If
End Sub

Private Sub SetF(i As Integer)
  Dim j As Integer
  Dim Matrik As New matrix
  Dim tmp() As Double

  ReDim Preserve MatrikIT(i).arrF(intJumlahTinggi)

  If i = 0 Then
    MatrikIT(i).arrF = SetZero(MatrikIT(i).arrF)
  Else
    ReDim tmp(1, intJumlahTinggi)
    For j = 0 To intJumlahTinggi - 1
      tmp(0, j) = MatrikIT(i).arrY(j)
    Next j
    Matrik.SetMatrixA tmp
    Matrik.SetMatrixB MatrikKx
    Matrik.Multiplication tmp

    For j = 0 To intJumlahTinggi - 1
      MatrikIT(i).arrF(j) = tmp(0, j)
    Next j
  End If
End Sub

Private Sub SetV(i As Integer)
  Dim j, k As Integer
  Dim tmp As Double
  ReDim Preserve MatrikIT(i).arrV(intJumlahTinggi)

  If i = 0 Then
    MatrikIT(i).arrV = SetZero(MatrikIT(i).arrV)
  Else
    For j = 0 To intJumlahTinggi - 1
      tmp = 0
      For k = j To intJumlahTinggi - 1
        tmp = tmp + MatrikIT(i).arrF(k)
      Next k
      MatrikIT(i).arrV(j) = tmp
    Next j
  End If
End Sub

Private Sub SetM(i As Integer)
  Dim j, k As Integer
  Dim tmp As Double
  ReDim Preserve MatrikIT(i).arrM(intJumlahTinggi)

  If i = 0 Then
    MatrikIT(i).arrM = SetZero(MatrikIT(i).arrM)
  Else
    For j = 0 To intJumlahTinggi - 1
      tmp = 0
      For k = j To intJumlahTinggi - 1
        tmp = (tmp + (MatrikIT(i).arrF(k) * (k - j + 1)) *
decTinggiTingkat) / 1000
      Next k
      MatrikIT(i).arrM(j) = tmp
    Next j
  End If
End Sub

Private Sub SetG1(i As Integer)
  Dim j, k As Integer
  ReDim Preserve MatrikIT(i).arrG1(intJumlahTinggi)

  If i = 0 Then
    For j = 0 To intJumlahTinggi - 1
      MatrikIT(i).arrG1(j) = (MatrikIT(i + 1).arrG(j) - 0) /
(2 * 0.01)
    Next j
  Else
    If i = UBound(ArrDataGempa) - 1 Then
      For j = 0 To intJumlahTinggi - 1
        MatrikIT(i).arrG1(j) = (0 - MatrikIT(i - 1).arrG(j))
/ (2 * 0.01)
      Next j
    Else
      For j = 0 To intJumlahTinggi - 1
        MatrikIT(i).arrG1(j) = (MatrikIT(i + 1).arrG(j) -
MatrikIT(i - 1).arrG(j)) / (2 * 0.01)
      Next j
    End If
  End If
End Sub
```

```
Private Sub SetZ1(i As Integer)
    Dim j, k As Integer
    Dim tmp As Double
    ReDim Preserve MatrikIT(i).arrZ1(intJumlahTinggi)

    For j = 0 To intJumlahTinggi - 1
        MatrikIT(i).arrZ1(j) = MatrikIT(i).arrG1(j) * arrRx(j)
    Next j
End Sub

Private Sub SetY1(i As Integer)
    Dim j, k As Integer
    ReDim Preserve MatrikIT(i).arrY1(intJumlahTinggi)

    If i = 0 Then
        For j = 0 To intJumlahTinggi - 1
            MatrikIT(i).arrY1(j) = (MatrikIT(i + 1).arrY(j) - 0) /
(2 * 0.01)
        Next j
    Else
        If i = UBound(ArrDataGempa) - 1 Then
            For j = 0 To intJumlahTinggi - 1
                MatrikIT(i).arrY1(j) = (0 - MatrikIT(i - 1).arrY(j))
/ (2 * 0.01)
            Next j
        Else
            For j = 0 To intJumlahTinggi - 1
                MatrikIT(i).arrY1(j) = (MatrikIT(i + 1).arrY(j) -
MatrikIT(i - 1).arrY(j)) / (2 * 0.01)
            Next j
        End If
    End If
End Sub

Private Sub SetYx(i As Integer)
    Dim j As Integer
    ReDim Preserve MatrikIT(i).arrYx(intJumlahTinggi)

    If i = 0 Then
        For j = 0 To intJumlahTinggi - 1
            MatrikIT(i).arrYx(j) = (MatrikIT(i + 1).arrY(j) - (2 *
MatrikIT(i).arrY(j)) - 0) / (0.01 ^ 2)
        Next j
    Else
        If i = UBound(ArrDataGempa) - 1 Then
            For j = 0 To intJumlahTinggi - 1
                MatrikIT(i).arrYx(j) = (0 - (2 *
MatrikIT(i).arrY(j)) - MatrikIT(i - 1).arrY(j)) / (0.01 ^ 2)
            Next j
        Else
            For j = 0 To intJumlahTinggi - 1
                MatrikIT(i).arrYx(j) = (MatrikIT(i + 1).arrY(j) -
(2 * MatrikIT(i).arrY(j)) - MatrikIT(i - 1).arrY(j)) / (0.01 ^
2)
            Next j
        End If
    End If
End Sub

Public Sub setGenerator()
    Dim i As Integer

    For i = 0 To UBound(ArrDataGempa) - 1
        SetG i
        SetZ i
        SetY i
        SetYY i
        SetF i
        SetV i
        SetM i
        If i > 0 Then
            SetG1 i - 1
            SetZ1 i - 1
            SetY1 i - 1
            SetYx i - 1
        End If
    Next i
    'last row
    SetG1 UBound(ArrDataGempa) - 1
    SetZ1 UBound(ArrDataGempa) - 1
    SetY1 UBound(ArrDataGempa) - 1
    SetYx UBound(ArrDataGempa) - 1
    setArrayMax
End Sub

Private Sub setArrayMax()
    Dim i, j As Integer
    Dim tmp() As Double
    ReDim tmp(11 * intJumlahTinggi)

    For i = 0 To UBound(MatrikIT) - 1
        'cari max per G
        For j = 0 To UBound(MatrikIT(i).arrG) - 1
            tmp(j) = cariMax(tmp(j), MatrikIT(i).arrG(j))
        Next j

        'cari max per Z
        For j = 0 To UBound(MatrikIT(i).arrZ) - 1
            tmp(j + intJumlahTinggi) = cariMax(tmp(j +
intJumlahTinggi), MatrikIT(i).arrZ(j))
        Next j

        'cari max per Y
        For j = 0 To UBound(MatrikIT(i).arrY) - 1
            tmp(j + intJumlahTinggi * 2) = cariMax(tmp(j +
intJumlahTinggi * 2), MatrikIT(i).arrY(j))
        Next j

        'cari max per yy
        For j = 0 To UBound(MatrikIT(i).arrYY) - 1
            tmp(j + intJumlahTinggi * 3) = cariMax(tmp(j +
intJumlahTinggi * 3), MatrikIT(i).arrYY(j))
        Next j

        'cari max per F
        For j = 0 To UBound(MatrikIT(i).arrF) - 1
            tmp(j + intJumlahTinggi * 4) = cariMax(tmp(j +
intJumlahTinggi * 4), MatrikIT(i).arrF(j))
        Next j

        'cari max per V
        For j = 0 To UBound(MatrikIT(i).arrV) - 1
            tmp(j + intJumlahTinggi * 5) = cariMax(tmp(j +
intJumlahTinggi * 5), MatrikIT(i).arrV(j))
        Next j

        'cari max per MG
        For j = 0 To UBound(MatrikIT(i).arrM) - 1
            tmp(j + intJumlahTinggi * 6) = cariMax(tmp(j +
intJumlahTinggi * 6), MatrikIT(i).arrM(j))
        Next j

        'cari max per G1
        For j = 0 To UBound(MatrikIT(i).arrG1) - 1
            tmp(j + intJumlahTinggi * 7) = cariMax(tmp(j +
intJumlahTinggi * 7), MatrikIT(i).arrG1(j))
        Next j

        'cari max per Z1
        For j = 0 To UBound(MatrikIT(i).arrZ1) - 1
            tmp(j + intJumlahTinggi * 8) = cariMax(tmp(j +
intJumlahTinggi * 8), MatrikIT(i).arrZ1(j))
        Next j

        'cari max per Y1
        For j = 0 To UBound(MatrikIT(i).arrY1) - 1
            tmp(j + intJumlahTinggi * 9) = cariMax(tmp(j +
intJumlahTinggi * 9), MatrikIT(i).arrY1(j))
        Next j

        'cari max per Yx
```

```
    For j = 0 To UBound(MatrikIT(i).arrYx) - 1
      tmp(j + intJumlahTinggi * 10) = cariMax(tmp(j +
intJumlahTinggi * 10), MatrikIT(i).arrYx(j))
    Next j
  Next i

  ArrayMaxIT = tmp
  End Sub

  Private Function cariMax(a As Double, b As Double)
    If Abs(a) < Abs(b) Then
      cariMax = Abs(b)
    Else
      cariMax = Abs(a)
    End If
  End Function

  Private Sub ClearUp()
    ReDim MatrikIT(UBound(ArrDataGempa))
  End Sub

  Private Sub Class_Initialize()
    ClearUp
  End Sub

'Perhitungan Effective Weight Dan Effective Mass

  Private Sub ClearUp()
  End Sub

  Private Sub Class_Initialize()
    ClearUp
  End Sub

  Private Function getSumModeShape(ms() As Double)
    Dim i, j As Integer
    Dim tmp As Double
    Dim arrTMP() As Double
    ReDim arrTMP(intJumlahTinggi) As Double

    For i = 0 To intJumlahTinggi - 1
      tmp = 0
      For j = 0 To intJumlahTinggi - 1
        tmp = tmp + matrikModeShape(j, i)
      Next j
      arrTMP(i) = tmp
    Next i
    getSumModeShape = arrTMP
  End Function

  Private Function getSumModeShape2(ms() As Double)
    Dim i, j As Integer
    Dim tmp As Double
    Dim arrTMP() As Double
    ReDim arrTMP(intJumlahTinggi) As Double

    For i = 0 To intJumlahTinggi - 1
      tmp = 0
      For j = 0 To intJumlahTinggi - 1
        tmp = tmp + matrikModeShape2(j, i)
      Next j
      arrTMP(i) = tmp
    Next i
    getSumModeShape2 = arrTMP
  End Function

  Private Sub getA()
    Dim i As Integer
    ReDim Preserve arrEffectiveEw.arrA(intJumlahTinggi)

    arrSumMS = getSumModeShape(matrikModeShape)
    For i = 0 To intJumlahTinggi - 1
      arrEffectiveEw.arrA(i) = (arrM(i) * 980) *
arrSumMS(i)
    Next i
  End Sub

  Private Sub getB()
    Dim i As Integer
    ReDim Preserve arrEffectiveEw.arrB(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      arrEffectiveEw.arrB(i) = arrEffectiveEw.arrA(i) ^ 2
    Next i
  End Sub

  Private Sub getC()
    Dim i As Integer
    ReDim Preserve arrEffectiveEw.arrC(intJumlahTinggi)

    GetModeShape2
    arrSumMS2 = getSumModeShape2(matrikModeShape2)
    For i = 0 To intJumlahTinggi - 1
      arrEffectiveEw.arrC(i) = (arrM(i) * 980) *
arrSumMS2(i)
    Next i
  End Sub

  Private Sub getD()
    Dim i As Integer
    ReDim Preserve arrEffectiveEw.arrD(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
      arrEffectiveEw.arrD(i) = arrEffectiveEw.arrB(i) /
arrEffectiveEw.arrC(i)
    Next i
  End Sub

  Private Sub getE()
    Dim i As Integer
    Dim tmp As Double

    'get sum of D
    For i = 0 To intJumlahTinggi - 1
      tmp = tmp + arrEffectiveEw.arrD(i)
    Next i

    ReDim Preserve arrEffectiveEw.arrE(intJumlahTinggi)
    For i = 0 To intJumlahTinggi - 1
      arrEffectiveEw.arrE(i) = (arrEffectiveEw.arrD(i) / tmp)
* 100
    Next i
  End Sub

  Private Sub getF()
    Dim i As Integer

    ReDim Preserve arrEffectiveEw.arrF(intJumlahTinggi)
    arrEffectiveEw.arrF(0) = arrEffectiveEw.arrE(0)
    For i = 1 To intJumlahTinggi - 1
      arrEffectiveEw.arrF(i) = arrEffectiveEw.arrF(i - 1) +
arrEffectiveEw.arrE(i)
    Next i
  End Sub

  Private Sub GetModeShape2()
    Dim i, j As Integer
    ReDim matrikModeShape2(UBound(matrikModeShape),
UBound(matrikModeShape, 2))

    For i = 0 To UBound(matrikModeShape)
      For j = 0 To UBound(matrikModeShape, 2)
        matrikModeShape2(i, j) = (matrikModeShape(i, j)) ^
2
      Next j
    Next i
  End Sub

  Private Sub getmA()
    Dim i As Integer
    ReDim Preserve arrEffectiveEm.arrA(intJumlahTinggi)
```

```
    For i = 0 To intJumlahTinggi - 1
        arrEffectiveEm.arrA(i) = arrSumMS(i)
    Next i
End Sub

Private Sub getmB()
    Dim i As Integer
    ReDim Preserve arrEffectiveEm.arrB(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
        arrEffectiveEm.arrB(i) = arrEffectiveEm.arrA(i) ^ 2
    Next i
End Sub

Private Sub getmC()
    Dim i As Integer
    ReDim Preserve arrEffectiveEm.arrC(intJumlahTinggi)
    For i = 0 To intJumlahTinggi - 1
        arrEffectiveEm.arrC(i) = arrSumMS2(i)
    Next i
End Sub

Private Sub getmD()
    Dim i As Integer
    ReDim Preserve arrEffectiveEm.arrD(intJumlahTinggi)

    For i = 0 To intJumlahTinggi - 1
        arrEffectiveEm.arrD(i) = arrEffectiveEm.arrB(i) /
arrEffectiveEm.arrC(i)
    Next i
End Sub

Private Sub getmE()
    Dim i As Integer
    Dim tmp As Double

    'get sum of D
    For i = 0 To intJumlahTinggi - 1
        tmp = tmp + arrEffectiveEm.arrD(i)
    Next i

    ReDim Preserve arrEffectiveEm.arrE(intJumlahTinggi)
    For i = 0 To intJumlahTinggi - 1
        arrEffectiveEm.arrE(i) = (arrEffectiveEm.arrD(i) /
tmp) * 100
    Next i
End Sub

Private Sub getmF()
    Dim i As Integer

    ReDim Preserve arrEffectiveEm.arrF(intJumlahTinggi)
    arrEffectiveEm.arrF(0) = arrEffectiveEm.arrE(0)
    For i = 1 To intJumlahTinggi - 1
        arrEffectiveEm.arrF(i) = arrEffectiveEm.arrF(i - 1) +
arrEffectiveEm.arrE(i)
    Next i
End Sub

Public Sub SetEffectiveE()
'effective w
getA
getB
getC
getD
getE
getF

'effective m
getmA
getmB
getmC
getmD
getmE
getmF
End Sub
```

Export ke Excel

```
Option Explicit
Private myExcel As New Excel.Application
Private myBook As Excel.Workbook
Private mySheet As Excel.Worksheet
Private mySheet2 As Excel.Worksheet
Private mySheet3 As Excel.Worksheet
Private mySheet4 As Excel.Worksheet
Private mySheet5 As Excel.Worksheet
Private strTitle() As String
Private strJudul() As String
Private tmpTinggi() As Double
Private tmpinvTinggi() As Double
Private tmpTingkat() As Double
Private arrayNol() As Double

Private Sub initialExcel()
    Set myBook = myExcel.Workbooks.Add
'    myBook.Application.Visible = True
    myBook.Worksheets.Add
    myBook.Worksheets.Add
    myBook.Worksheets.Add
    myBook.Worksheets.Add
    myBook.Worksheets.Add
    Set mySheet = myBook.Worksheets(1)
    mySheet.Name = "Data"
    Set mySheet2 = myBook.Worksheets(2)
    mySheet2.Name = "Grafik"
    Set mySheet3 = myBook.Worksheets(3)
    mySheet3.Name = "Mode Shape"
    Set mySheet4 = myBook.Worksheets(4)
    mySheet4.Name = "Mode Shape Ori"
    Set mySheet5 = myBook.Worksheets(5)
    mySheet5.Name = "Effective"
    End Sub

Private Sub setTmpTinggi()
    Dim i, j As Integer
    ReDim tmpTinggi(intJumlahTinggi + 1)
    ReDim tmpinvTinggi(intJumlahTinggi)
    ReDim arrayNol(intJumlahTinggi)

    For i = 0 To intJumlahTinggi
        tmpTinggi(i) = i
    Next i

    j = 0
    For i = intJumlahTinggi To 1 Step -1
        tmpinvTinggi(j) = i
        j = j + 1
    Next i

    For i = 0 To intJumlahTinggi - 1
        arrayNol(i) = 0
    Next i
End Sub

Private Sub setTmpTingkat()
    Dim i, j As Integer
    ReDim tmpTingkat(intJumlahTinggi + 1)
    ReDim tmpinvTinggi(intJumlahTinggi)

    For i = 0 To intJumlahTinggi
        tmpTingkat(i) = i
    Next i
    j = 0
    For i = intJumlahTinggi To 1 Step -1
        tmpinvTinggi(j) = i
        j = j + 1
    Next i
End Sub

Public Sub export(pbE As ProgressBar, gempa As String)
    Dim i As Integer
    Dim j As Double
```

```
    initialExcel
    setTmpTinggi
    setTmpTingkat
    printMatrik 2, 1, mySheet, MatrikMassa1, "Matrik
Massa"
    printMatrik 2, UBound(MatrikMassa1, 2) + 2, mySheet,
MatrikModeShape1, "T"
    printMatrik 2, UBound(MatrikMassa1, 2) +
UBound(MatrikModeShape1, 2) + 3, mySheet, MatrikTM,
"Matrik TM"
    printMatrik 2, UBound(MatrikMassa1, 2) +
UBound(MatrikModeShape1, 2) + UBound(MatrikTM) + 4,
mySheet, matrikModeShape, "Matrik Mode Shape"
    printMatrik 2, UBound(MatrikMassa1, 2) +
UBound(MatrikModeShape1, 2) + UBound(MatrikTM) +
UBound(matrikModeShape) + 5, mySheet, MatrikK,
"Matrik [K]"
    printMatrik 2, UBound(MatrikMassa1, 2) +
UBound(MatrikModeShape1, 2) + UBound(MatrikTM) +
UBound(matrikModeShape) + UBound(MatrikK) + 6,
mySheet, matrikModeShape2, "Matrik Mode Shape2"

    printMatrik 3, 1, mySheet3, MatrikInvModeShape,
"Matrik Mode Shape Dibagi"

    printColomn 1, 1, mySheet3, tmpTinggi
    printColomn 2, 1, mySheet3, arrayNol

    printMatrik 3, 1, mySheet4, matrikModeShape, "Matrik
Mode Shape "

    printColomn 1, 1, mySheet4, tmpTinggi
    printColomn 2, 1, mySheet4, arrayNol
    printColomn 1, 1, mySheet5, tmpinvTinggi

    printArray UBound(MatrikMassa1) + 4, 1, mySheet,
arrM, "M"
    printArray UBound(MatrikMassa1) + 4, 2, mySheet,
lamda, "Lamda"
    printArray UBound(MatrikMassa1) + 4, 3, mySheet,
arrKekakuanTotal, "Kekakuan Total"
    printArray UBound(MatrikMassa1) + 4, 4, mySheet,
arrW, "Omega"
    printArray UBound(MatrikMassa1) + 4, 5, mySheet,
ArraySumRow, "Sigma TM"
    printArray UBound(MatrikMassa1) + 4, 6, mySheet,
ArrayTMT, "TMT"
    printArray UBound(MatrikMassa1) + 4, 7, mySheet,
arrA, "A"
    printArray UBound(MatrikMassa1) + 4, 8, mySheet,
arrB, "B"
    printArray UBound(MatrikMassa1) + 4, 9, mySheet,
arrKaksen, "K'"
    printArray UBound(MatrikMassa1) + 4, 10, mySheet,
arrKB, "Kb"
    printArray UBound(MatrikMassa1) + 4, 11, mySheet,
arrT, "T"
    printArray UBound(MatrikMassa1) + 4, 12, mySheet,
arrPx, "Px"
    printArray UBound(MatrikMassa1) + 4, 13, mySheet,
arrMx, "Mx"
    printArray UBound(MatrikMassa1) + 4, 14, mySheet,
arrRx, "Rx"
    printArray UBound(MatrikMassa1) + 4, 16, mySheet,
arrSumMS, "EMS"
    printArray UBound(MatrikMassa1) + 4, 17, mySheet,
arrSumMS2, "EMS2"

    printArrayInv UBound(MatrikMassa1) + 4, 19, mySheet,
arrEffectiveEw.arrA, "EWT"
    printArrayInv UBound(MatrikMassa1) + 4, 20, mySheet,
arrEffectiveEw.arrB, "(EWT)^2"
    printArrayInv UBound(MatrikMassa1) + 4, 21, mySheet,
arrEffectiveEw.arrC, "EWT^2"
    printArrayInv UBound(MatrikMassa1) + 4, 22, mySheet,
arrEffectiveEw.arrD, "Ew"
    printArrayInv UBound(MatrikMassa1) + 4, 23, mySheet,
arrEffectiveEw.arrE, "% Jumlah"
    printArrayInv UBound(MatrikMassa1) + 4, 24, mySheet,
arrEffectiveEw.arrF, "Akumulasi"

    printArrayInv UBound(MatrikMassa1) + 4, 26, mySheet,
arrEffectiveEm.arrA, "Px"
    printArrayInv UBound(MatrikMassa1) + 4, 27, mySheet,
arrEffectiveEm.arrB, "Px^2"
    printArrayInv UBound(MatrikMassa1) + 4, 28, mySheet,
arrEffectiveEm.arrC, "Mx"
    printArrayInv UBound(MatrikMassa1) + 4, 29, mySheet,
arrEffectiveEm.arrD, "Em"
    printArrayInv UBound(MatrikMassa1) + 4, 30, mySheet,
arrEffectiveEm.arrE, "% Jumlah"
    printArrayInv UBound(MatrikMassa1) + 4, 31, mySheet,
arrEffectiveEm.arrF, "Akumulasi"

    printArray UBound(MatrikMassa1) + intJumlahTinggi +
7, 3, mySheet, ArrDataGempa, "0"

    pbE.Min = 0
    pbE.Max = UBound(MatrikIT)
    j = 0

    For i = 0 To UBound(MatrikIT) - 1
      mySheet.Cells(UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 1) = i
      mySheet.Cells(UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 2) = j
      j = j + 0.01

      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4, mySheet, MatrikIT(i).arrG
      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG),
mySheet, MatrikIT(i).arrZ
      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG) +
UBound(MatrikIT(i).arrZ), mySheet, MatrikIT(i).arrY
      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG) +
UBound(MatrikIT(i).arrZ) + UBound(MatrikIT(i).arrY),
mySheet, MatrikIT(i).arrYY
      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG) +
UBound(MatrikIT(i).arrZ) + UBound(MatrikIT(i).arrY) +
UBound(MatrikIT(i).arrYY), mySheet, MatrikIT(i).arrF
      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG) +
UBound(MatrikIT(i).arrZ) + UBound(MatrikIT(i).arrY) +
UBound(MatrikIT(i).arrYY) + UBound(MatrikIT(i).arrF),
mySheet, MatrikIT(i).arrV
      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG) +
UBound(MatrikIT(i).arrZ) + UBound(MatrikIT(i).arrY) +
UBound(MatrikIT(i).arrYY) + UBound(MatrikIT(i).arrF) +
UBound(MatrikIT(i).arrV), mySheet, MatrikIT(i).arrM

      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG) +
UBound(MatrikIT(i).arrZ) + UBound(MatrikIT(i).arrY) +
UBound(MatrikIT(i).arrYY) + UBound(MatrikIT(i).arrF) +
UBound(MatrikIT(i).arrV) + _
        UBound(MatrikIT(i).arrM), mySheet,
MatrikIT(i).arrG1
      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG) +
UBound(MatrikIT(i).arrZ) + UBound(MatrikIT(i).arrY) +
UBound(MatrikIT(i).arrYY) + UBound(MatrikIT(i).arrF) +
UBound(MatrikIT(i).arrV) + _
        UBound(MatrikIT(i).arrM) +
UBound(MatrikIT(i).arrG1), mySheet, MatrikIT(i).arrZ1
      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG) +
UBound(MatrikIT(i).arrZ) + UBound(MatrikIT(i).arrY) +
```

```
UBound(MatrikIT(i).arrYY) + UBound(MatrikIT(i).arrF) +
UBound(MatrikIT(i).arrV) + _
        UBound(MatrikIT(i).arrM) +
UBound(MatrikIT(i).arrG1) + UBound(MatrikIT(i).arrZ1),
mySheet, MatrikIT(i).arrY1
      printColomn UBound(MatrikMassa1) +
intJumlahTinggi + i + 6, 4 + UBound(MatrikIT(i).arrG) +
UBound(MatrikIT(i).arrZ) + UBound(MatrikIT(i).arrY) +
UBound(MatrikIT(i).arrYY) + UBound(MatrikIT(i).arrF) +
UBound(MatrikIT(i).arrV) + _
        UBound(MatrikIT(i).arrM) +
UBound(MatrikIT(i).arrG1) + UBound(MatrikIT(i).arrZ1) +
UBound(MatrikIT(i).arrY1), mySheet, MatrikIT(i).arrYx
    pbE.Value = i
  Next i

  'buat judul
  createTitle gempa
  printColomnS (UBound(MatrikMassa1) +
intJumlahTinggi + 5), 1, mySheet, strTitle
  printColomn UBound(MatrikMassa1) + intJumlahTinggi
+ i + 7, 4, mySheet, ArrayMaxIT

  buatGrafik mySheet, mySheet2, intJumlahTinggi * 2,
"Y", "Simpangan (cm)", 1, 1, False
  buatGrafik mySheet, mySheet2, intJumlahTinggi * 3,
"yy", "Interstorey Drift (%)", 2, 1, True
  buatGrafik mySheet, mySheet2, intJumlahTinggi * 4, "F",
"Gaya Horisontal Tingkat (Kg)", 3, 2, False
  buatGrafik mySheet, mySheet2, intJumlahTinggi * 5,
"V", "Gaya Geser (Kg)", 4, 2, True
  buatGrafik mySheet, mySheet2, intJumlahTinggi * 6,
"MG", "Momen Guling (Kg.cm)", 5, 3, False
  buatGrafik mySheet, mySheet2, intJumlahTinggi * 7,
"G1", "G1", 6, 3, True
  'buatGrafik mySheet, mySheet2, intJumlahTinggi * 8,
"Z1", "Z1", 7, 4, False
  buatGrafik mySheet, mySheet2, intJumlahTinggi * 9,
"Y1", "Kecepatan", 7, 4, False
  buatGrafik mySheet, mySheet2, intJumlahTinggi * 10,
"Yx", "Percepatan", 8, 4, True
  BuatGrafikInvModeShape mySheet3, mySheet3
  BuatGrafikModeShape mySheet4, mySheet4
  BuatGrafikRx mySheet, mySheet4

  BuatGrafikEffect mySheet, mySheet5,
mySheet5.Range(mySheet5.Cells(1, 1), _
    mySheet5.Cells(1, intJumlahTinggi)),
mySheet.Range(mySheet.Cells(UBound(MatrikMassa1) +
4, 23), _
    mySheet.Cells(UBound(MatrikMassa1) + 3 +
intJumlahTinggi, 23)), 0, 1, "% Jumlah Ew"
  BuatGrafikEffect mySheet, mySheet5,
mySheet5.Range(mySheet5.Cells(1, 1), _
    mySheet5.Cells(1, intJumlahTinggi)),
mySheet.Range(mySheet.Cells(UBound(MatrikMassa1) +
4, 24), _
    mySheet.Cells(UBound(MatrikMassa1) + 3 +
intJumlahTinggi, 24)), 1, 1, "Akumulasi Ew"
  BuatGrafikEffect mySheet, mySheet5,
mySheet5.Range(mySheet5.Cells(1, 1), _
    mySheet5.Cells(1, intJumlahTinggi)),
mySheet.Range(mySheet.Cells(UBound(MatrikMassa1) +
4, 30), _
    mySheet.Cells(UBound(MatrikMassa1) + 3 +
intJumlahTinggi, 30)), 2, 2, "% Jumlah Em"
  BuatGrafikEffect mySheet, mySheet5,
mySheet5.Range(mySheet5.Cells(1, 1), _
    mySheet5.Cells(1, intJumlahTinggi)),
mySheet.Range(mySheet.Cells(UBound(MatrikMassa1) +
4, 31), _
    mySheet.Cells(UBound(MatrikMassa1) + 3 +
intJumlahTinggi, 31)), 3, 2, "Akumulasi Em"
  BuatGrafikT mySheet, mySheet4,
mySheet4.Range(mySheet4.Cells(1, 2), _
    mySheet4.Cells(1, intJumlahTinggi)),
mySheet.Range(mySheet.Cells(UBound(MatrikMassa1) +
4, 11), _
    mySheet.Cells(UBound(MatrikMassa1) + 3 +
intJumlahTinggi, 11)), 4, 3, "T"
End Sub

Public Sub saveExcel(strExcel)
  myBook.SaveAs strExcel
  myBook.Close
  myExcel.Quit
End Sub

Private Sub createTitle(gempa As String)
Dim i As Integer
ReDim strTitle(intJumlahTinggi * 11 + 3)

strTitle(0) = "No. (i)"
strTitle(1) = "t"
strTitle(2) = gempa

'generate g
For i = 0 To intJumlahTinggi - 1
  strTitle(2 + i + 1) = "g" + Trim(Str(i + 1))
Next i

'generate z
For i = 0 To intJumlahTinggi - 1
  strTitle(2 + intJumlahTinggi * 1 + i + 1) = "Z" +
Trim(Str(i + 1))
Next i

'generate Y
For i = 0 To intJumlahTinggi - 1
  strTitle(2 + intJumlahTinggi * 2 + i + 1) = "Y" +
Trim(Str(i + 1))
Next i

'generate yy
For i = 0 To intJumlahTinggi - 1
  strTitle(2 + intJumlahTinggi * 3 + i + 1) = "yy" +
Trim(Str(i + 1))
Next i

'generate F
For i = 0 To intJumlahTinggi - 1
  strTitle(2 + intJumlahTinggi * 4 + i + 1) = "F" +
Trim(Str(i + 1))
Next i

'generate V
For i = 0 To intJumlahTinggi - 1
  strTitle(2 + intJumlahTinggi * 5 + i + 1) = "V" +
Trim(Str(i + 1))
Next i

'generate MG
For i = 0 To intJumlahTinggi - 1
  strTitle(2 + intJumlahTinggi * 6 + i + 1) = "MG" +
Trim(Str(i + 1))
Next i

'generate G1
For i = 0 To intJumlahTinggi - 1
  strTitle(2 + intJumlahTinggi * 7 + i + 1) = "G1-" +
Trim(Str(i + 1))
Next i

'generate Z1
For i = 0 To intJumlahTinggi - 1
  strTitle(2 + intJumlahTinggi * 8 + i + 1) = "Z1-" +
Trim(Str(i + 1))
Next i
```

```
    'generate Y1
    For i = 0 To intJumlahTinggi - 1
      strTitle(2 + intJumlahTinggi * 9 + i + 1) = "Y1-" +
    Trim(Str(i + 1))
    Next i

    'generate Yx
    For i = 0 To intJumlahTinggi - 1
      strTitle(2 + intJumlahTinggi * 10 + i + 1) = "Yx" +
    Trim(Str(i + 1))
    Next i
    End Sub

    Private Sub printArray(row As Integer, col As Integer,
    Sheet As Excel.Worksheet, arrData() As Double, strCaption
    As String)
    Dim i As Integer

    If (strCaption <> "") Then
      Sheet.Cells(row - 1, col) = strCaption
    End If
    For i = 0 To UBound(arrData) - 1
      Sheet.Cells(row + i, col) = arrData(i)
    Next i
    End Sub

    Private Sub printArrayInv(row As Integer, col As Integer,
    Sheet As Excel.Worksheet, arrData() As Double, strCaption
    As String)
    Dim i, j As Integer

    If (strCaption <> "") Then
      Sheet.Cells(row - 1, col) = strCaption
    End If

    j = 0
    For i = UBound(arrData) - 1 To 0 Step -1
      Sheet.Cells(row + i, col) = arrData(j)
      j = j + 1
    Next i
    End Sub

    Private Sub BuatGrafikInvModeShape(sheetSource As
    Excel.Worksheet, sheetDestination As Excel.Worksheet)
      Dim i As Integer

      sheetDestination.Select

      For i = 0 To UBound(MatrikInvModeShape, 2) - 1
        myBook.Charts.Add
        myBook.ActiveChart.ChartType = xlXYScatterSmooth
        myBook.ActiveChart.SetSourceData
  sheetDestination.Range("A1")

        myExcel.ActiveChart.SeriesCollection(1).XValues = _
          sheetSource.Range(sheetSource.Cells(2, 1 + i), _
          sheetSource.Cells(2 + intJumlahTinggi, 1 + i))

        myExcel.ActiveChart.SeriesCollection(1).Values = _
          sheetSource.Range(sheetSource.Cells(1, 1), _
          sheetSource.Cells(1, 1 + intJumlahTinggi))

      myBook.ActiveChart.Location xlLocationAsObject,
  "Mode Shape"
      With myBook.ActiveChart
        .HasTitle = True
        .ChartTitle.Characters.Text = "Mode " + Str(i + 1)
        .Axes(xlCategory, xlPrimary).HasTitle = False
        .Axes(xlValue, xlPrimary).HasTitle = False
      End With
      With myBook.ActiveChart
      .HasAxis(xlCategory, xlPrimary) = True
      .HasAxis(xlValue, xlPrimary) = True
      End With
      With myBook.ActiveChart.Axes(xlCategory)
        .HasMajorGridlines = False
        .HasMinorGridlines = False
      End With
      With myBook.ActiveChart.Axes(xlValue)
        .HasMajorGridlines = False
        .HasMinorGridlines = False
      End With
      myBook.ActiveChart.HasLegend = True
      myBook.ActiveChart.Legend.Font.Size = 8
      myBook.ActiveChart.Legend.Select
      myExcel.Selection.Position = xlBottom
      'geser posisi
      myBook.ActiveChart.ChartArea.Select
      myBook.ActiveSheet.ChartObjects("Chart " + Str(i +
  1)).Activate
      myBook.ActiveChart.ChartArea.Select
      myBook.ActiveChart.PlotArea.Select
      myExcel.Selection.ClearFormats
      myExcel.ActiveWindow.Visible = False
      myBook.ActiveSheet.ChartObjects("Chart " + Str(i +
  1)).Activate
      myBook.ActiveChart.ChartArea.Select
      myBook.ActiveChart.Legend.Select
      myExcel.Selection.Delete
      myBook.ActiveChart.PlotArea.Select
      myBook.ActiveChart.ChartArea.Select
      With myExcel.Selection.Border
        .Weight = 2
        .LineStyle = -1
      End With
      myExcel.Selection.Interior.ColorIndex = xlNone
      myExcel.ActiveWindow.Visible = False
      myBook.ActiveSheet.ChartObjects("Chart " + Str(i +
  1)).Activate
      myBook.ActiveChart.ChartArea.Select
      myBook.ActiveSheet.Shapes("Chart " + Str(i +
  1)).Width = 100
      With myExcel.Selection.Border
        .Weight = 1
        .LineStyle = 0
      End With
      myExcel.Selection.Interior.ColorIndex = xlNone
      myExcel.ActiveWindow.Visible = False
      myBook.ActiveSheet.ChartObjects("Chart " + Str(i +
  1)).Activate
      myBook.ActiveChart.PlotArea.Select
      myBook.ActiveChart.ChartArea.Select
      myBook.ActiveChart.PlotArea.Width = 100
      myBook.ActiveChart.PlotArea.top = 20
      myBook.ActiveSheet.Shapes("Chart " + Str(i +
  1)).IncrementLeft 120 * i
      myBook.ActiveSheet.Shapes("Chart " + Str(i +
  1)).IncrementTop 30
      myBook.ActiveChart.ChartTitle.Select
      myExcel.Selection.AutoScaleFont = True
      With myExcel.Selection.Font
        .Name = "Arial"
        .Size = 8
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = xlAutomatic
        .Background = xlAutomatic
      End With
      myBook.ActiveChart.Axes(xlValue).Select
      With myBook.ActiveChart.Axes(xlValue)
        .MinimumScaleIsAuto = True
        .MaximumScale = intJumlahTinggi
        .MinorUnitIsAuto = True
        .MajorUnitIsAuto = True
        .Crosses = xlAutomatic
        .ReversePlotOrder = False
        .ScaleType = xlLinear
        .DisplayUnit = xlNone
```

```
            End With
                myExcel.Selection.TickLabels.AutoScaleFont =
        True
            With myExcel.Selection.TickLabels.Font
              .Name = "Arial"
              .FontStyle = "Regular"
              .Size = 7
              .Strikethrough = False
              .Superscript = False
              .Subscript = False
              .OutlineFont = False
              .Shadow = False
              .Underline = xlUnderlineStyleNone
              .ColorIndex = xlAutomatic
              .Background = xlAutomatic
            End With
            myBook.ActiveChart.Axes(xlCategory).Select
            With myBook.ActiveChart.Axes(xlCategory)
              .MinimumScaleIsAuto = True
              .MaximumScaleIsAuto = True
              .MinorUnitIsAuto = True
              .MajorUnitIsAuto = 1
              .Crosses = xlAutomatic
              .ReversePlotOrder = False
              .ScaleType = xlLinear
              .DisplayUnit = xlNone
            End With
            myExcel.Selection.TickLabels.AutoScaleFont = True
            With myExcel.Selection.TickLabels.Font
              .Name = "Arial"
              .FontStyle = "Regular"
              .Size = 7
              .Strikethrough = False
              .Superscript = False
              .Subscript = False
              .OutlineFont = False
              .Shadow = False
              .Underline = xlUnderlineStyleNone
              .ColorIndex = xlAutomatic
              .Background = xlAutomatic
            End With
          Next i
        End Sub

        Private Sub BuatGrafikModeShape(sheetSource As
        Excel.Worksheet, sheetDestination As Excel.Worksheet)
          Dim i As Integer

          sheetDestination.Select

          For i = 0 To UBound(matrikModeShape, 2) - 1
            myExcel.Charts.Add
            myExcel.ActiveChart.ChartType =
      xlXYScatterSmooth
            myExcel.ActiveChart.SetSourceData
      sheetDestination.Range("A1")

            myExcel.ActiveChart.SeriesCollection(1).XValues = _
              sheetSource.Range(sheetSource.Cells(2, 1 + i), _
              sheetSource.Cells(2 + intJumlahTinggi, 1 + i))

            myExcel.ActiveChart.SeriesCollection(1).Values = _
              sheetSource.Range(sheetSource.Cells(1, 1), _
              sheetSource.Cells(1, 1 + intJumlahTinggi))

            myExcel.ActiveChart.Location xlLocationAsObject,
      "Mode Shape Ori"
            With myBook.ActiveChart
              .HasTitle = True
              .ChartTitle.Characters.Text = "Mode " + Str(i + 1)
              .Axes(xlCategory, xlPrimary).HasTitle = False
              .Axes(xlValue, xlPrimary).HasTitle = False
            End With
            With myBook.ActiveChart
            .HasAxis(xlCategory, xlPrimary) = True
            .HasAxis(xlValue, xlPrimary) = True
            End With
            With myBook.ActiveChart.Axes(xlCategory)
              .HasMajorGridlines = False
              .HasMinorGridlines = False
            End With
            With myBook.ActiveChart.Axes(xlValue)
              .HasMajorGridlines = False
              .HasMinorGridlines = False
            End With
            myBook.ActiveChart.HasLegend = True
            myBook.ActiveChart.Legend.Font.Size = 8
            myBook.ActiveChart.Legend.Select
            myExcel.Selection.Position = xlBottom
            'geser posisi
            myBook.ActiveChart.ChartArea.Select
            myBook.ActiveSheet.ChartObjects("Chart " + Str(i +
      1)).Activate
            myBook.ActiveChart.ChartArea.Select
            myBook.ActiveChart.PlotArea.Select
            myExcel.Selection.ClearFormats
            myExcel.ActiveWindow.Visible = False
            myBook.ActiveSheet.ChartObjects("Chart " + Str(i +
      1)).Activate
            myBook.ActiveChart.ChartArea.Select
            myBook.ActiveChart.Legend.Select
            myExcel.Selection.Delete
            myBook.ActiveChart.PlotArea.Select
            myBook.ActiveChart.ChartArea.Select
            With myExcel.Selection.Border
              .Weight = 2
              .LineStyle = -1
            End With
            myExcel.Selection.Interior.ColorIndex = xlNone
            myExcel.ActiveWindow.Visible = False
            myBook.ActiveSheet.ChartObjects("Chart " + Str(i +
      1)).Activate
            myBook.ActiveChart.ChartArea.Select
            myBook.ActiveSheet.Shapes("Chart " + Str(i +
      1)).Width = 100
            With myExcel.Selection.Border
              .Weight = 1
              .LineStyle = 0
            End With
            myExcel.Selection.Interior.ColorIndex = xlNone
            myExcel.ActiveWindow.Visible = False
            myBook.ActiveSheet.ChartObjects("Chart " + Str(i +
      1)).Activate
            myBook.ActiveChart.PlotArea.Select
            myBook.ActiveChart.ChartArea.Select
            myBook.ActiveChart.PlotArea.Width = 100
            myBook.ActiveChart.PlotArea.top = 20
            myBook.ActiveSheet.Shapes("Chart " + Str(i +
      1)).IncrementLeft 120 * i
            myBook.ActiveSheet.Shapes("Chart " + Str(i +
      1)).IncrementTop 30
            myBook.ActiveChart.ChartTitle.Select
            myExcel.Selection.AutoScaleFont = True
            With myExcel.Selection.Font
              .Name = "Arial"
              .Size = 8
              .Strikethrough = False
              .Superscript = False
              .Subscript = False
              .OutlineFont = False
              .Shadow = False
              .Underline = xlUnderlineStyleNone
              .ColorIndex = xlAutomatic
              .Background = xlAutomatic
            End With
            myBook.ActiveChart.Axes(xlValue).Select
            With myBook.ActiveChart.Axes(xlValue)
              .MinimumScaleIsAuto = True
              .MaximumScale = intJumlahTinggi
              .MinorUnitIsAuto = True
              .MajorUnitIsAuto = True
              .Crosses = xlAutomatic
```

```
        .ReversePlotOrder = False
        .ScaleType = xlLinear
        .DisplayUnit = xlNone
      End With
        myExcel.Selection.TickLabels.AutoScaleFont =
True
      With myExcel.Selection.TickLabels.Font
        .Name = "Arial"
        .FontStyle = "Regular"
        .Size = 7
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = xlAutomatic
        .Background = xlAutomatic
      End With
      myBook.ActiveChart.Axes(xlCategory).Select
      With myBook.ActiveChart.Axes(xlCategory)
        .MinimumScaleIsAuto = True
        .MaximumScaleIsAuto = True
        .MinorUnitIsAuto = True
        .MajorUnitIsAuto = 1
        .Crosses = xlAutomatic
        .ReversePlotOrder = False
        .ScaleType = xlLinear
        .DisplayUnit = xlNone
      End With
      myExcel.Selection.TickLabels.AutoScaleFont = True
      With myExcel.Selection.TickLabels.Font
        .Name = "Arial"
        .FontStyle = "Regular"
        .Size = 7
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = xlAutomatic
        .Background = xlAutomatic
      End With
    Next i
End Sub

Private Sub BuatGrafikRx(sheetSource As
Excel.Worksheet, sheetDestination As Excel.Worksheet)
    Dim i As Integer

    sheetDestination.Select

    myExcel.Charts.Add
    myExcel.ActiveChart.ChartType = xlXYScatterLines
    myExcel.ActiveChart.SetSourceData
sheetDestination.Range("A1")

    myBook.ActiveChart.SeriesCollection(1).XValues = _
        sheetDestination.Range(sheetDestination.Cells(1, 2), _
        sheetDestination.Cells(1, 1 + intJumlahTinggi))

    myBook.ActiveChart.SeriesCollection(1).Values = _
        sheetSource.Range(sheetSource.Cells(intJumlahTinggi
+ 4, 14), _
        sheetSource.Cells(2 * intJumlahTinggi + 3, 14))
    myExcel.ActiveChart.Location xlLocationAsObject,
"Mode Shape Ori"
    With myBook.ActiveChart
        .HasTitle = False
        .Axes(xlCategory, xlPrimary).HasTitle = True
        .Axes(xlCategory,
xlPrimary).AxisTitle.Characters.Text = "Mode"
        .Axes(xlValue, xlPrimary).HasTitle = True
        .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text =
"Partisipasi"
    End With
    With myExcel.ActiveChart.Axes(xlCategory)
        .HasMajorGridlines = False
        .HasMinorGridlines = False
    End With
    With myExcel.ActiveChart.Axes(xlValue)
        .HasMajorGridlines = False
        .HasMinorGridlines = False
    End With
    myExcel.ActiveChart.HasLegend = True
    myExcel.ActiveChart.Legend.Font.Size = 8
    myExcel.ActiveChart.Legend.Select

    myExcel.Selection.Position = xlBottom

    'geser posisi
    myExcel.ActiveChart.ChartArea.Select
    myExcel.ActiveSheet.ChartObjects("Chart " +
Str(intJumlahTinggi + 1)).Activate
    myExcel.ActiveChart.ChartArea.Select
    myExcel.ActiveChart.PlotArea.Select
    myExcel.Selection.ClearFormats
    myExcel.ActiveChart.Axes(xlCategoryScale).Select
    With myExcel.Selection.Border
        .Weight = xlHairline
        .LineStyle = xlAutomatic
    End With
    With myExcel.Selection
        .MajorTickMark = xlOutside
        .MinorTickMark = xlNone
        .TickLabelPosition = xlNextToAxis
    End With
    myExcel.Selection.Delete
    myExcel.ActiveWindow.Visible = False
    myExcel.ActiveSheet.ChartObjects("Chart " +
Str(intJumlahTinggi + 1)).Activate
    myExcel.ActiveChart.ChartArea.Select
    myExcel.ActiveChart.Legend.Select
    myExcel.Selection.Delete
    myExcel.ActiveChart.PlotArea.Select
    myExcel.ActiveChart.ChartArea.Select
    With myExcel.Selection.Border
        .Weight = 2
        .LineStyle = -1
    End With
    myExcel.Selection.Interior.ColorIndex = xlNone
    myExcel.ActiveSheet.ChartObjects("Chart " +
Str(intJumlahTinggi + 1)).Activate
    myExcel.ActiveChart.ChartArea.Select
    myExcel.ActiveSheet.Shapes("Chart " +
Str(intJumlahTinggi + 1)).Width = 400
    With myExcel.Selection.Border
        .Weight = 1
        .LineStyle = 0
    End With
    myExcel.Selection.Interior.ColorIndex = xlNone
    myExcel.ActiveWindow.Visible = False
    myExcel.ActiveSheet.ChartObjects("Chart " +
Str(intJumlahTinggi + 1)).Activate
    myExcel.ActiveChart.PlotArea.Select
    myExcel.ActiveChart.ChartArea.Select
    With myExcel.ActiveChart
        .HasAxis(xlCategory, xlPrimary) = True
        .HasAxis(xlValue, xlPrimary) = True
    End With
    myExcel.ActiveChart.Axes(xlCategory,
xlPrimary).CategoryType = xlAutomatic
    myExcel.ActiveChart.PlotArea.Width = 400
    myExcel.ActiveSheet.Shapes("Chart " +
Str(intJumlahTinggi + 1)).IncrementLeft 50
    myExcel.ActiveSheet.Shapes("Chart " +
Str(intJumlahTinggi + 1)).IncrementTop 300
    myExcel.ActiveChart.Axes(xlValue).Select
    With myExcel.ActiveChart.Axes(xlValue)
        .MinimumScaleIsAuto = True
        .MaximumScaleIsAuto = True
```

```
            .MinorUnitIsAuto = True
            .MajorUnitIsAuto = True
            .Crosses = xlAutomatic
            .ReversePlotOrder = False
            .ScaleType = xlLinear
            .DisplayUnit = xlNone
        End With
        myExcel.Selection.TickLabels.AutoScaleFont = True
        With myExcel.Selection.TickLabels.Font
          .Name = "Arial"
          .FontStyle = "Regular"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myBook.ActiveChart.Axes(xlCategory).Select
        myExcel.Selection.TickLabels.AutoScaleFont = True
        With myExcel.Selection.TickLabels.Font
          .Name = "Arial"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myBook.ActiveChart.Axes(xlValue).AxisTitle.Select
        myExcel.Selection.AutoScaleFont = True
        With myExcel.Selection.Font
          .Name = "Arial"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myExcel.Selection.Font.Bold = False
        myBook.ActiveChart.Axes(xlCategory).AxisTitle.Select
        myExcel.Selection.AutoScaleFont = True
        With myExcel.Selection.Font
          .Name = "Arial"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myExcel.Selection.Font.Bold = False
        myBook.ActiveChart.Axes(xlCategory).Select
        With myBook.ActiveChart.Axes(xlCategory)
          .MinimumScale = 1
          .MaximumScale = intJumlahTinggi
          .MinorUnitIsAuto = True
          .MajorUnit = 1
          .Crosses = xlAutomatic
          .ReversePlotOrder = False
          .ScaleType = xlLinear
          .DisplayUnit = xlNone
        End With
    End Sub

    Private Sub BuatGrafikEffect(sheetSource As
    Excel.Worksheet, sheetDestination As Excel.Worksheet,
    RangeX As Excel.Range, RangeY As Excel.Range,
    ChartNumber As Integer, top As Integer, cap As String)
      Dim i As Integer

      sheetDestination.Select

      myExcel.Charts.Add
      myExcel.ActiveChart.ChartType = xlXYScatterLines
      myExcel.ActiveChart.SetSourceData
    sheetDestination.Range("A1")
      myExcel.ActiveChart.Location xlLocationAsObject,
    "Effective"
      myExcel.ActiveChart.SeriesCollection.NewSeries
      myExcel.ActiveChart.SeriesCollection(1).XValues =
    RangeX
      myExcel.ActiveChart.SeriesCollection(1).Values =
    RangeY
      With myBook.ActiveChart
        .HasTitle = False
        .Axes(xlCategory, xlPrimary).HasTitle = True
        .Axes(xlCategory,
    xlPrimary).AxisTitle.Characters.Text = "Mode"
        .Axes(xlValue, xlPrimary).HasTitle = True
        .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text =
    cap
      End With
      With myExcel.ActiveChart.Axes(xlCategory)
        .HasMajorGridlines = False
        .HasMinorGridlines = False
      End With
      With myExcel.ActiveChart.Axes(xlValue)
        .HasMajorGridlines = False
        .HasMinorGridlines = False
      End With
      myExcel.ActiveChart.HasLegend = True
      myExcel.ActiveChart.Legend.Font.Size = 8
      myExcel.ActiveChart.Legend.Select
      myExcel.Selection.Position = xlBottom

      'geser posisi
      myExcel.ActiveChart.ChartArea.Select
      myExcel.ActiveSheet.ChartObjects("Chart " +
    Str(ChartNumber + 1)).Activate
      myExcel.ActiveChart.ChartArea.Select
      myExcel.ActiveChart.PlotArea.Select
      myExcel.Selection.ClearFormats
      myExcel.ActiveChart.Axes(xlCategoryScale).Select
      With myExcel.Selection.Border
        .Weight = xlHairline
        .LineStyle = xlAutomatic
      End With
      With myExcel.Selection
        .MajorTickMark = xlOutside
        .MinorTickMark = xlNone
        .TickLabelPosition = xlNextToAxis
      End With
      myExcel.Selection.Delete
      myExcel.ActiveWindow.Visible = False
      myExcel.ActiveSheet.ChartObjects("Chart " +
    Str(ChartNumber + 1)).Activate
      myExcel.ActiveChart.ChartArea.Select
      myExcel.ActiveChart.Legend.Select
      myExcel.Selection.Delete
      myExcel.ActiveChart.PlotArea.Select
      myExcel.ActiveChart.ChartArea.Select
      With myExcel.Selection.Border
        .Weight = 2
        .LineStyle = -1
      End With
      myExcel.Selection.Interior.ColorIndex = xlNone
```

```
        myExcel.ActiveSheet.ChartObjects("Chart " +
    Str(ChartNumber + 1)).Activate
        myExcel.ActiveChart.ChartArea.Select
        myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).Width = 400
        With myExcel.Selection.Border
          .Weight = 1
          .LineStyle = 0
        End With
        myExcel.Selection.Interior.ColorIndex = xlNone
        myExcel.ActiveWindow.Visible = False
        myExcel.ActiveSheet.ChartObjects("Chart " +
    Str(ChartNumber + 1)).Activate
        myExcel.ActiveChart.PlotArea.Select
        myExcel.ActiveChart.ChartArea.Select
        With myExcel.ActiveChart
          .HasAxis(xlCategory, xlPrimary) = True
          .HasAxis(xlValue, xlPrimary) = True
        End With
        myExcel.ActiveChart.Axes(xlCategory,
    xlPrimary).CategoryType = xlAutomatic
        myExcel.ActiveChart.PlotArea.Width = 400

        If (ChartNumber Mod 2) = 0 Then
          myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).IncrementLeft 245#
          myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).IncrementTop (top - 1) * 300#
        Else
          myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).IncrementLeft -167#
          myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).IncrementTop (top - 1) * 300#
        End If
        myExcel.ActiveChart.Axes(xlValue).Select
        With myExcel.ActiveChart.Axes(xlValue)
          .MinimumScaleIsAuto = True
          .MaximumScaleIsAuto = True
          .MinorUnitIsAuto = True
          .MajorUnitIsAuto = True
          .Crosses = xlAutomatic
          .ReversePlotOrder = False
          .ScaleType = xlLinear
          .DisplayUnit = xlNone
        End With
        myExcel.Selection.TickLabels.AutoScaleFont = True
        With myExcel.Selection.TickLabels.Font
          .Name = "Arial"
          .FontStyle = "Regular"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myBook.ActiveChart.Axes(xlCategory).Select
        myExcel.Selection.TickLabels.AutoScaleFont = True
        With myExcel.Selection.TickLabels.Font
          .Name = "Arial"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myExcel.ActiveChart.Axes(xlValue).AxisTitle.Select
        myExcel.Selection.AutoScaleFont = True
        With myExcel.Selection.Font
          .Name = "Arial"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myExcel.Selection.Font.Bold = False
        myBook.ActiveChart.Axes(xlCategory).Select
        With myBook.ActiveChart.Axes(xlCategory)
          .MinimumScale = 1
          .MaximumScale = intJumlahTinggi
          .MinorUnitIsAuto = True
          .MajorUnit = 1
          .Crosses = xlAutomatic
          .ReversePlotOrder = False
          .ScaleType = xlLinear
          .DisplayUnit = xlNone
        End With

    End Sub
    Private Sub BuatGrafikT(sheetSource As Excel.Worksheet,
    sheetDestination As Excel.Worksheet, RangeX As
    Excel.Range, RangeY As Excel.Range, ChartNumber As
    Integer, top As Integer, cap As String)
      Dim i As Integer

      sheetDestination.Select

      myExcel.Charts.Add
      myExcel.ActiveChart.ChartType = xlXYScatterLines
      myExcel.ActiveChart.SetSourceData
    sheetDestination.Range("A1")
      myExcel.ActiveChart.Location xlLocationAsObject,
    "Effective"
      'myExcel.ActiveChart.SeriesCollection.NewSeries
      myExcel.ActiveChart.SeriesCollection(1).XValues =
    RangeX
      myExcel.ActiveChart.SeriesCollection(1).Values =
    RangeY
      With myBook.ActiveChart
        .HasTitle = False
        .Axes(xlCategory, xlPrimary).HasTitle = True
        .Axes(xlCategory,
    xlPrimary).AxisTitle.Characters.Text = "Mode"
        .Axes(xlValue, xlPrimary).HasTitle = True
        .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text =
    cap
      End With
      With myExcel.ActiveChart.Axes(xlCategory)
        .HasMajorGridlines = False
        .HasMinorGridlines = False
      End With
      With myExcel.ActiveChart.Axes(xlValue)
        .HasMajorGridlines = False
        .HasMinorGridlines = False
      End With
```

```
        myExcel.ActiveChart.HasLegend = True
        myExcel.ActiveChart.Legend.Font.Size = 8
        myExcel.ActiveChart.Legend.Select
        myExcel.Selection.Position = xlBottom

        'geser posisi
        myExcel.ActiveChart.ChartArea.Select
        myExcel.ActiveSheet.ChartObjects("Chart " +
    Str(ChartNumber + 1)).Activate
        myExcel.ActiveChart.ChartArea.Select
        myExcel.ActiveChart.PlotArea.Select
        myExcel.Selection.ClearFormats
        myExcel.ActiveChart.Axes(xlCategoryScale).Select
        With myExcel.Selection.Border
          .Weight = xlHairline
          .LineStyle = xlAutomatic
        End With
        With myExcel.Selection
          .MajorTickMark = xlOutside
          .MinorTickMark = xlNone
          .TickLabelPosition = xlNextToAxis
        End With
        myExcel.Selection.Delete
        myExcel.ActiveWindow.Visible = False
        myExcel.ActiveSheet.ChartObjects("Chart " +
    Str(ChartNumber + 1)).Activate
        myExcel.ActiveChart.ChartArea.Select
        myExcel.ActiveChart.Legend.Select
        myExcel.Selection.Delete
        myExcel.ActiveChart.PlotArea.Select
        myExcel.ActiveChart.ChartArea.Select
        With myExcel.Selection.Border
          .Weight = 2
          .LineStyle = -1
        End With
        myExcel.Selection.Interior.ColorIndex = xlNone
        myExcel.ActiveSheet.ChartObjects("Chart " +
    Str(ChartNumber + 1)).Activate
        myExcel.ActiveChart.ChartArea.Select
        myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).Width = 400
        With myExcel.Selection.Border
          .Weight = 1
          .LineStyle = 0
        End With
        myExcel.Selection.Interior.ColorIndex = xlNone
        myExcel.ActiveWindow.Visible = False
        myExcel.ActiveSheet.ChartObjects("Chart " +
    Str(ChartNumber + 1)).Activate
        myExcel.ActiveChart.PlotArea.Select
        myExcel.ActiveChart.ChartArea.Select
        With myExcel.ActiveChart
          .HasAxis(xlCategory, xlPrimary) = True
          .HasAxis(xlValue, xlPrimary) = True
        End With
        myExcel.ActiveChart.Axes(xlCategory,
    xlPrimary).CategoryType = xlAutomatic
        myExcel.ActiveChart.PlotArea.Width = 400

        If (ChartNumber Mod 2) = 0 Then
          myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).IncrementLeft 245#
          myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).IncrementTop (top - 1) * 300#
        Else
          myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).IncrementLeft -167#
          myExcel.ActiveSheet.Shapes("Chart " +
    Str(ChartNumber + 1)).IncrementTop (top - 1) * 300#
        End If
        myExcel.ActiveChart.Axes(xlValue).Select
        With myExcel.ActiveChart.Axes(xlValue)
          .MinimumScaleIsAuto = True
          .MaximumScaleIsAuto = True
          .MinorUnitIsAuto = True
          .MajorUnitIsAuto = True
          .Crosses = xlAutomatic
          .ReversePlotOrder = False
          .ScaleType = xlLinear
          .DisplayUnit = xlNone
        End With
        myExcel.Selection.TickLabels.AutoScaleFont = True
        With myExcel.Selection.TickLabels.Font
          .Name = "Arial"
          .FontStyle = "Regular"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myBook.ActiveChart.Axes(xlCategory).Select
        myExcel.Selection.TickLabels.AutoScaleFont = True
        With myExcel.Selection.TickLabels.Font
          .Name = "Arial"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myExcel.ActiveChart.Axes(xlValue).AxisTitle.Select
        myExcel.Selection.AutoScaleFont = True
        With myExcel.Selection.Font
          .Name = "Arial"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myExcel.Selection.Font.Bold = False
        myBook.ActiveChart.Axes(xlCategory).AxisTitle.Select
        myExcel.Selection.AutoScaleFont = True
        With myExcel.Selection.Font
          .Name = "Arial"
          .Size = 7
          .Strikethrough = False
          .Superscript = False
          .Subscript = False
          .OutlineFont = False
          .Shadow = False
          .Underline = xlUnderlineStyleNone
          .ColorIndex = xlAutomatic
          .Background = xlAutomatic
        End With
        myExcel.Selection.Font.Bold = False
        myBook.ActiveChart.Axes(xlCategory).Select
        With myBook.ActiveChart.Axes(xlCategory)
          .MinimumScale = 1
          .MaximumScale = intJumlahTinggi
          .MinorUnitIsAuto = True
          .MajorUnit = 1
          .Crosses = xlAutomatic
          .ReversePlotOrder = False
          .ScaleType = xlLinear
          .DisplayUnit = xlNone
        End With
End Sub
```

```
Private Sub printMatrik(row As Integer, col As Integer,
Sheet As Excel.Worksheet, arrData() As Double, strCaption
As String)
Dim i, j As Integer
Dim RangeX As Excel.Range

If (strCaption <> "") Then
   Sheet.Cells(row - 1, col) = strCaption
End If
For i = 0 To UBound(arrData) - 1
   For j = 0 To UBound(arrData, 2) - 1
      Sheet.Cells(row + i, col + j) = arrData(i, j)
   Next j
Next i
End Sub

Private Sub printColomn(row As Integer, col As Integer,
Sheet As Excel.Worksheet, arrData() As Double)
Dim i, j As Integer

For i = 0 To UBound(arrData) - 1
   Sheet.Cells(row, col + i) = arrData(i)
Next i
End Sub

Private Sub printColomnS(rowx As Integer, col As Integer,
Sheet As Excel.Worksheet, arrData() As String)
Dim i, j As Integer

For i = 0 To UBound(arrData) - 1
   Sheet.Cells(rowx, col + i) = arrData(i)
Next i
End Sub

Private Sub ClearUp()
'
End Sub

Private Sub buatGrafik(sheetSource As Excel.Worksheet,
sheetDest As Excel.Worksheet, CelStart As Integer, Legend
As String, title As String, graphKe As Integer, posisi As
Integer, kanan As Boolean)
   Dim i As Integer

   sheetDest.Select
   myBook.Charts.Add
   myBook.ActiveChart.ChartType =
xlXYScatterSmoothNoMarkers
   myBook.ActiveChart.SetSourceData
sheetDest.Range("A1")

   For i = 0 To intJumlahTinggi - 1
      myBook.ActiveChart.SeriesCollection.NewSeries

      myBook.ActiveChart.SeriesCollection(i + 1).XValues
= _

sheetSource.Range(sheetSource.Cells(UBound(MatrikMass
a1) + intJumlahTinggi + 6, 2), _
        sheetSource.Cells(UBound(MatrikMassa1) +
intJumlahTinggi + 5 + UBound(ArrDataGempa), 2))

      myBook.ActiveChart.SeriesCollection(i + 1).Values =
_

sheetSource.Range(sheetSource.Cells(UBound(MatrikMass
a1) + intJumlahTinggi + 6, 4 + CelStart + i), _
        sheetSource.Cells(UBound(MatrikMassa1) +
intJumlahTinggi + 5 + UBound(ArrDataGempa), 4 +
CelStart + i))

      myBook.ActiveChart.SeriesCollection(i + 1).Name =
Legend + Trim(Str(i + 1))
   Next i

   myBook.ActiveChart.Location xlLocationAsObject,
"Grafik"

   With myBook.ActiveChart
      .HasTitle = True
      .ChartTitle.Characters.Text = ""
      .Axes(xlCategory, xlPrimary).HasTitle = True
      .Axes(xlCategory,
xlPrimary).AxisTitle.Characters.Text = "Waktu (dt)"
      .Axes(xlValue, xlPrimary).HasTitle = True
      .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text =
title
   End With
   With myBook.ActiveChart.Axes(xlCategory)
      .HasMajorGridlines = False
      .HasMinorGridlines = False
   End With
   With myBook.ActiveChart.Axes(xlValue)
      .HasMajorGridlines = False
      .HasMinorGridlines = False
   End With

   myBook.ActiveChart.HasLegend = True
   myBook.ActiveChart.Legend.Font.Size = 7
   myBook.ActiveChart.Legend.Select
   myExcel.Selection.Position = xlCorner
   myBook.ActiveChart.PlotArea.Select
   myExcel.Selection.top = 1
   myExcel.Selection.Width = 335
   myExcel.Selection.Height = 214
   myBook.ActiveChart.Legend.Select
   myExcel.Selection.Left = 313
   myExcel.Selection.top = 13
   With myExcel.Selection.Border
      .Weight = xlHairline
      .LineStyle = xlAutomatic
   End With
   myExcel.Selection.Shadow = True
   myExcel.Selection.Interior.ColorIndex = xlAutomatic
   myBook.ActiveChart.ChartArea.Select
   myBook.ActiveChart.PlotArea.Select
   With myExcel.Selection.Border
      .Weight = xlThin
      .LineStyle = xlAutomatic
   End With

   myExcel.Selection.Interior.ColorIndex = xlNone
   myBook.ActiveChart.ChartArea.Select
   myExcel.Selection.AutoScaleFont = True
   With myExcel.Selection.Font
      .Name = "Arial"
      .Size = 7
      .Strikethrough = False
      .Superscript = False
      .Subscript = False
      .OutlineFont = False
      .Shadow = False
      .Underline = xlUnderlineStyleNone
      .ColorIndex = xlAutomatic
      .Background = xlAutomatic
   End With

   'geser posisi

'
myBook.ActiveChart.Axes(xlValue).MajorGridlines.Select
'   myExcel.Selection.Delete

   myBook.ActiveChart.ChartArea.Select
   With myExcel.Selection.Border
      .Weight = 1
      .LineStyle = 0
   End With

   myBook.ActiveChart.PlotArea.Select
   With myExcel.Selection.Border
```

```
        .Weight = xlThin
        .LineStyle = xlAutomatic
      End With
      myExcel.Selection.Interior.ColorIndex = xlNone
      myExcel.Selection.top = 1
      myExcel.Selection.Width = 335
      myExcel.Selection.Height = 214
      myExcel.Selection.Left = 14
      myExcel.Selection.Width = 348
      myExcel.Selection.Height = 220

      'myExcel.Selection.ClearFormats
      myBook.ActiveSheet.ChartObjects("Chart " +
  Str(graphKe)).Activate
      myBook.ActiveChart.ChartArea.Select
      myBook.ActiveSheet.Shapes("Chart " +
  Str(graphKe)).IncrementTop (posisi - 1) * 300#

      If kanan Then
        myBook.ActiveSheet.Shapes("Chart " +
  Str(graphKe)).IncrementLeft 245#
      Else
        myBook.ActiveSheet.Shapes("Chart " +
  Str(graphKe)).IncrementLeft -167#
      End If

      myBook.ActiveChart.Axes(xlValue).Select
      myExcel.Selection.TickLabels.AutoScaleFont = True
      With myExcel.Selection.TickLabels.Font
        .Name = "Arial"
        .FontStyle = "Regular"
        .Size = 7
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = xlAutomatic
        .Background = xlAutomatic
      End With
      myBook.ActiveChart.Axes(xlCategory).Select
      myExcel.Selection.TickLabels.AutoScaleFont = True
      With myExcel.Selection.TickLabels.Font
        .Name = "Arial"
        .FontStyle = "Regular"
        .Size = 7
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = xlAutomatic
        .Background = xlAutomatic
      End With
      myBook.ActiveChart.Axes(xlValue).AxisTitle.Select
      myExcel.Selection.Font.Bold = False
      myExcel.Selection.AutoScaleFont = True
      With myExcel.Selection.Font
        .Name = "Arial"
        .Size = 7
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = xlAutomatic
        .Background = xlAutomatic
      End With
      myBook.ActiveChart.Axes(xlCategory).AxisTitle.Select
      myExcel.Selection.Font.Bold = False
      myExcel.Selection.AutoScaleFont = True
      With myExcel.Selection.Font
        .Name = "Arial"
        .Size = 7
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = xlAutomatic
        .Background = xlAutomatic
      End With
    End Sub

    Private Sub Class_Initialize()
      ClearUp
    End Sub

    Public Sub ClearExcel()
      On Error Resume Next
      myBook.Close
      myExcel.Quit
      Set myBook = Null
      Set mySheet = Null
      Set mySheet2 = Null
      Set mySheet3 = Null
      Set mySheet4 = Null
      Set mySheet5 = Null
      Set myExcel = Null
    End Sub

    Private Sub Class_Terminate()
      On Error Resume Next
      myBook.Close
      myExcel.Quit
      Set myBook = Null
      Set mySheet = Null
      Set mySheet2 = Null
      Set mySheet3 = Null
      Set mySheet4 = Null
      Set mySheet5 = Null
      Set myExcel = Null
    End Sub

    'Pencetakkan Pada NotePad

    Public Sub CetakInput(folder As String, prefix As String)
      Dim i, j As Integer
      Dim tmp As String
      Dim filename As String

      filename = folder & "\" & Left(prefix, Len(prefix) - 4) &
  "_input.txt"

      If fso.FileExists(filename) Then
        fso.DeleteFile (filename)
      End If

      Open filename For Output As #1
      Print #1, "INPUT"
      Print #1, ""
      Print #1, "BENTANG" & vbTab & "BENT. TEPI" &
  vbTab & "BEN. TENGAH" & vbTab & "E" & vbTab & "B
  K. TEPI" & vbTab & "B K. TENGAH" & vbTab & "H K.
  TEPI" & vbTab & "H K. TENGAH"
      Print #1, intJumlahBentang & vbTab & decLTepi &
  vbTab & vbTab & decLTengah & vbTab & vbTab & E &
  vbTab & decBTepi & vbTab & vbTab & decBTengah &
  vbTab & vbTab & decHTepi & vbTab & vbTab &
  decHTengah
      Print #1, ""
      Print #1, "NDOF" & vbTab & "DAMPR" & vbTab &
  "DT" & vbTab & "TMAX" & vbTab & "SG"
      Print #1, intJumlahTinggi & vbTab & "0.05" & vbTab &
  "0.01" & vbTab & "10" & vbTab & "1"
      Print #1, ""
      Print #1, "Tingkat" & vbTab & "H" & vbTab &
  "MASSA" & vbTab & "KEKAKUAN"
```

```
    For i = 0 To intJumlahTinggi - 1
        Print #1, (i + 1) & vbTab & decTinggiTingkat & vbTab
& arrM(i) & vbTab & arrKekakuanTotal(i)
    Next i

    Print #1, "OUTPUT"
    Print #1, ""
    tmp = "Percepatan"

        For j = 0 To UBound(MatrikIT(i).arrY) - 1
            tmp = tmp & vbTab & vbTab & "Y" & Trim(Str(j +
1))
        Next j

    Print #1, tmp

    For i = 0 To UBound(MatrikIT) - 1
        If (Len(Trim(Str(ArrDataGempa(i)))) < 8) Then
            tmp = ArrDataGempa(i) & vbTab
        Else
            tmp = ArrDataGempa(i)
        End If

        For j = 0 To UBound(MatrikIT(i).arrY) - 1
            tmp = tmp & vbTab & MatrikIT(i).arrY(j)
        Next j

        Print #1, tmp
    Next i
    Close #1
End Sub
```