BAB VI

KESIMPULAN DAN SARAN

6.1. Kesimpulan

Kesimpulan yang dapat diambil dari tugas akhir dengan judul **Pemodelan dan Analisis Struktur dengan Menggunakan Rekaman Data Gempa yang terjadi di Indonesia** ini yaitu :

1. Program ETABS sangat baik dan sangat membantu dalam menganalisa suatu struktur karena penggunaannya yang mudah dipelajari dan lebih sederhana.
2. Analisis Riwayat Waktu (*Time History Analysis*) menghasilkan respons spektrum rencana dengan hasil yang lebih teliti dan lebih akurat.
3. Gempa yang lebih besar menghasilkan respons spektrum rencana yang lebih besar.
4. Respons spektrum rencana yang dihasilkan tidak dibagi menjadi 6 zone seperti pada Pedoman Perencanaan Ketahanan Gempa untuk Rumah dan Gedung tahun 1987 karena ketiga gempa yang digunakan yaitu gempa Bengkulu, gempa Mangole dan gempa Pandeglang sudah mewakili keseluruhan wilayah yang ada di Indonesia. Respons spektrum gempa Bengkulu mewakili zona gempa 3, gempa Pandeglang mewakili zona gempa 4 dan gempa Mangole mewakili zona gempa 2.
5. Respons spektrum rencana yang dihasilkan dibuat untuk 3 damping rasio yaitu 0,02 ; 0,05 ; 0,1. Ketiga damping rasio ini bisa digunakan berdasarkan

pemakaian bahan pada struktur, misalnya baja menggunakan damping rasio 0,02 , beton 0,05, bahan lain 0,1.

6. Tanah keras pada penelitian ini dimodelkan dengan dukungan jepit, sedangkan tanah lunak dimodelkan dengan dukungan *spring* atau pegas. Makin kecil konstanta kekakuan yang digunakan pada tanah lunak maka respons spektrum yang didapat akan makin besar.

6.2. Saran

1. Sebaiknya data rekaman gempa yang digunakan lebih banyak lagi agar bisa mewakili keseluruhan daerah di Indonesia.
2. Seharusnya dilakukan penyelidikan tanah sebelumnya di daerah terjadinya gempa tersebut agar bisa didapatkan respons spektrum rencana untuk tanah lunak.

KATA TUTUP

Berkat kasih dan kemurahan-Nya serta tuntunan Roh Kudus yang selalu menyertai setiap langkah dalam kehidupan penyusun, akhirnya penyusun dapat menyelesaikan tugas akhir ini.

Dengan terselesainya tugas akhir ini, penyusun telah banyak mendapat tambahan pengetahuan yang bermanfaat mengenai pemodelan struktur dalam bentuk *Single Degree of Freedom* (SDOF) maupun *Multi Degree of Freedom* (MDOF) dan Analisis Riwayat Waktu (*Time History Analysis*) yang menghasilkan respons spektrum rencana.

Penyusun menyadari bahwa masih banyak sekali kekurangan dalam laporan tugas akhir ini, untuk itu penyusun mengharapkan banyak kritik dan sarang yang bersifat membangun. Disisi lain penyusun sangat berharap semoga tugas akhir ini bisa berguna bagi pembaca pada umumnya dan teman-teman mahasiswa pada khususnya.

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LAMPIRAN

LAMPIRAN
Surat Permohonan Data | 1

FAKULTAS TEKNIK
UNIVERSITAS ATMA JAYA YOGYAKARTA
Jalan Babarsari 44, Yogyakarta 55281 Indonesia Kotak Pos 1086
Telepon : (0274) 565411 (Hunting), Fax. : (0274) 565258
E-Mail : uajy@uajy.org BBS : (0274) 580529

Nomor : 2946/XV/P
Hal : Permohonan data

8 November 2000

Kepada
Yth. Kepala Kantor
Badan Meteorologi dan Geofisika (BMG)
Jl. Angkasa I No. 2, Kemayoran, Jakarta

Dengan hormat,

Dalam rangka menyelesaikan pendidikan Program Strata 1 pada Program Studi Teknik Sipil Fakultas Teknik Universitas Atma Jaya Yogyakarta, setiap mahasiswa diwajibkan menempuh Tugas Akhir (Ujian Sarjana) dimana tugas tersebut sangat membutuhkan data pendukung secara nyata dan lengkap.

Untuk itu kami mohon Bapak/Ibu berkenan memberikan data kepada mahasiswa :

Nama : Dian Rosita Anggraeni
NPM : 97 02 08548
Semester : Gasal
Tahun Akademik : 2000/2001

Data yang diperlukan adalah :

- **Rekaman gempa besar (skala > 6 skala Ritcher) yang terjadi di Indonesia seperti gempa Bengkulu, Liwa, Irian dan Gempa Seram**
- **Accelaration vs time atau percepatan vs waktu dalam bentuk angka dan grafik**

Atas perhatian dan bantuannya, kami ucapkan terima kasih.

Dekan

Ir. A.Y. Harijanto Setiawan, M.Eng.

LAMPIRAN	
Surat Keterangan dari BMG	2

DEPARTEMEN PERHUBUNGAN
BADAN METEOROLOGI DAN GEOFISIKA
JL. ANGKASA I NO. 2, KEMAYORAN, JAKARTA (10720)
TEL. 4209103, 4246321(ext 195) FAX . 6456316
http://www.bmg.go.id

SURAT KETERANGAN

Menerangkan bahwa :

Nama	: Dian Rosita Anggraeni
Alamat	: Jl. RE Martadinata 68 Yogyakarta 55253
Mahasiswa	: Universitas Atma Jaya Yogyakarta Fakultas Teknik Program Studi Teknik Sipil
No. Mhs	: 08548 / TS

telah mengambil data berupa rekaman data gempa Bengkulu, Pandeglang, dan Mangole dari Kantor Departemen Perhubungan Badan Meteorologi Dan Geofisika pada tanggal 22-23 Januari 2001 untuk keperluan Tugas Akhir.

Jakarta, 23 Januari 2001
A/n Kepala Sub Bidang Analisa Geofisika

Drs. Budi Waluyo, Dpl. Seis.

LAMPIRAN	
Surat Peminjaman Laboratorium Komputer	3

FAKULTAS TEKNIK

UNIVERSITAS ATMA JAYA YOG

Jalan Babarsari 44, Yogyakarta 55281 Indonesia Kotal
Telepon : (0274) 565411 (Hunting), Fax. : (0274) 565258
E-Mail : uajy@uajy.org BBS : (0274) 580529

Nomor : 1283/I.01/U 14 Mei 2001
Hal : Peminjaman penggunaan fasilitas
Laboratorium Komputer

Kepada
Yth. Sdr. Dian Rosita Anggraeni 08548/TS
Mahasiswa Fakultas Teknik
Universitas Atma Jaya Yogyakarta

Memperhatikan surat Saudara perihal permohonan ijin menggunakan fasilitas Laboratorium Komputer untuk penelitian Tugas Akhir, dengan ini diberitahukan bahwa pada prinsipnya permohonan Saudara dapat dikabulkan dengan ketentuan sebagai berikut :

1. Pemakaian fasilitas Laboratorium Komputer sampai dengan pukul 14.00
2. Biaya pemakaian sebesar Rp 1.500,00/jam.

Untuk pelaksanaan selanjutnya Saudara dapat berkoordinasi dengan Kepala Laboratorium Komputer Fakultas Teknik UAJY.

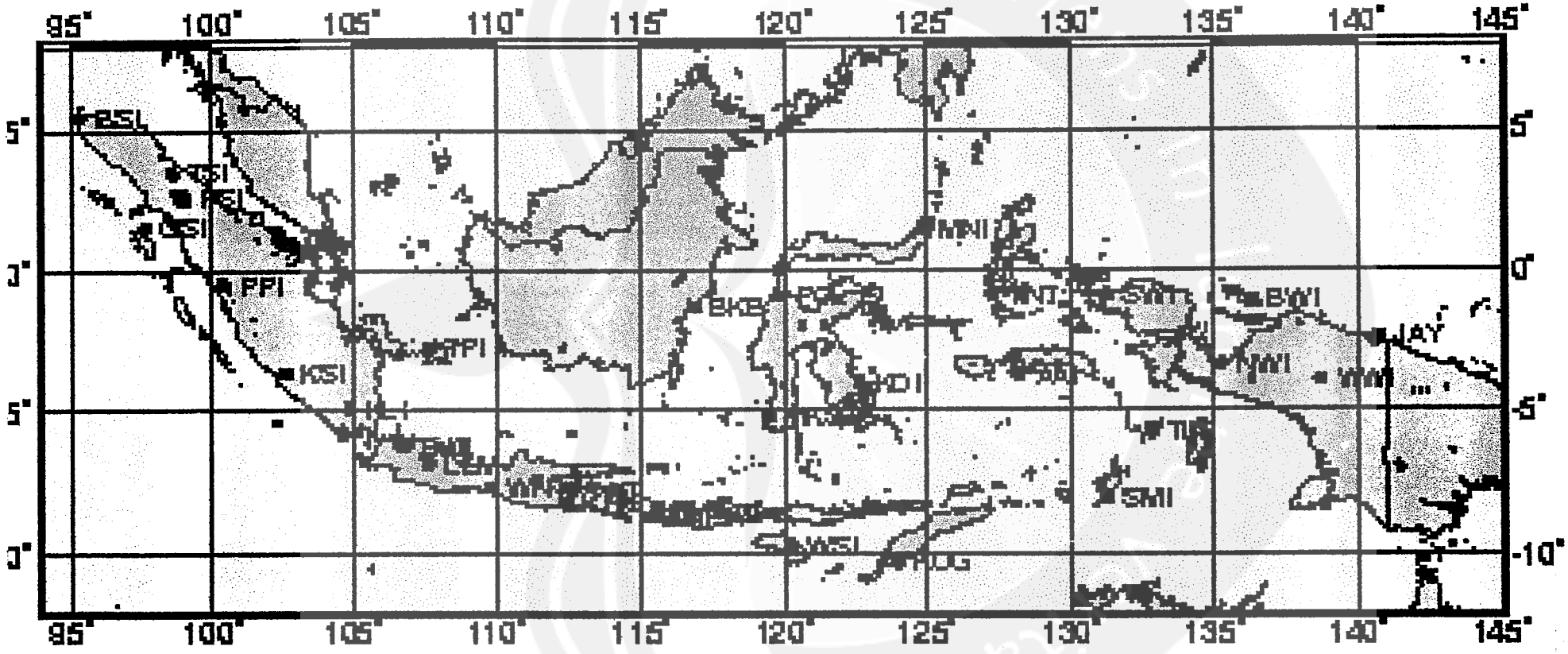
Atas perhatian Saudara, diucapkan terima kasih.

Dekan,

Ir. A.Y. Harijanto Setiawan, M.Eng.

Tembusan Yth.:
Kepala Lab. Komputer FT UAJY

STASIUN GEOFISIKA DI INDONESIA



KETERANGAN

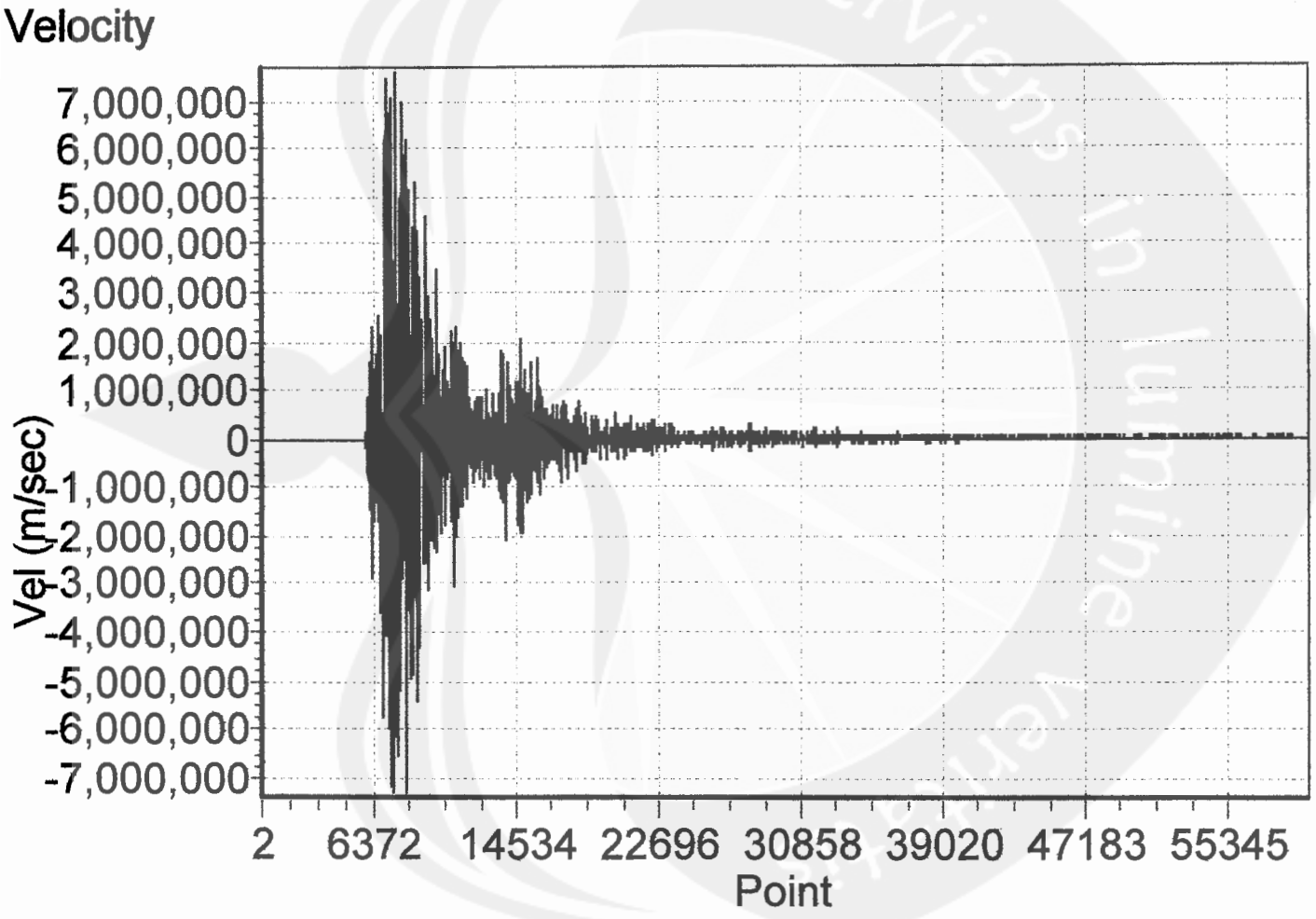
- Stasiun Geofisika

LAMPIRAN

Stasiun Geofisika di Indonesia

4

GRAFIK KECEPATAN VS WAKTU GEMPA BENGKULU



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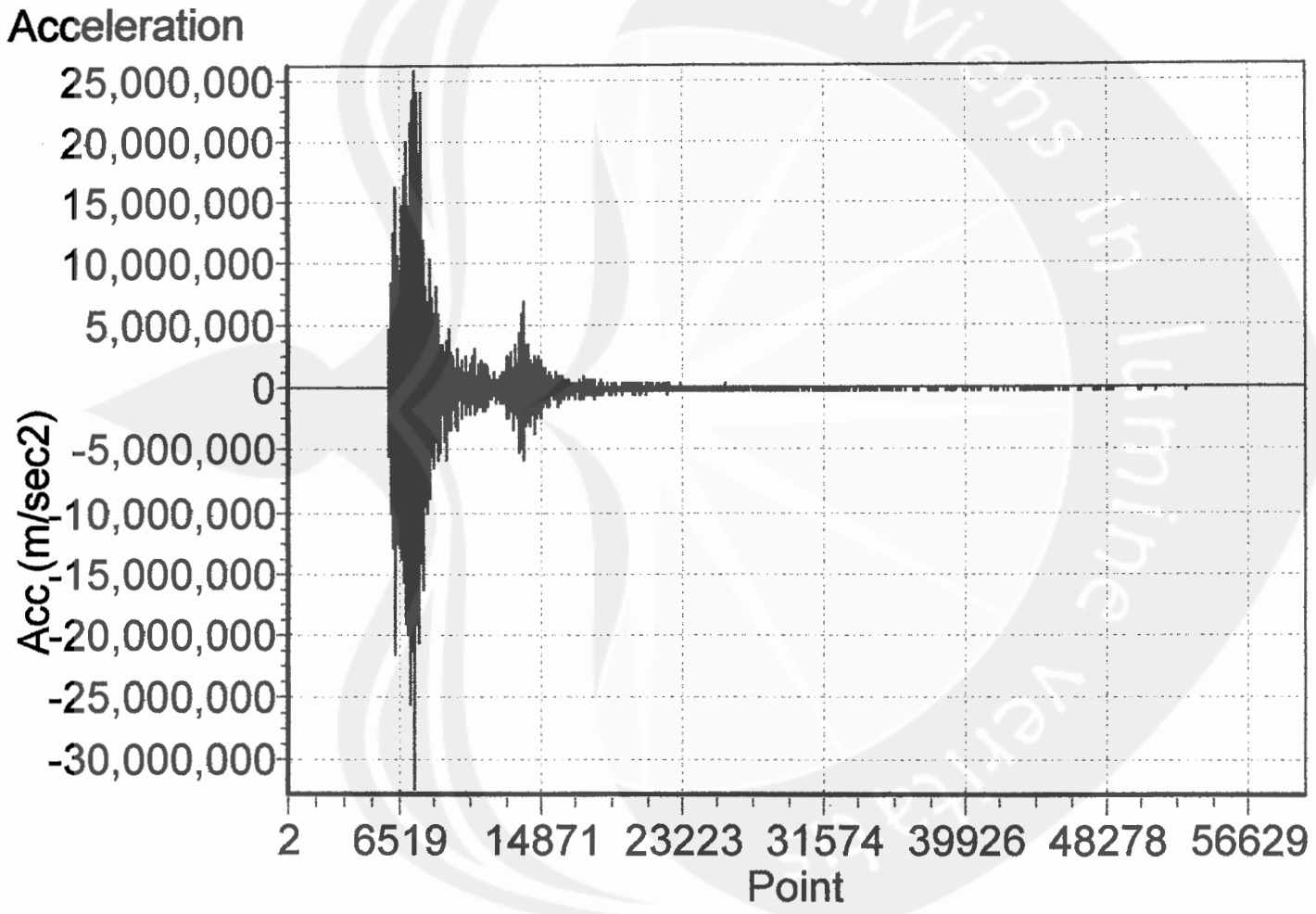
Grafik Kecepatan vs waktu Gempa Bengkulu	5

GRAFIK PERCEPATAN VS WAKTU GEMPA BENGKULU



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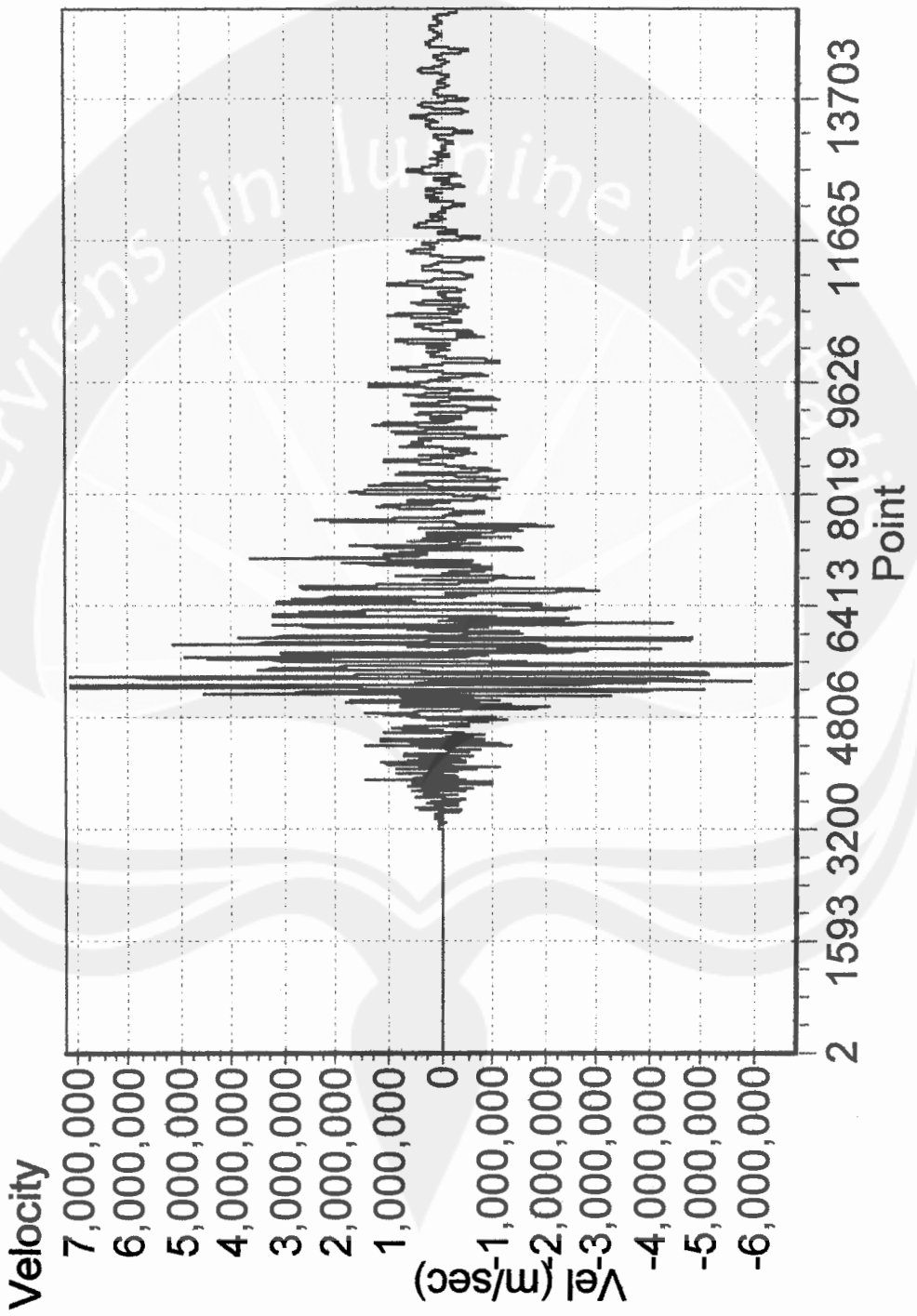

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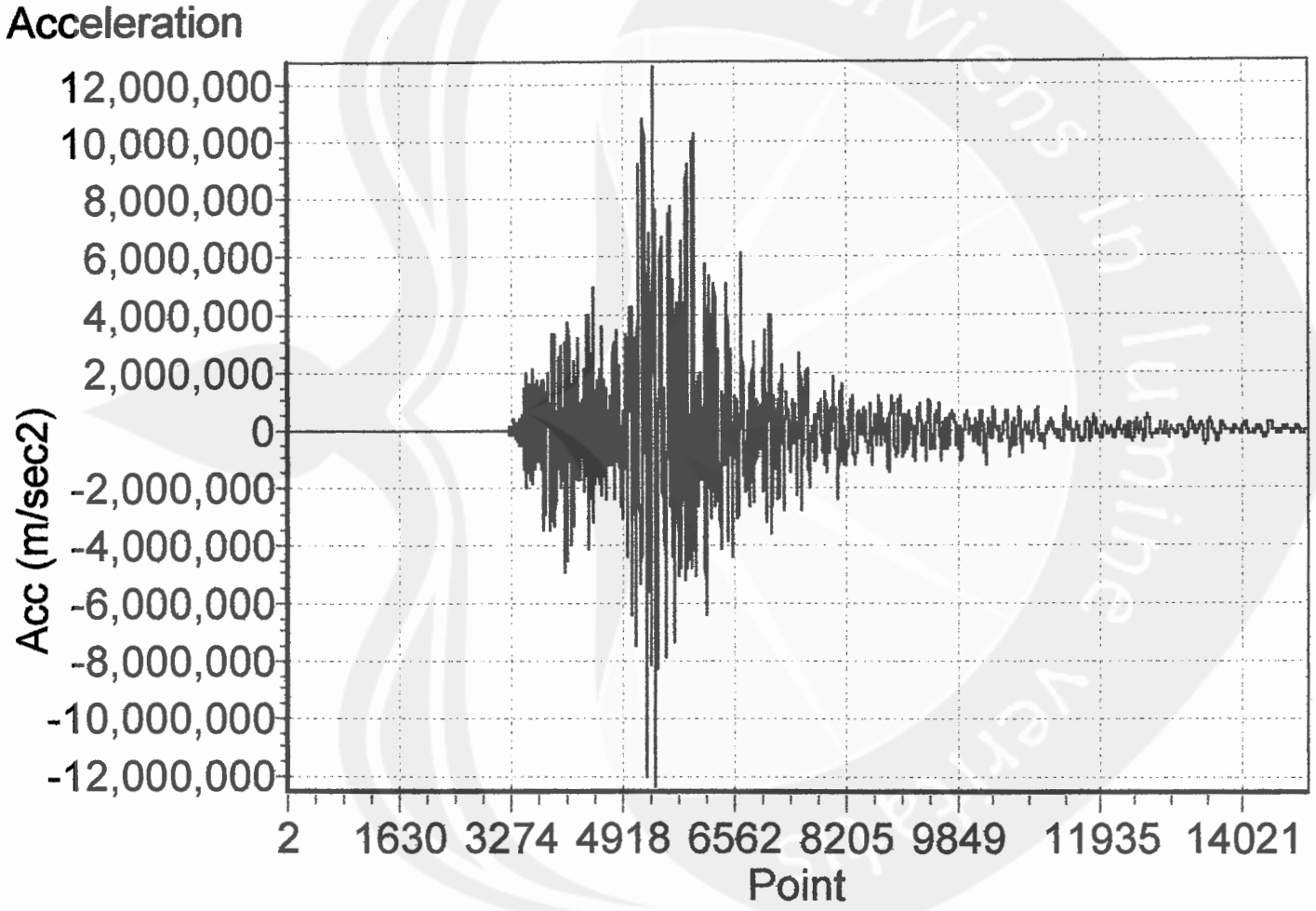

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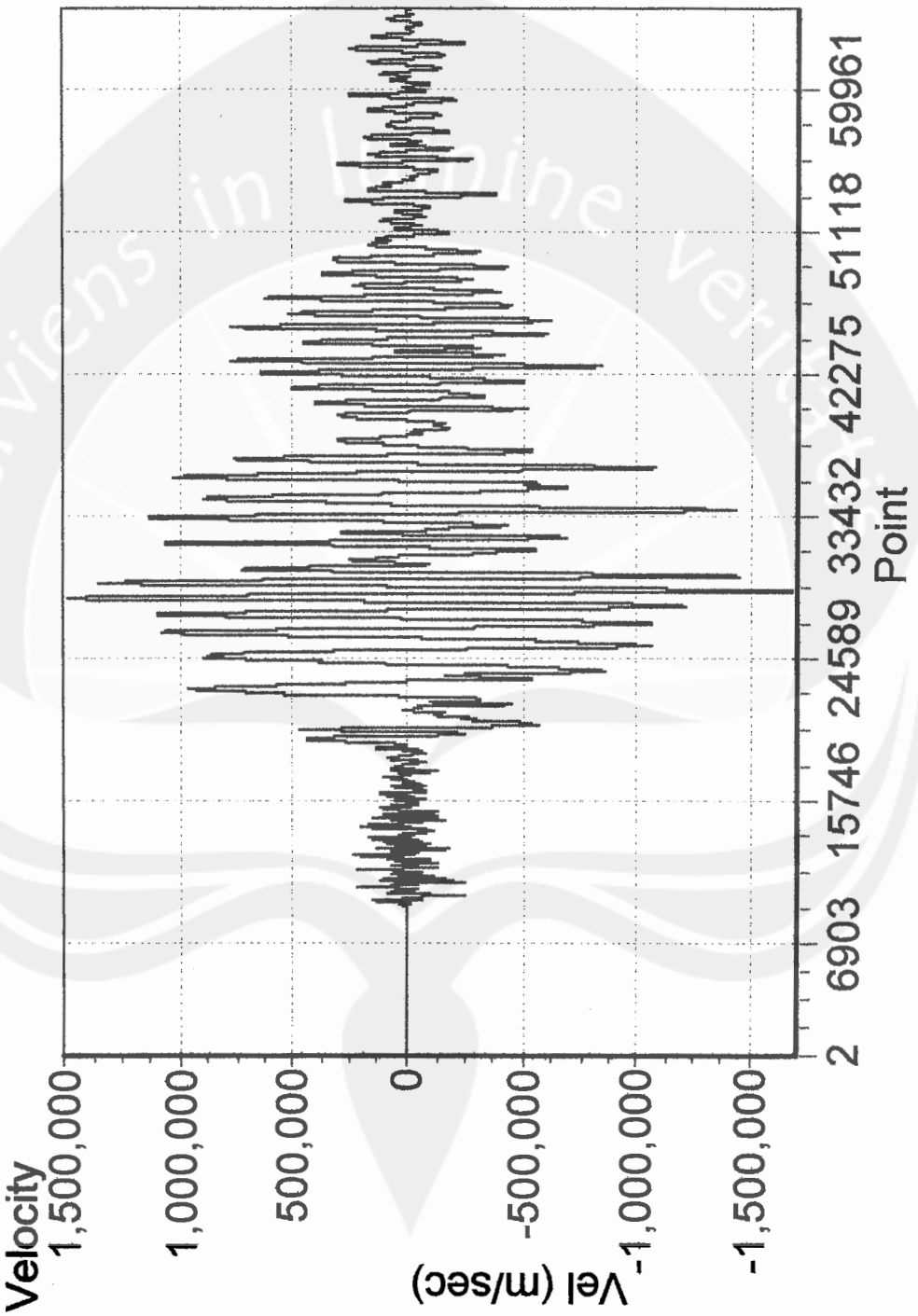

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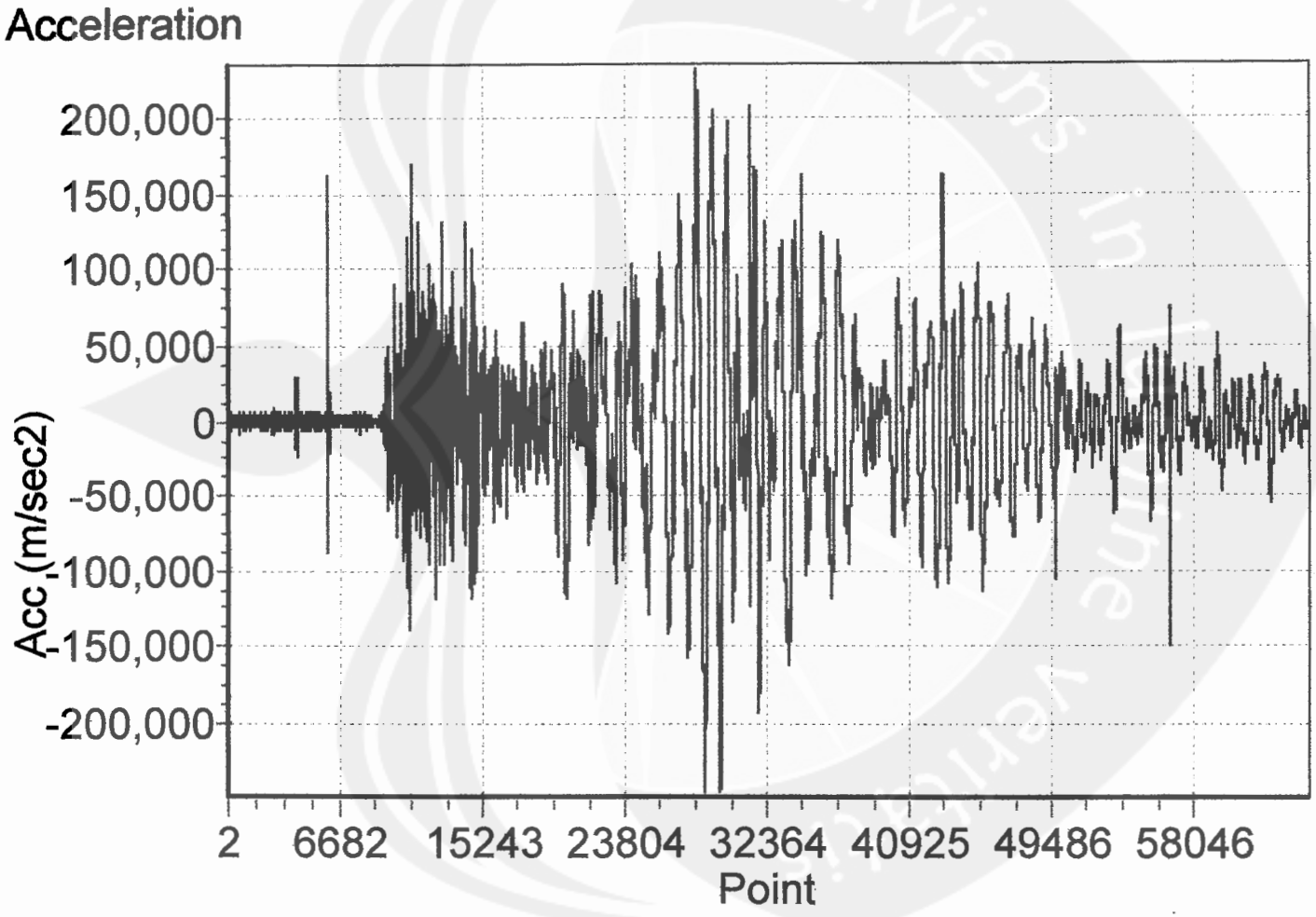

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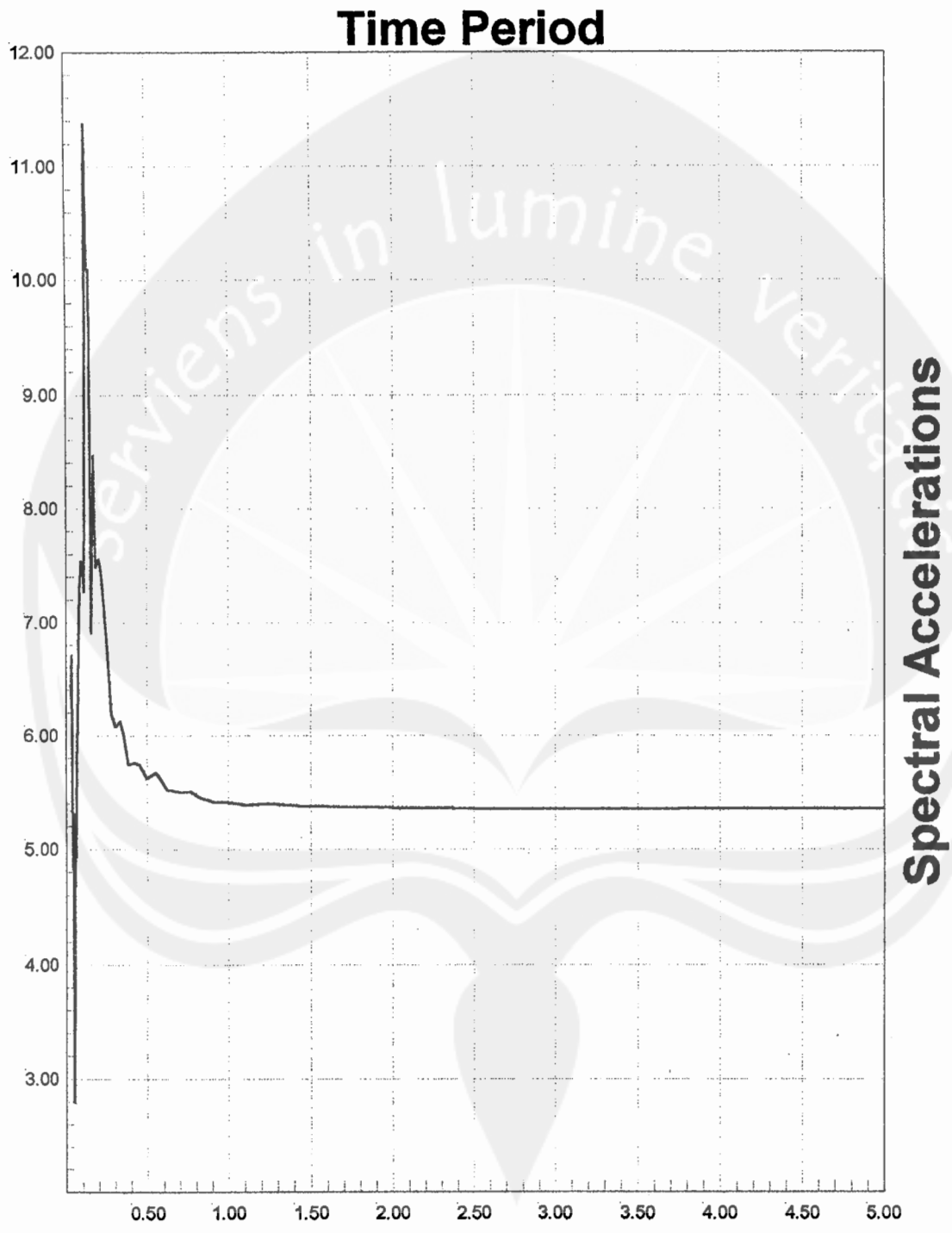

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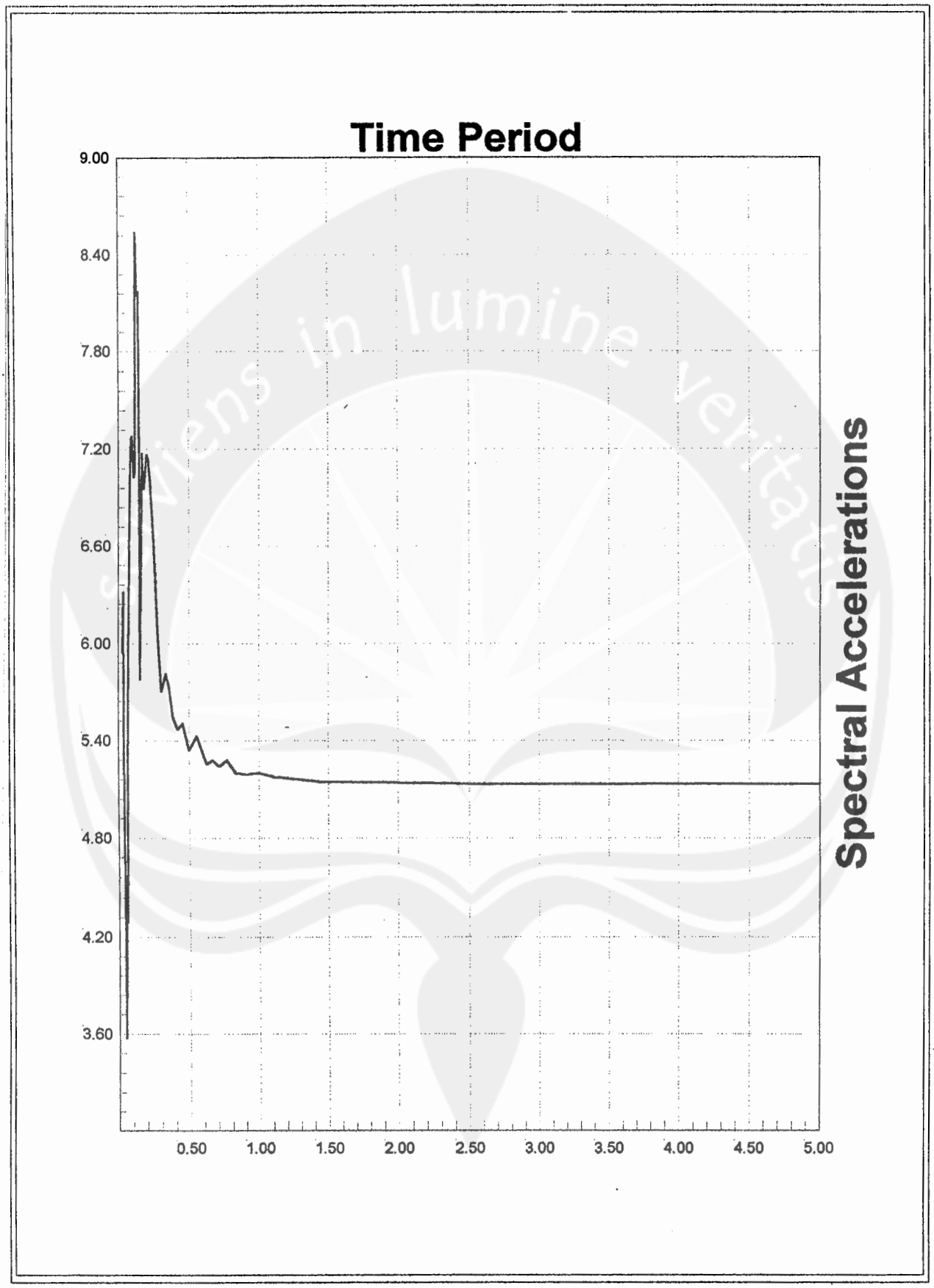

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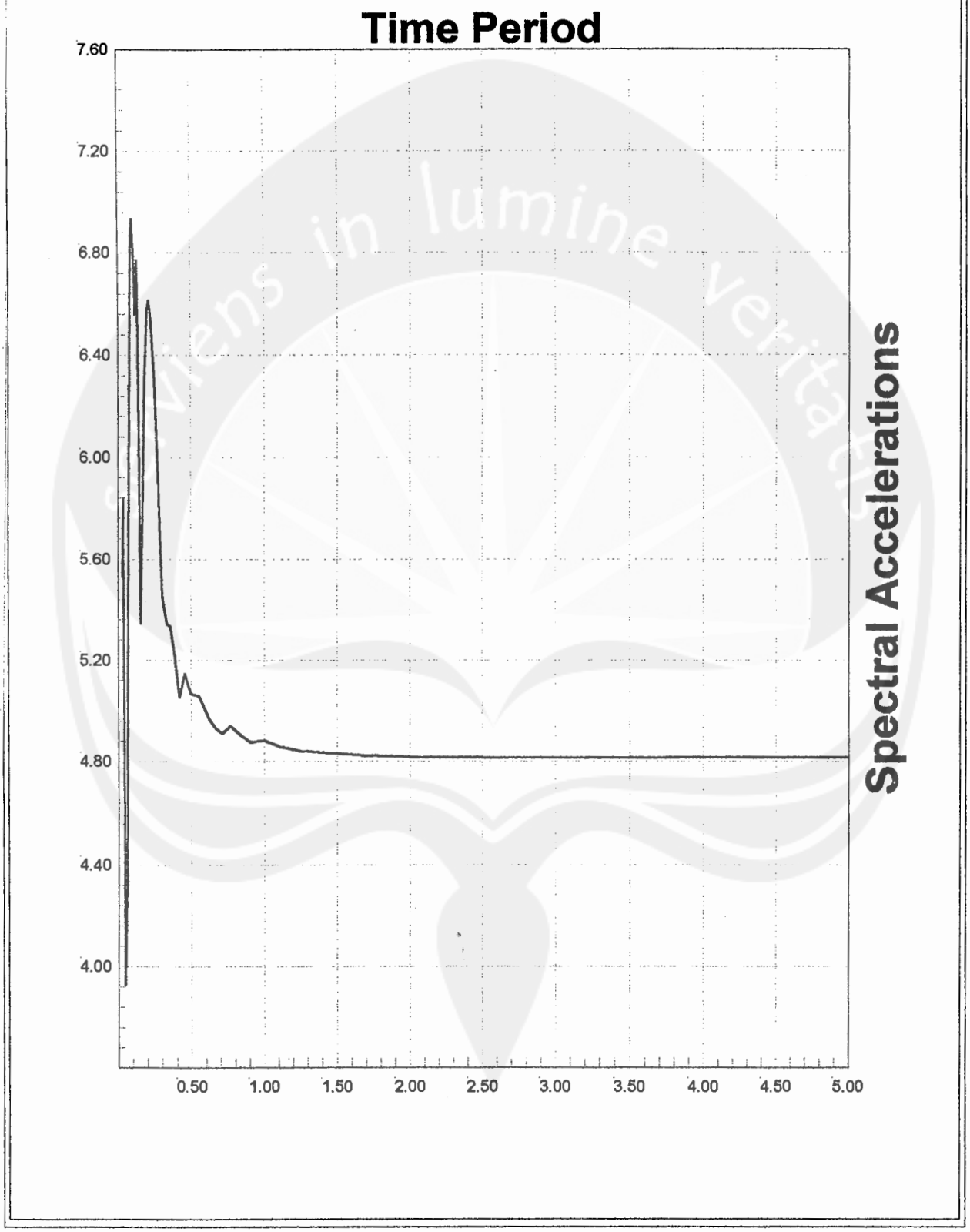

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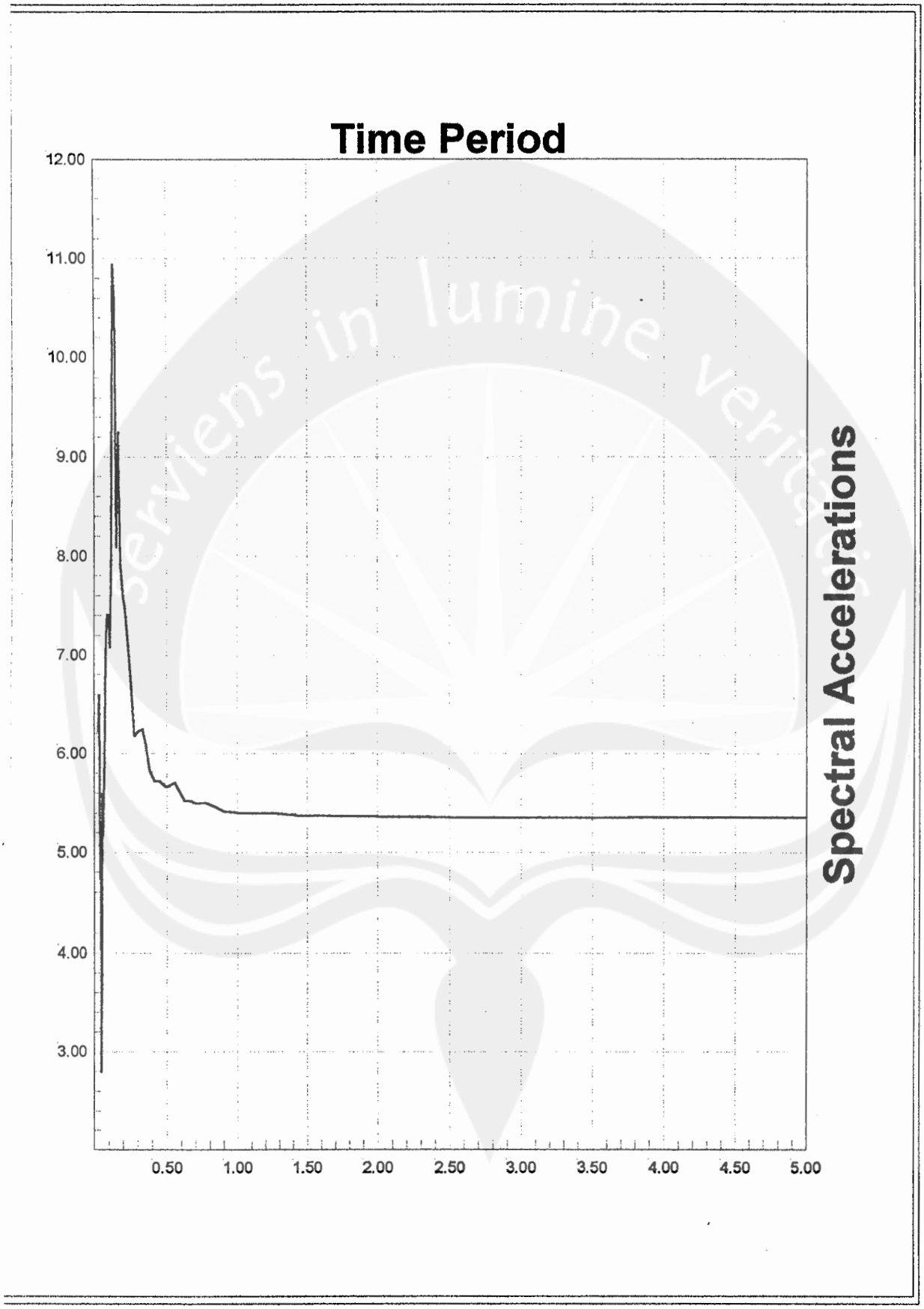

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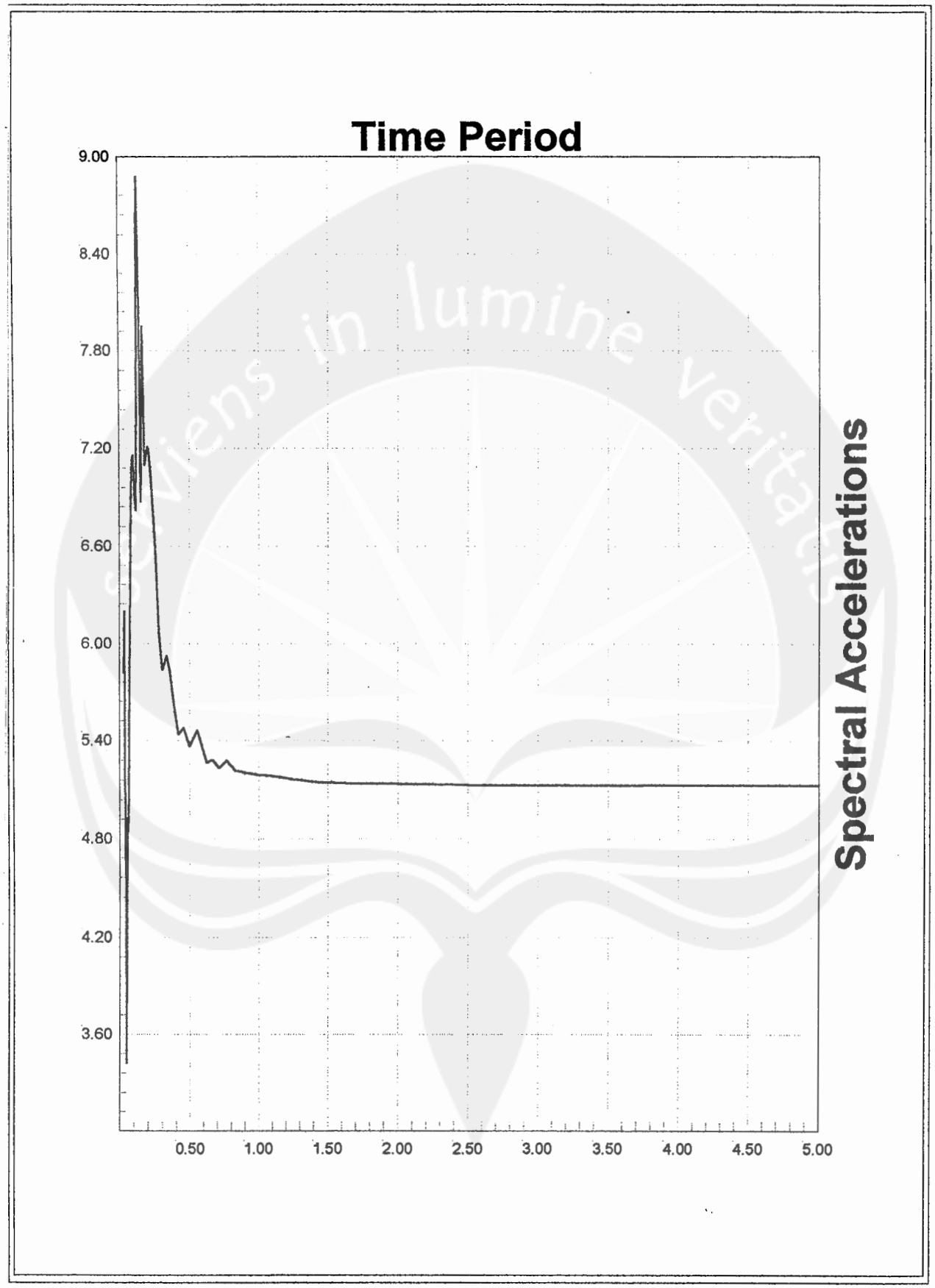

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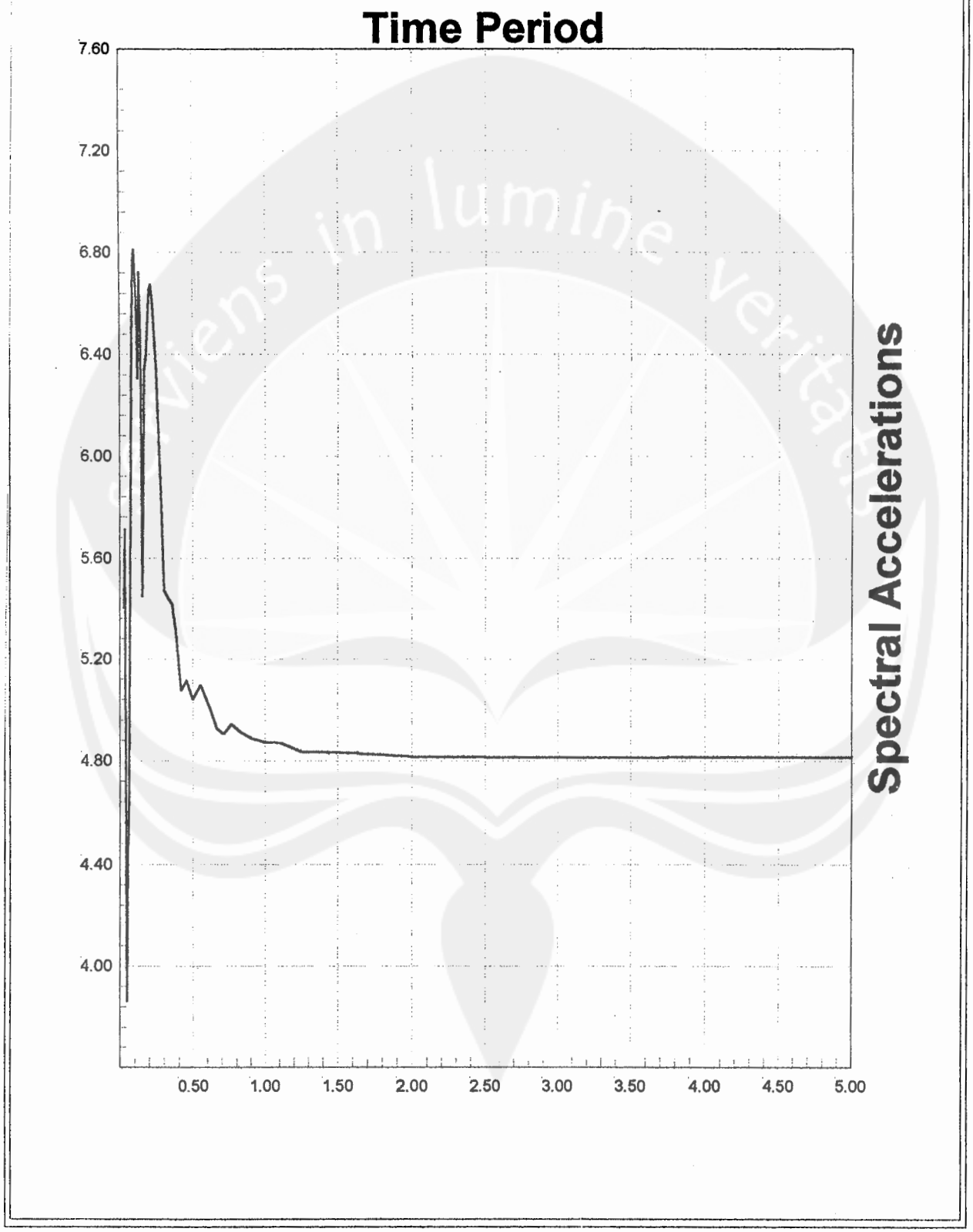

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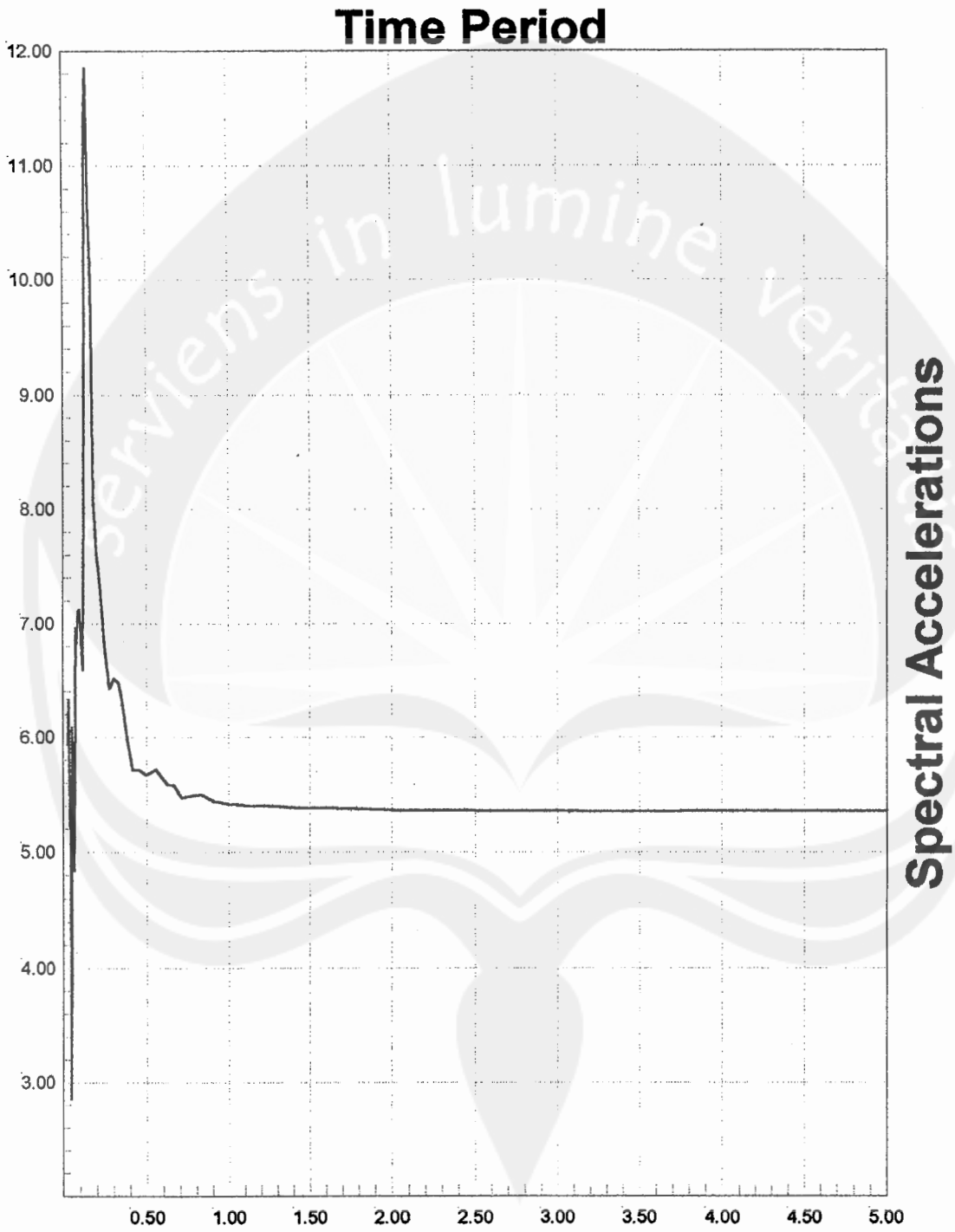

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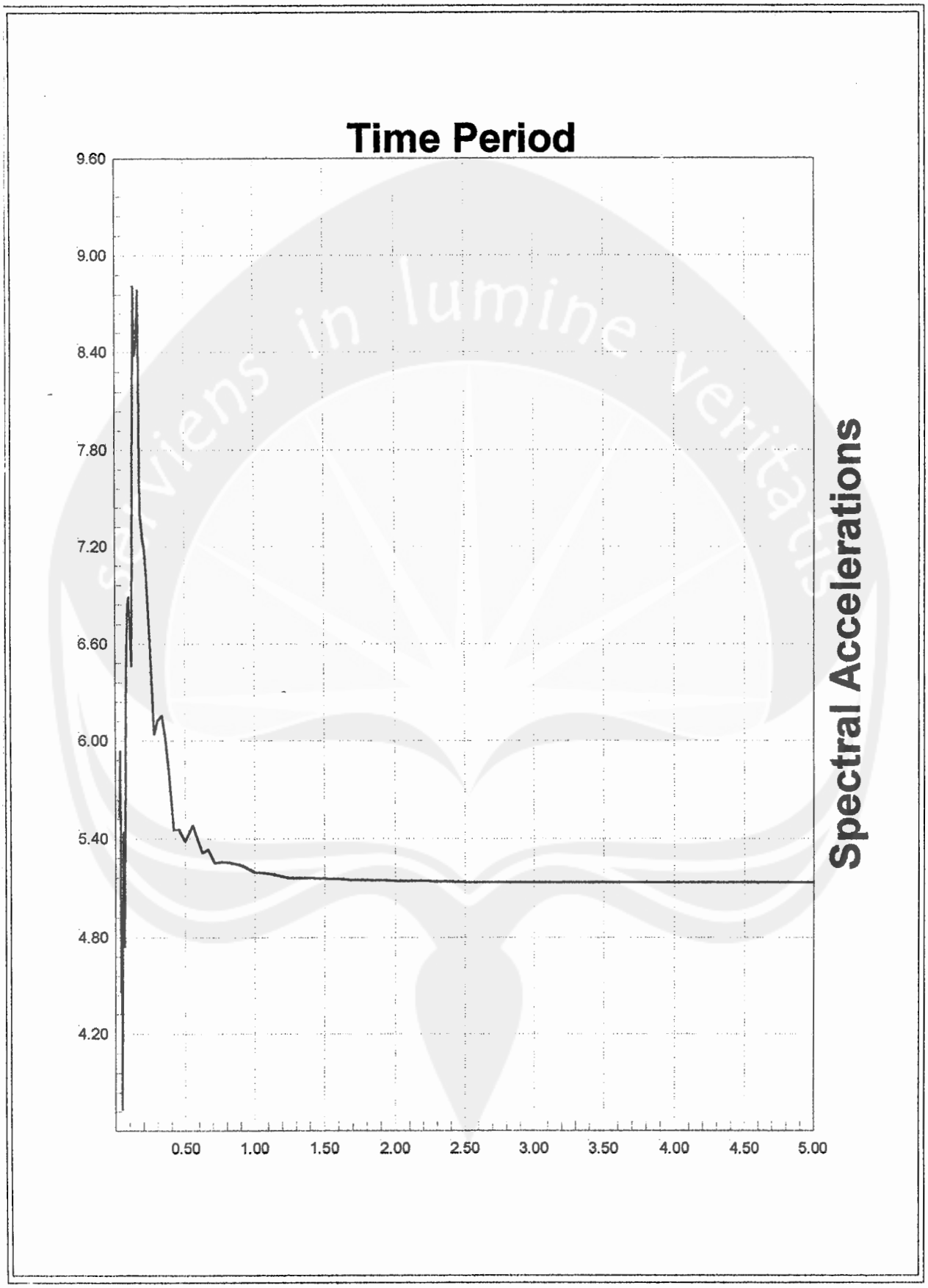

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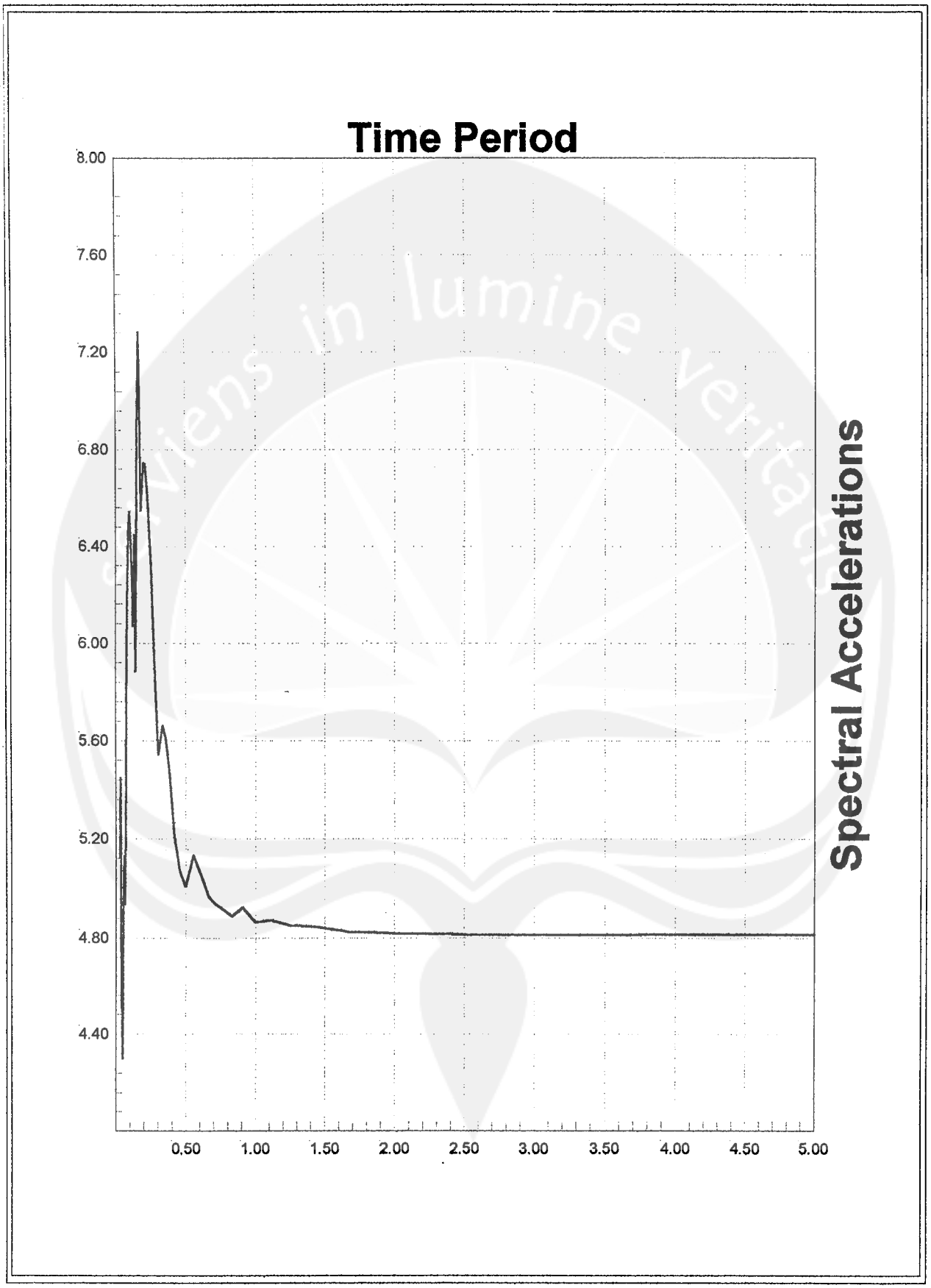

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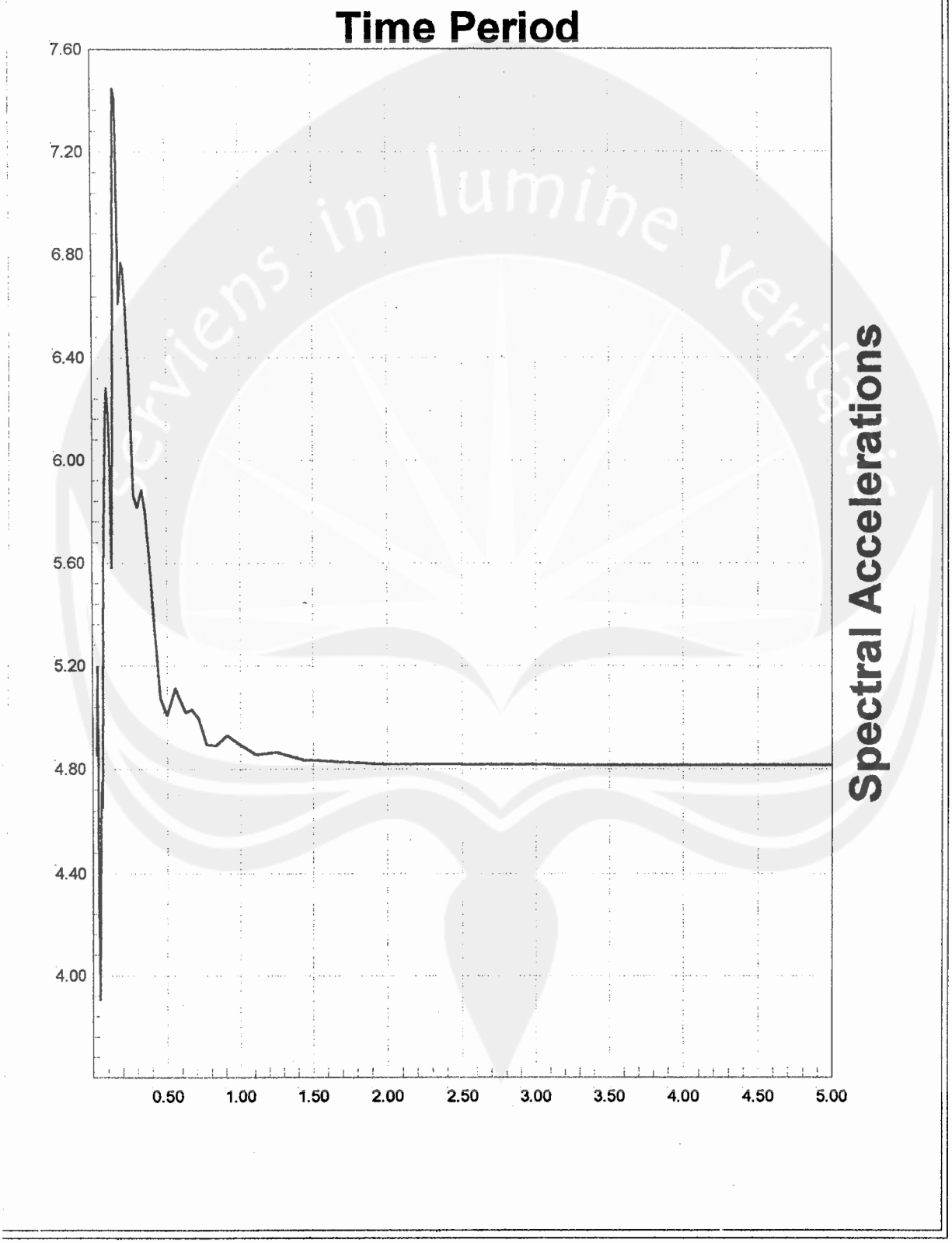

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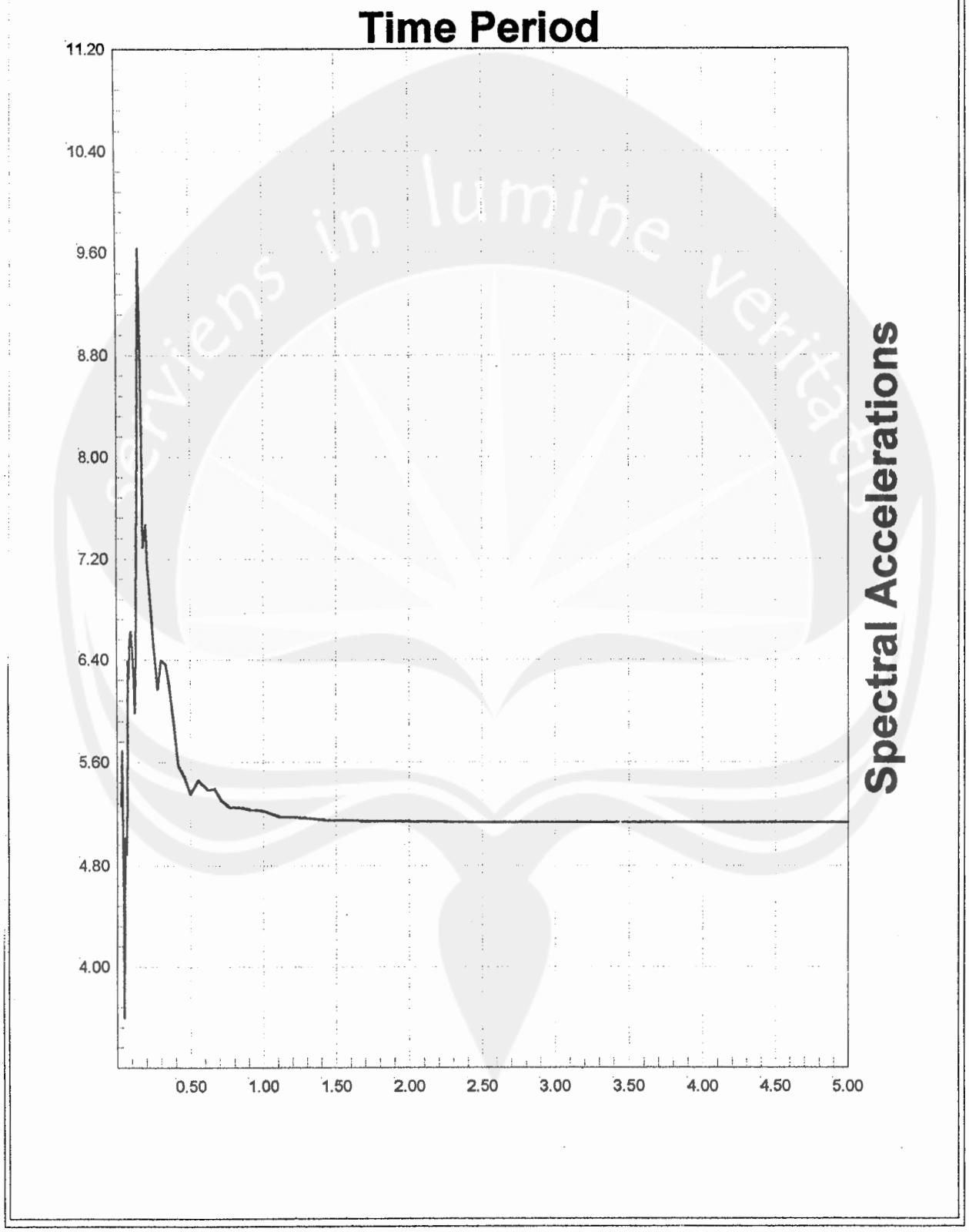
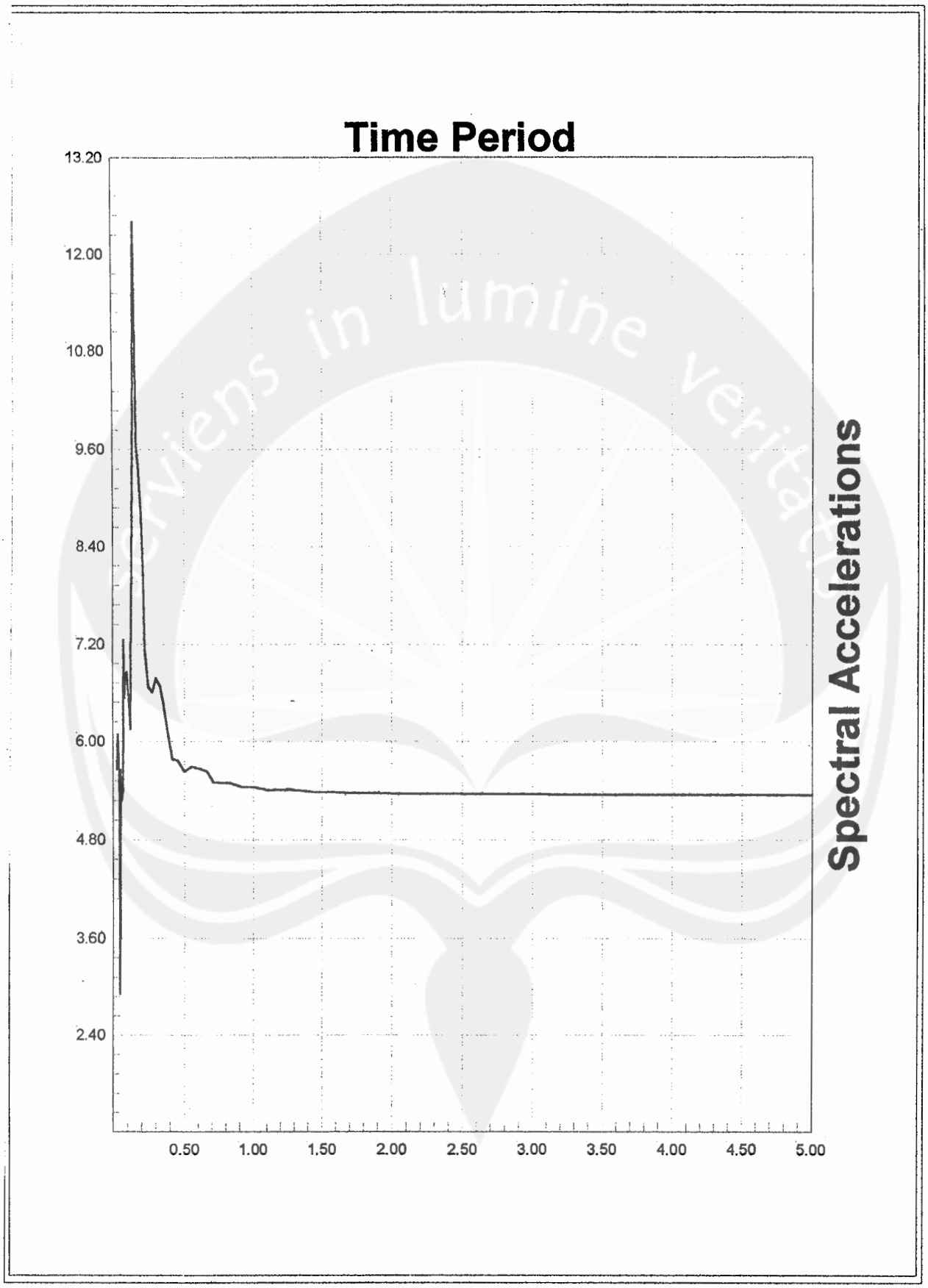
ETABS Response Spectrum Curves June 13,2001 15:01



ETABS 6.13 File: SBENG6.PST
Untitled Level LT1 Column 1 Direction X
Damping Values 0.05 Scale Factor 1.00e00 Widening 0.00 %



ETABS 6.13 File: SBENG6.PST
Untitled Level LT1 Column 1 Direction X
Damping Values 0.02 Scale Factor 1.00e00 Widening 0.00 %

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$ Control Data.  File SBENG3 saved 6/3/01 15:17:40 in KiloNewton-meters
ETABS 6.1
Heading Data 1
Heading Data 2
 2 1 1 1 0 0 1 1 1 1 0 0 0 1 0 3 1 1 4 0 3
 9.81456 0.0001 0 1
$ Story Data
 LT1 5 0
 BASE 1 0
$ Material Property Data
 1 C 2.482112E+07 0.2 23.5616 2.400678 0.0000055 413685.3 27579.02 275790.2 \
 27579.02
$ Column Property Data
 1 RECT 1 0.5 0.5 0 0 1 1 1
$ Beam Property Data
 1 RECT 1 0.25 0.25 0.35 0 0 1 1 1
$ Spring Property Data
 1 LINEAR
   50000 50000 50000 50000 50000 50000
$ Frame Heading and Control Data

 1 2 1 0 0 1 0 1 0 0 0 0 1
$ Layout Grids
! 1 ita rect 0 0 0 2 1
!  0 5
!  0
$ Layout Column Lines
 1 0 0 0 ! 1 1 1 0 0 0
 2 5 0 0 ! 1 2 1 0 0 0
$ Layout Beam Bays
 1 1 2 0
$ Beam Load Pattern Data
 1 0 150 0 0 0 0 0 0 0
$ Joint Assignment Data
 1 1 0 BASE BASE 1 1
 2 2 0 BASE BASE 1 1

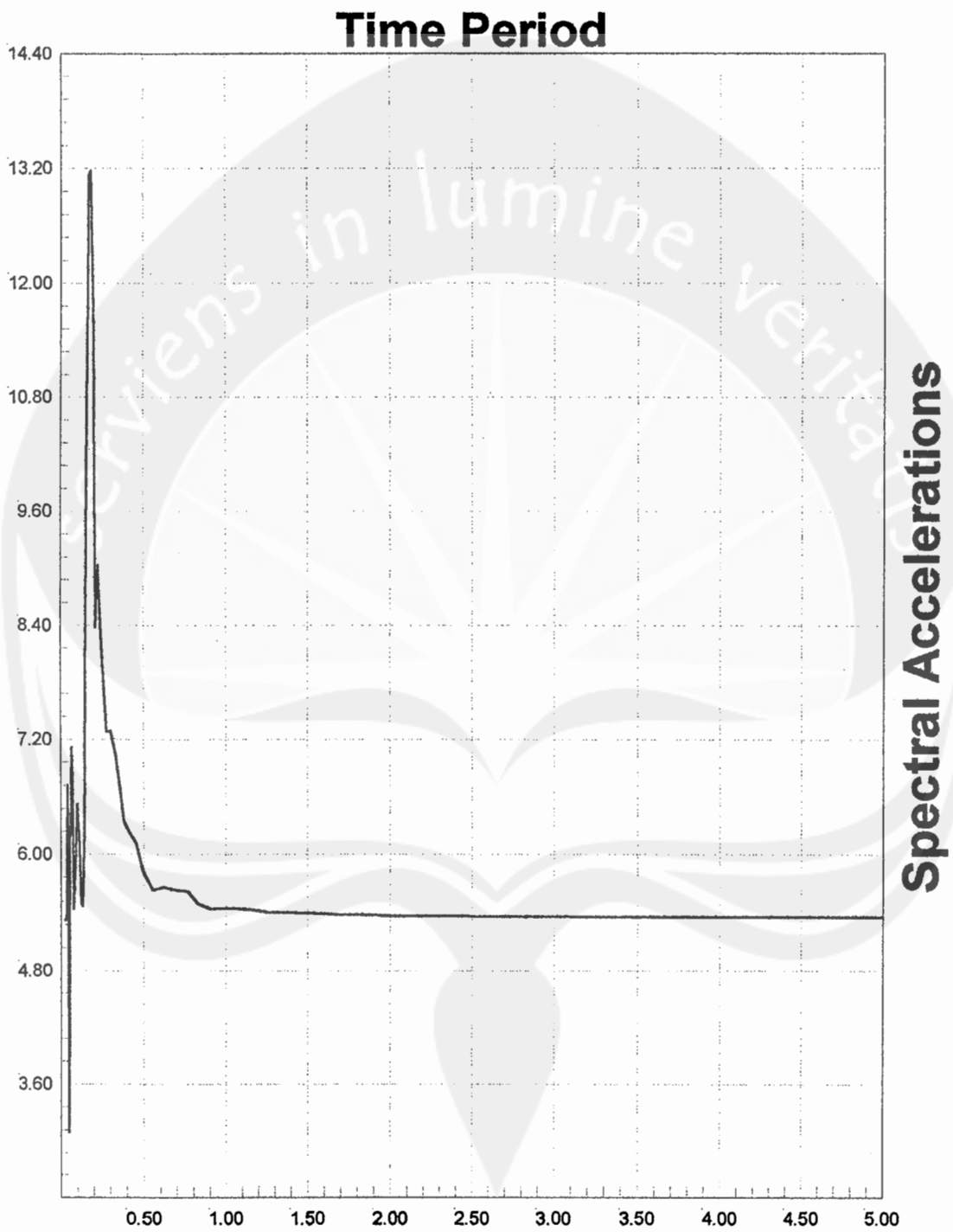
$ Column Assignment Data
 1 1 0 LT1 LT1 1 0 0
 2 2 0 LT1 LT1 1 0 0

$ Beam Assignment Data
 1 1 0 LT1 LT1 1 0 0 0 0

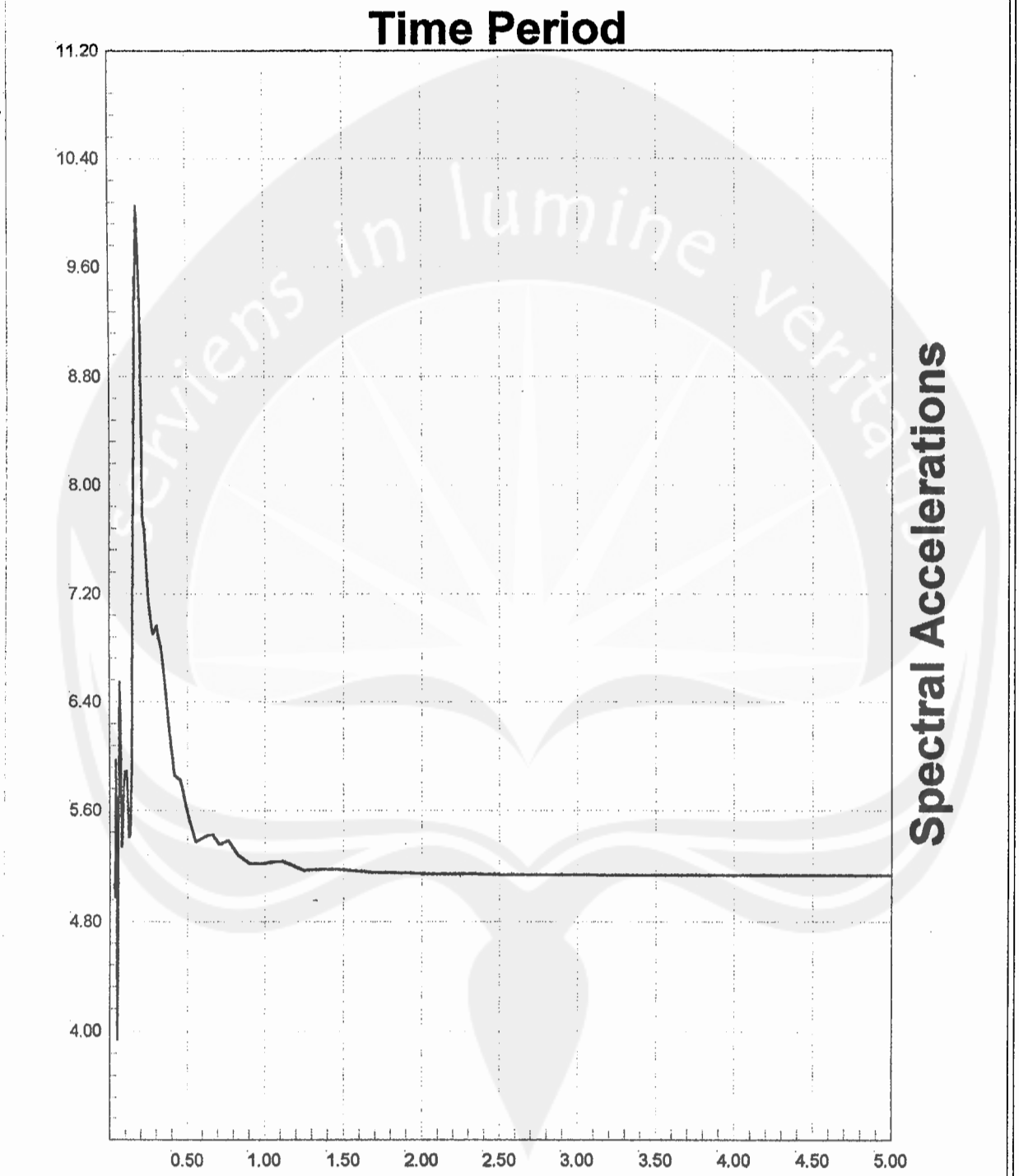
$ Beam Load Assignment Data
 1 1 0 LT1 LT1 1 0 0

$ Frame Location Data
 1 0 0 0
$ Lateral Dynamic Time History Data
 tugas akhir, dian rosita, 8548
 0 100 0.05 0.05 0
 benita 0.00981 E 0.05 1 1
```

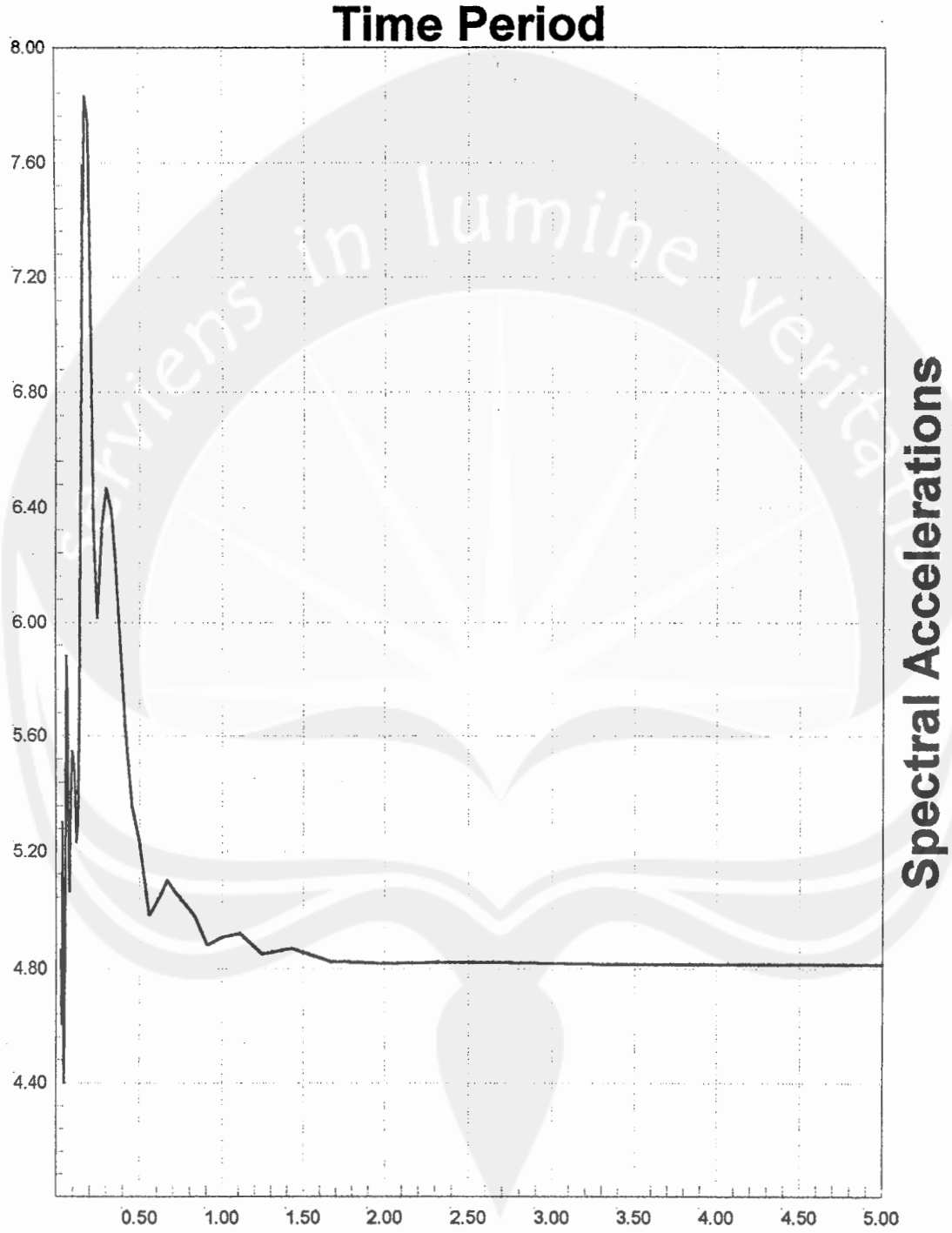
ETABS Response Spectrum Curves June 13,2001 14:52



ETABS 6.13 File: SBENG3.PST
Untitled Level LT1 Column 1 Direction X
Damping Values 0.02 Scale Factor 1.00e00 Widening 0.00 %



ETABS 6.13 File: SBENG3.PST
Untitled Level LT1 Column 1 Direction X
Damping Values 0.05 Scale Factor 1.00e00 Widening 0.00 %



.TABS 6.13 File: SBENG3.PST
Intitled Level LT1 Column 1 Direction X
Damping Values 0.10 Scale Factor 1.00e00 Widening 0.00 %

```
$.....Heading
ETABS 6.1
TGA : RANGKA GEDUNG 10 LANTAI 3-D
        ANALISA RESPONS SPEKTRUM  Satuan : KN-meter-detik
10 1 1 1 0 2 10 1 1 1 0 0 0 0 0 2 0 0 1 0 3
9.81  0.0001 0 1
$Story Data
$.....Story Data
lt-10 3 1
1 0 8.8E3 0 11 8
lt-9  3 1
1 0 8.8E3 0 11 8
lt-8  3 1
1 0 8.8E3 0 11 8
lt-7  3 1
1 0 8.8E3 0 11 8
lt-6  3 1
1 0 8.8E3 0 11 8
lt-5  4 1
1 0 11E3 0 11 8
lt-4  4 1
1 0 11E3 0 11 8
lt-3  4 1
1 0 11E3 0 11 8
lt-2  4 1
1 0 11E3 0 11 8
lt-1  4 1
1 0 11E3 0 11 8
$Material Property Data
$.....Material Data
1 c 3E9
$Column Property Data
$.....Column Properties
1 rect 1 0.5 0.5 0 0 0 1 1 1
$Beam Property Data
$.....Beam Properties
1 rect 1 0.25 0.25 0.35 0 0 1 1 1
$Frame Heading and Control Data
            Rangka gedung 3-D sb global dan lokal berimpit
1 16 24 0 0 0 0 0 0 0 0 0 0
$Layout Column Lines
1 0 0 0
2 5 0 0
3 10 0 0
4 15 0 0
5 0 5 0
6 5 5 0
7 10 5 0
8 15 5 0
9 0 10 0
10 5 10 0
11 10 10 0
12 15 10 0
13 0 15 0
14 5 15 0
```

15 10 15 0
16 15 15 0
$Layout Beam Bays
1 1 2 0
2 2 3 0
3 3 4 0
4 5 6 0
5 6 7 0
6 7 8 0
7 9 10 0
8 10 11 0
9 11 12 0
10 13 14 0
11 14 15 0
12 15 16 0
13 1 5 0
14 2 6 0
15 3 7 0
16 4 8 0
17 5 9 0
18 6 10 0
19 7 11 0
20 8 12 0
21 9 13 0
22 10 14 0
23 11 15 0
24 12 16 0
$Column Assignment Data
$.....Column Assignment
1 16 0 lt-10 lt-1 1 0 0

$Beam Assignment Data
$.....Beam Assignments
1 24 0 lt-10 lt-1 1 0 0 0 0

$Frame Location Data
1 0 0 0 /3-D Frame
$Lateral Dynamic Spectrum Data
Respons Spektrum Gempa
0 CQC 0.05
PGI 9.81 1 1

$Load Case Data
1 0 0 0 0 0 0 0 1

$**********End of Data**********

$ Gempa wilayah 3 PGI 1983
$ Asumsi tanah keras
$ Damping
0.05

$ Periode	PSA
0	0.05
0.5	0.048
1.0	0.035
1.5	0.032
2.0	0.025
3.0	0.025

E T A B S

Extended Three Dimensional Analysis of Building Systems

Version 6.13

12 Jun 2001 11:36:06

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN1.STR

TGA : RANGKA GEDUNG 10 LANTAI 3-D

ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

TOTAL MODAL DAMPING & SPECTRAL VALUES

MODE NO	TIME PERIOD	DAMPING RATIO	SPEC-ACC D1	SPEC-ACC D2
1	1.00055	0.05000	0.343	0.000
2	0.92159	0.05000	0.363	0.000
3	0.29691	0.05000	0.479	0.000
4	0.27334	0.05000	0.480	0.000
5	0.17558	0.05000	0.484	0.000
6	0.16116	0.05000	0.484	0.000
7	0.11612	0.05000	0.486	0.000
8	0.10643	0.05000	0.486	0.000
9	0.08693	0.05000	0.487	0.000
10	0.07961	0.05000	0.487	0.000

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

COORDINATES OF CENTERS OF CUMULATIVE MASS & CENTERS OF RIGIDITY

STORY LEVEL	DIAPHRAGM NUMBER	/----------CENTER OF MASS----------//--CENTER OF RIGIDITY--/ MASS	ORDINATE-X	ORDINATE-Y	ORDINATE-X	ORDINATE-Y
LT-10	1	8800.000	11.000	8.000	7.500	7.500
LT-9	1	17600.000	11.000	8.000	7.500	7.500
LT-8	1	26400.000	11.000	8.000	7.500	7.500
LT-7	1	35200.000	11.000	8.000	7.500	7.500
LT-6	1	44000.000	11.000	8.000	7.500	7.500
LT-5	1	55000.000	11.000	8.000	7.500	7.500
LT-4	1	66000.000	11.000	8.000	7.500	7.500
LT-3	1	77000.000	11.000	8.000	7.500	7.500
LT-2	1	88000.000	11.000	8.000	7.500	7.500
LT-1	1	99000.000	11.000	8.000	7.500	7.500

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

DYNAMIC RESPONSE SPECTRUM BASE SHEARS

MODE	/----------D1----------//		----------D2----------/	
NO	DIRECTION-X	DIRECTION-Y	DIRECTION-X	DIRECTION-Y
1	570.206	-3991.439	0.000	0.000
2	29526.891	4218.127	0.000	0.000
3	85.746	-600.224	0.000	0.000
4	4251.487	607.357	0.000	0.000
5	30.458	-213.203	0.000	0.000
6	1502.297	214.614	0.000	0.000
7	18.241	-127.686	0.000	0.000
8	897.767	128.253	0.000	0.000
9	8.496	-59.471	0.000	0.000
10	418.232	59.746	0.000	0.000
CQC	30271.908	3741.569	0.000	0.000

RESPONSE SPECTRUM LATERAL DISPLACEMENTS FOR DIAPHRAGM 1

VALUES ARE AT THE CENTER OF MASS OF THE
CORRESPONDING DIAPHRAGM IN GLOBAL COORDINATES

	/-LOAD	CONDITIONS-/	
LEVEL	DIRN	D1	D2
LT-10	X	0.0097	0.0000
LT-10	Y	0.0013	0.0000
LT-10	ROTZ	6.487E-05	0.000E+00
LT-9	X	0.0095	0.0000
LT-9	Y	0.0013	0.0000
LT-9	ROTZ	6.387E-05	0.000E+00
LT-8	X	0.0092	0.0000
LT-8	Y	0.0012	0.0000
LT-8	ROTZ	6.209E-05	0.000E+00
LT-7	X	0.0087	0.0000
LT-7	Y	0.0012	0.0000
LT-7	ROTZ	5.950E-05	0.000E+00
LT-6	X	0.0082	0.0000
LT-6	Y	0.0011	0.0000
LT-6	ROTZ	5.610E-05	0.000E+00
LT-5	X	0.0075	0.0000
LT-5	Y	0.0010	0.0000
LT-5	ROTZ	5.168E-05	0.000E+00
LT-4	X	0.0062	0.0000
LT-4	Y	0.0008	0.0000
LT-4	ROTZ	4.272E-05	0.000E+00
LT-3	X	0.0046	0.0000
LT-3	Y	0.0006	0.0000
LT-3	ROTZ	3.210E-05	0.000E+00
LT-2	X	0.0029	0.0000
LT-2	Y	0.0004	0.0000
LT-2	ROTZ	2.047E-05	0.000E+00
LT-1	X	0.0012	0.0000
LT-1	Y	0.0002	0.0000
LT-1	ROTZ	8.566E-06	0.000E+00

RESPONSE SPECTRUM LATERAL STORY INERTIA FORCES FOR DIAPHRAGM 1

LOADS ARE AT THE CENTERS OF MASS OF THE RESPECTIVE STORY LEVELS

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	4475.71	0.00
LT-10	Y	562.64	0.00
LT-10	ROTZ	1.997E-10	0.000E+00
LT-9	X	4150.98	0.00
LT-9	Y	516.96	0.00
LT-9	ROTZ	2.337E-10	0.000E+00
LT-8	X	3911.27	0.00
LT-8	Y	487.31	0.00
LT-8	ROTZ	2.276E-10	0.000E+00
LT-7	X	3712.08	0.00
LT-7	Y	463.68	0.00
LT-7	ROTZ	2.754E-10	0.000E+00
LT-6	X	3526.69	0.00
LT-6	Y	439.48	0.00
LT-6	ROTZ	2.358E-10	0.000E+00
LT-5	X	4213.18	0.00
LT-5	Y	527.19	0.00
LT-5	ROTZ	1.634E-10	0.000E+00
LT-4	X	3910.90	0.00
LT-4	Y	489.17	0.00
LT-4	ROTZ	2.857E-10	0.000E+00
LT-3	X	3515.76	0.00
LT-3	Y	439.46	0.00
LT-3	ROTZ	2.544E-10	0.000E+00
LT-2	X	2947.64	0.00
LT-2	Y	364.17	0.00
LT-2	ROTZ	4.089E-11	0.000E+00
LT-1	X	1846.73	0.00
LT-1	Y	223.59	0.00
LT-1	ROTZ	2.027E-11	0.000E+00

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

RESPONSE SPECTRUM LATERAL STORY SHEARS FOR DIAPHRAGM 1

		/-LOAD CONDITIONS-/	
LEVEL	DIRN	D1	D2
LT-10	X	4475.71	0.00
LT-10	Y	562.64	0.00
LT-9	X	8583.08	0.00
LT-9	Y	1072.72	0.00
LT-8	X	12329.57	0.00
LT-8	Y	1534.10	0.00
LT-7	X	15775.94	0.00
LT-7	Y	1958.23	0.00
LT-6	X	18931.66	0.00
LT-6	Y	2346.46	0.00
LT-5	X	22544.84	0.00
LT-5	Y	2790.64	0.00
LT-4	X	25525.16	0.00
LT-4	Y	3157.48	0.00
LT-3	X	27871.14	0.00
LT-3	Y	3446.34	0.00
LT-2	X	29494.98	0.00
LT-2	Y	3646.45	0.00
LT-1	X	30271.88	0.00
LT-1	Y	3741.57	0.00

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

RESPONSE SPECTRUM LATERAL STORY INERTIA FORCES FOR ALL DIAPHRAGMS

VALUES ARE AT THE GLOBAL ORIGIN IN THE GLOBAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	4475.71	0.00
LT-10	Y	562.64	0.00
LT-10	ROTZ	3.327E+04	0.000E+00
LT-9	X	4150.98	0.00
LT-9	Y	516.96	0.00
LT-9	ROTZ	3.087E+04	0.000E+00
LT-8	X	3911.27	0.00
LT-8	Y	487.31	0.00
LT-8	ROTZ	2.908E+04	0.000E+00
LT-7	X	3712.08	0.00
LT-7	Y	463.68	0.00
LT-7	ROTZ	2.759E+04	0.000E+00
LT-6	X	3526.69	0.00
LT-6	Y	439.48	0.00
LT-6	ROTZ	2.623E+04	0.000E+00
LT-5	X	4213.18	0.00
LT-5	Y	527.19	0.00
LT-5	ROTZ	3.134E+04	0.000E+00
LT-4	X	3910.90	0.00
LT-4	Y	489.17	0.00
LT-4	ROTZ	2.916E+04	0.000E+00
LT-3	X	3515.76	0.00
LT-3	Y	439.46	0.00
LT-3	ROTZ	2.627E+04	0.000E+00
LT-2	X	2947.64	0.00
LT-2	Y	364.17	0.00
LT-2	ROTZ	2.211E+04	0.000E+00
LT-1	X	1846.73	0.00
LT-1	Y	223.59	0.00
LT-1	ROTZ	1.391E+04	0.000E+00

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

RESPONSE SPECTRUM LATERAL STORY SHEARS FOR ALL DIAPHRAGMS

VALUES ARE AT THE GLOBAL ORIGIN IN THE GLOBAL COORDINATES

	/-LOAD	CONDITIONS-/	
LEVEL	DIRN	D1	D2
LT-10	X	4475.71	0.00
LT-10	Y	562.64	0.00
LT-9	X	8583.08	0.00
LT-9	Y	1072.72	0.00
LT-8	X	12329.57	0.00
LT-8	Y	1534.10	0.00
LT-7	X	15775.94	0.00
LT-7	Y	1958.23	0.00
LT-6	X	18931.66	0.00
LT-6	Y	2346.46	0.00
LT-5	X	22544.84	0.00
LT-5	Y	2790.64	0.00
LT-4	X	25525.16	0.00
LT-4	Y	3157.48	0.00
LT-3	X	27871.14	0.00
LT-3	Y	3446.34	0.00
LT-2	X	29494.98	0.00
LT-2	Y	3646.45	0.00
LT-1	X	30271.88	0.00
LT-1	Y	3741.57	0.00

RESPONSE SPECTRUM LATERAL OVERTURNING MOMENTS FOR ALL DIAPHRAGMS

VALUES ARE AT THE GLOBAL ORIGIN IN THE GLOBAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	0.134E+05	0.000E+00
LT-10	Y	0.169E+04	0.000E+00
LT-9	X	0.391E+05	0.000E+00
LT-9	Y	0.490E+04	0.000E+00
LT-8	X	0.759E+05	0.000E+00
LT-8	Y	0.947E+04	0.000E+00
LT-7	X	0.123E+06	0.000E+00
LT-7	Y	0.153E+05	0.000E+00
LT-6	X	0.179E+06	0.000E+00
LT-6	Y	0.222E+05	0.000E+00
LT-5	X	0.268E+06	0.000E+00
LT-5	Y	0.332E+05	0.000E+00
LT-4	X	0.368E+06	0.000E+00
LT-4	Y	0.456E+05	0.000E+00
LT-3	X	0.477E+06	0.000E+00
LT-3	Y	0.590E+05	0.000E+00
LT-2	X	0.592E+06	0.000E+00
LT-2	Y	0.733E+05	0.000E+00
LT-1	X	0.711E+06	0.000E+00
LT-1	Y	0.879E+05	0.000E+00

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN1.STR
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

FRAME ID .... /3-D FRAME

RESPONSE SPECTRUM LATERAL FRAME DISPLACEMENTS FOR DIAPHRAGM 1

VALUES ARE AT THE FRAME ORIGIN IN THE FRAME LOCAL COORDINATES

	/-LOAD	CONDITIONS-/	
LEVEL	DIRN	D1	D2
LT-10	X	0.0094	0.0000
LT-10	Y	0.0011	0.0000
LT-10	ROTZ	0.0001	0.0000
LT-9	X	0.0092	0.0000
LT-9	Y	0.0011	0.0000
LT-9	ROTZ	0.0001	0.0000
LT-8	X	0.0089	0.0000
LT-8	Y	0.0010	0.0000
LT-8	ROTZ	0.0001	0.0000
LT-7	X	0.0085	0.0000
LT-7	Y	0.0010	0.0000
LT-7	ROTZ	0.0001	0.0000
LT-6	X	0.0079	0.0000
LT-6	Y	0.0009	0.0000
LT-6	ROTZ	0.0001	0.0000
LT-5	X	0.0073	0.0000
LT-5	Y	0.0008	0.0000
LT-5	ROTZ	0.0001	0.0000
LT-4	X	0.0060	0.0000
LT-4	Y	0.0007	0.0000
LT-4	ROTZ	0.0000	0.0000
LT-3	X	0.0044	0.0000
LT-3	Y	0.0005	0.0000
LT-3	ROTZ	0.0000	0.0000
LT-2	X	0.0028	0.0000
LT-2	Y	0.0003	0.0000
LT-2	ROTZ	0.0000	0.0000
LT-1	X	0.0012	0.0000
LT-1	Y	0.0001	0.0000
LT-1	ROTZ	0.0000	0.0000

FRAME ID .... /3-D FRAME

RESPONSE SPECTRUM LATERAL FRAME DRIFT RATIOS FOR DIAPHRAGM 1

VALUES ARE AT THE FRAME ORIGIN IN THE FRAME LOCAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	0.00007	0.00000
LT-10	Y	0.00001	0.00000
LT-10	ROTZ	0.00000	0.00000
LT-9	X	0.00011	0.00000
LT-9	Y	0.00001	0.00000
LT-9	ROTZ	0.00000	0.00000
LT-8	X	0.00015	0.00000
LT-8	Y	0.00002	0.00000
LT-8	ROTZ	0.00000	0.00000
LT-7	X	0.00018	0.00000
LT-7	Y	0.00002	0.00000
LT-7	ROTZ	0.00000	0.00000
LT-6	X	0.00023	0.00000
LT-6	Y	0.00003	0.00000
LT-6	ROTZ	0.00000	0.00000
LT-5	X	0.00033	0.00000
LT-5	Y	0.00004	0.00000
LT-5	ROTZ	0.00000	0.00000
LT-4	X	0.00038	0.00000
LT-4	Y	0.00004	0.00000
LT-4	ROTZ	0.00000	0.00000
LT-3	X	0.00041	0.00000
LT-3	Y	0.00005	0.00000
LT-3	ROTZ	0.00000	0.00000
LT-2	X	0.00041	0.00000
LT-2	Y	0.00005	0.00000
LT-2	ROTZ	0.00000	0.00000
LT-1	X	0.00029	0.00000
LT-1	Y	0.00003	0.00000
LT-1	ROTZ	0.00000	0.00000

FRAME ID .... /3-D FRAME

RESPONSE SPECTRUM LATERAL FRAME STORY SHEARS FOR DIAPHRAGM 1

VALUES ARE AT THE FRAME ORIGIN IN THE FRAME LOCAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	4475.71	0.00
LT-10	Y	562.64	0.00
LT-10	ROTZ	3.33E+04	0.00E+00
LT-9	X	8583.08	0.00
LT-9	Y	1072.72	0.00
LT-9	ROTZ	6.38E+04	0.00E+00
LT-8	X	12329.57	0.00
LT-8	Y	1534.10	0.00
LT-8	ROTZ	9.17E+04	0.00E+00
LT-7	X	15775.94	0.00
LT-7	Y	1958.23	0.00
LT-7	ROTZ	1.17E+05	0.00E+00
LT-6	X	18931.66	0.00
LT-6	Y	2346.46	0.00
LT-6	ROTZ	1.41E+05	0.00E+00
LT-5	X	22544.84	0.00
LT-5	Y	2790.64	0.00
LT-5	ROTZ	1.68E+05	0.00E+00
LT-4	X	25525.16	0.00
LT-4	Y	3157.48	0.00
LT-4	ROTZ	1.90E+05	0.00E+00
LT-3	X	27871.14	0.00
LT-3	Y	3446.34	0.00
LT-3	ROTZ	2.07E+05	0.00E+00
LT-2	X	29494.98	0.00
LT-2	Y	3646.45	0.00
LT-2	ROTZ	2.19E+05	0.00E+00
LT-1	X	30271.88	0.00
LT-1	Y	3741.57	0.00
LT-1	ROTZ	2.25E+05	0.00E+00

E T A B S

Extended Three Dimensional Analysis of Building Systems

Version 6.13

12 Jun 2001 11:36:10

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN1.SUM
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

LOAD CASE DEFINITION DATA

LOAD	LTYP	I	II	III	A	B	C	D1	D2
1	0	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
2	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SPECTRAL DIRECTION 1
DYNAMIC 2 . . . SPECTRAL DIRECTION 2

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . TIME HISTORY MODAL ANALYSIS
DYNAMIC 2 . . . NOT USED

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

DISPLACEMENT MAXIMA & MINIMA IN FRAME /3-D FRAME
WITH (COLUMN#,CASE#)

	LOCAL X-TRAN	LOCAL Y-TRAN	LOCAL Z-TRAN	LOCAL XX-ROTN	LOCAL YY-ROTN	LOCAL ZZ-ROTN
MIN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	(1, 2)	(1, 2)	(1, 2)	(1, 2)	(1, 2)	(1, 2)
MAX	0.01001	0.00146	0.00022	0.00005	0.00036	0.00006
	(16, 1)	(16, 1)	(16, 1)	(4, 1)	(16, 1)	(16, 1)

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

COLUMN FORCE MAXIMA & MINIMA IN FRAME /3-D FRAME
WITH (ELEM#,CASE#)

PROP ID		MAJOR MOMENT	MAJOR SHEAR	MINOR MOMENT	MINOR SHEAR	AXIAL FORCE	TORSIONAL MOMENT
1							
	MIN	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		(1, 2)	(1, 2)	(1, 2)	(1, 2)	(1, 2)	(1, 2)
	MAX	0.5323E+04	0.2475E+04	0.7919E+03	0.3679E+03	0.1117E+05	0.3931E+02
		(15, 1)	(15, 1)	(12, 1)	(12, 1)	(16, 1)	(16, 1)

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN1.SUM
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

BEAM FORCE MAXIMA & MINIMA IN FRAME /3-D FRAME
WITH (ELEM#,CASE#)

PROP ID		MAJOR MOMENT	MAJOR SHEAR	MINOR MOMENT	MINOR SHEAR	AXIAL FORCE	TORSIONAL MOMENT
1							
	MIN	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		(1, 2)	(1, 2)	(1, 1)	(1, 1)	(1, 1)	(1, 2)
	MAX	0.4588E+04	0.1966E+04	0.0000E+00	0.0000E+00	0.1001E-09	0.1467E+02
		(12, 1)	(12, 1)	(24, 2)	(24, 2)	(9, 1)	(20, 1)

FRAME REACTION FORCES AT BASELINE (AT EACH COLUMN LINE)

VALUES ARE IN THE LOCAL COORDINATE SYSTEM OF THE FRAME

FRAME ID .... /3-D FRAME

COL ID	OUTPUT ID	FORCE ALONG-X	FORCE ALONG-Y	FORCE ALONG-Z	MOMENT ABOUT-XX	MOMENT ABOUT-YY	MOMENT ABOUT-ZZ
1	CASE 1	1571.55	184.42	11174.17	504.82	4306.49	28.27
1	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
2	CASE 1	2087.99	190.95	1446.87	523.15	4980.00	28.27
2	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
3	CASE 1	2087.99	214.53	1288.35	587.13	4980.00	28.27
3	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
4	CASE 1	1571.55	251.65	9922.78	685.71	4306.49	28.27
4	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
5	CASE 1	1607.49	244.84	10407.22	583.63	4402.45	28.27
5	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
6	CASE 1	2134.90	253.66	348.10	604.94	5090.27	28.27
6	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
7	CASE 1	2134.90	284.78	309.24	678.75	5090.27	28.27
7	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
8	CASE 1	1607.49	333.05	10369.38	791.88	4402.45	28.27
8	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
9	CASE 1	1643.72	244.84	10569.53	583.63	4500.75	28.27
9	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
10	CASE 1	2182.71	253.66	309.24	604.94	5203.67	28.27
10	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
11	CASE 1	2182.71	284.78	348.10	678.75	5203.67	28.27
11	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
12	CASE 1	1643.72	333.05	10605.73	791.88	4500.75	28.27
12	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
13	CASE 1	1682.54	184.42	9922.78	504.82	4604.25	28.27
13	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
14	CASE 1	2233.33	190.95	1095.43	523.15	5322.56	28.27
14	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00

15 CASE 1	2233.33	214.53	1520.48	587.13	5322.56	28.27
15 CASE 2	0.00	0.00	0.00	0.00	0.00	0.00

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

FRAME REACTION FORCES AT BASELINE (AT EACH COLUMN LINE)

VALUES ARE IN THE LOCAL COORDINATE SYSTEM OF THE FRAME

FRAME ID .... /3-D FRAME

COL ID	OUTPUT ID	FORCE ALONG-X	FORCE ALONG-Y	FORCE ALONG-Z	MOMENT ABOUT-XX	MOMENT ABOUT-YY	MOMENT ABOUT-ZZ
16	CASE 1	1682.54	251.65	11174.17	685.71	4604.25	28.27
16	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

SUMMATION OF FRAME REACTION FORCES AT BASELINE

VALUES ARE IN THE LOCAL COORDINATE SYSTEM OF THE FRAME

FRAME ID .... /3-D FRAME

OUTPUT ID	FORCE ALONG-X	FORCE ALONG-Y	FORCE ALONG-Z
CASE 1	30271.88	3741.57	0.00
CASE 2	0.00	0.00	0.00

$.....Heading
ETABS 6.1
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM Satuan : KN-meter-detik
10 1 1 1 0 2 10 1 1 1 0 0 0 0 0 2 0 0 1 0 3
9.81 0.0001 0 1
$Story Data
$.....Story Data
lt-10 3 1
1 0 8.8E3 0 11 8
lt-9 3 1
1 0 8.8E3 0 11 8
lt-8 3 1
1 0 8.8E3 0 11 8
lt-7 3 1
1 0 8.8E3 0 11 8
lt-6 3 1
1 0 8.8E3 0 11 8
lt-5 4 1
1 0 11E3 0 11 8
lt-4 4 1
1 0 11E3 0 11 8
lt-3 4 1
1 0 11E3 0 11 8
lt-2 4 1
1 0 11E3 0 11 8
lt-1 4 1
1 0 11E3 0 11 8
$Material Property Data
$.....Material Data
1 c 3E9
$Column Property Data
$.....Column Properties
1 rect 1 0.5 0.5 0 0 0 1 1 1
$Beam Property Data
$.....Beam Properties
1 rect 1 0.25 0.25 0.35 0 0 1 1 1
$Frame Heading and Control Data
Rangka gedung 3-D sb global dan lokal berimpit
1 16 24 0 0 0 0 0 0 0 0 0 0
$Layout Column Lines
1 0 0 0
2 5 0 0
3 10 0 0
4 15 0 0
5 0 5 0
6 5 5 0
7 10 5 0
8 15 5 0
9 0 10 0
10 5 10 0
11 10 10 0
12 15 10 0
13 0 15 0
14 5 15 0

15 10 15 0
16 15 15 0
$Layout Beam Bays
1 1 2 0
2 2 3 0
3 3 4 0
4 5 6 0
5 6 7 0
6 7 8 0
7 9 10 0
8 10 11 0
9 11 12 0
10 13 14 0
11 14 15 0
12 15 16 0
13 1 5 0
14 2 6 0
15 3 7 0
16 4 8 0
17 5 9 0
18 6 10 0
19 7 11 0
20 8 12 0
21 9 13 0
22 10 14 0
23 11 15 0
24 12 16 0
$Column Assignment Data
$.....Column Assignment
1 16 0 lt-10 lt-1 1 0 0

$Beam Assignment Data
$.....Beam Assignments
1 24 0 lt-10 lt-1 1 0 0 0 0

$Frame Location Data
1 0 0 0 /3-D Frame
$Lateral Dynamic Spectrum Data
Respons Spektrum Gempa
0 CQC 0.05
hasil 1 1 1

$Load Case Data
1 0 0 0 0 0 0 0 1

$**********End of Data**********

$ Gempa Terbaru di Indonesia
$ Damping
0.05

$ Periode	PSA
0	7.46
0.1	7.46
0.2	6.18
0.3	5.71
0.4	5.04
0.5	4.91
3.0	4.52

E T A B S

Extended Three Dimensional Analysis of Building Systems

Version 6.13

12 Jun 2001 11:35:30

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN.STR
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

COORDINATES OF CENTERS OF CUMULATIVE MASS & CENTERS OF RIGIDITY

STORY LEVEL	DIAPHRAGM NUMBER	/----------CENTER OF MASS----------//--CENTER OF RIGIDITY--/ MASS	ORDINATE-X	ORDINATE-Y	ORDINATE-X	ORDINATE-Y
LT-10						
	1	8800.000	11.000	8.000	7.500	7.500
LT-9						
	1	17600.000	11.000	8.000	7.500	7.500
LT-8						
	1	26400.000	11.000	8.000	7.500	7.500
LT-7						
	1	35200.000	11.000	8.000	7.500	7.500
LT-6						
	1	44000.000	11.000	8.000	7.500	7.500
LT-5						
	1	55000.000	11.000	8.000	7.500	7.500
LT-4						
	1	66000.000	11.000	8.000	7.500	7.500
LT-3						
	1	77000.000	11.000	8.000	7.500	7.500
LT-2						
	1	88000.000	11.000	8.000	7.500	7.500
LT-1						
	1	99000.000	11.000	8.000	7.500	7.500

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN.STR
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

TOTAL MODAL DAMPING & SPECTRAL VALUES

MODE NO	TIME PERIOD	DAMPING RATIO	SPEC-ACC D1	SPEC-ACC D2
1	1.00055	0.05000	4.832	0.000
2	0.92159	0.05000	4.844	0.000
3	0.29691	0.05000	5.725	0.000
4	0.27334	0.05000	5.835	0.000
5	0.17558	0.05000	6.493	0.000
6	0.16116	0.05000	6.677	0.000
7	0.11612	0.05000	7.254	0.000
8	0.10643	0.05000	7.378	0.000
9	0.08693	0.05000	7.460	0.000
10	0.07961	0.05000	7.460	0.000

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN.STR
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

DYNAMIC RESPONSE SPECTRUM BASE SHEARS

MODE	/----------D1----------//		----------D2----------/	
NO	DIRECTION-X	DIRECTION-Y	DIRECTION-X	DIRECTION-Y
1	8025.174	-56176.221	0.000	0.000
2	393658.116	56236.874	0.000	0.000
3	1025.065	-7175.502	0.000	0.000
4	51709.264	7387.058	0.000	0.000
5	408.898	-2862.280	0.000	0.000
6	20717.707	2959.667	0.000	0.000
7	272.280	-1905.968	0.000	0.000
8	13619.460	1945.651	0.000	0.000
9	130.121	-910.820	0.000	0.000
10	6401.648	914.501	0.000	0.000
CQC	403246.513	51042.807	0.000	0.000

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

RESPONSE SPECTRUM LATERAL DISPLACEMENTS FOR DIAPHRAGM 1

VALUES ARE AT THE CENTER OF MASS OF THE
CORRESPONDING DIAPHRAGM IN GLOBAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	0.1297	0.0000
LT-10	Y	0.0181	0.0000
LT-10	ROTZ	9.129E-04	0.000E+00
LT-9	X	0.1268	0.0000
LT-9	Y	0.0177	0.0000
LT-9	ROTZ	8.988E-04	0.000E+00
LT-8	X	0.1225	0.0000
LT-8	Y	0.0171	0.0000
LT-8	ROTZ	8.738E-04	0.000E+00
LT-7	X	0.1167	0.0000
LT-7	Y	0.0163	0.0000
LT-7	ROTZ	8.375E-04	0.000E+00
LT-6	X	0.1093	0.0000
LT-6	Y	0.0153	0.0000
LT-6	ROTZ	7.896E-04	0.000E+00
LT-5	X	0.1001	0.0000
LT-5	Y	0.0140	0.0000
LT-5	ROTZ	7.272E-04	0.000E+00
LT-4	X	0.0822	0.0000
LT-4	Y	0.0115	0.0000
LT-4	ROTZ	6.008E-04	0.000E+00
LT-3	X	0.0612	0.0000
LT-3	Y	0.0086	0.0000
LT-3	ROTZ	4.512E-04	0.000E+00
LT-2	X	0.0386	0.0000
LT-2	Y	0.0054	0.0000
LT-2	ROTZ	2.875E-04	0.000E+00
LT-1	X	0.0159	0.0000
LT-1	Y	0.0022	0.0000
LT-1	ROTZ	1.202E-04	0.000E+00

RESPONSE SPECTRUM LATERAL STORY INERTIA FORCES FOR DIAPHRAGM 1

LOADS ARE AT THE CENTERS OF MASS OF THE RESPECTIVE STORY LEVELS

	/-LOAD	CONDITIONS-/	
LEVEL	DIRN	D1	D2
LT-10	X	59386.54	0.00
LT-10	Y	7601.39	0.00
LT-10	ROTZ	2.756E-09	0.000E+00
LT-9	X	54918.52	0.00
LT-9	Y	6975.92	0.00
LT-9	ROTZ	3.154E-09	0.000E+00
LT-8	X	52192.41	0.00
LT-8	Y	6652.13	0.00
LT-8	ROTZ	3.177E-09	0.000E+00
LT-7	X	49849.41	0.00
LT-7	Y	6373.05	0.00
LT-7	ROTZ	3.674E-09	0.000E+00
LT-6	X	47277.94	0.00
LT-6	Y	6016.54	0.00
LT-6	ROTZ	3.292E-09	0.000E+00
LT-5	X	56242.43	0.00
LT-5	Y	7173.62	0.00
LT-5	ROTZ	2.240E-09	0.000E+00
LT-4	X	51593.17	0.00
LT-4	Y	6541.45	0.00
LT-4	ROTZ	3.974E-09	0.000E+00
LT-3	X	45572.20	0.00
LT-3	Y	5737.21	0.00
LT-3	ROTZ	3.496E-09	0.000E+00
LT-2	X	38766.07	0.00
LT-2	Y	4780.17	0.00
LT-2	ROTZ	5.622E-10	0.000E+00
LT-1	X	25851.23	0.00
LT-1	Y	3106.33	0.00
LT-1	ROTZ	2.836E-10	0.000E+00

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN.STR
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

RESPONSE SPECTRUM LATERAL STORY SHEARS FOR DIAPHRAGM 1

	/-LOAD	CONDITIONS-/	
LEVEL	DIRN	D1	D2
LT-10	X	59386.54	0.00
LT-10	Y	7601.39	0.00
LT-9	X	113585.24	0.00
LT-9	Y	14465.55	0.00
LT-8	X	163180.00	0.00
LT-8	Y	20716.87	0.00
LT-7	X	209247.51	0.00
LT-7	Y	26542.41	0.00
LT-6	X	251713.23	0.00
LT-6	Y	31918.87	0.00
LT-5	X	300443.52	0.00
LT-5	Y	38082.97	0.00
LT-4	X	340557.59	0.00
LT-4	Y	43163.64	0.00
LT-3	X	371799.53	0.00
LT-3	Y	47108.80	0.00
LT-2	X	393031.96	0.00
LT-2	Y	49779.12	0.00
LT-1	X	403246.20	0.00
LT-1	Y	51042.83	0.00

RESPONSE SPECTRUM LATERAL STORY INERTIA FORCES FOR ALL DIAPHRAGMS

VALUES ARE AT THE GLOBAL ORIGIN IN THE GLOBAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	59386.54	0.00
LT-10	Y	7601.39	0.00
LT-10	ROTZ	4.439E+05	0.000E+00
LT-9	X	54918.52	0.00
LT-9	Y	6975.92	0.00
LT-9	ROTZ	4.112E+05	0.000E+00
LT-8	X	52192.41	0.00
LT-8	Y	6652.13	0.00
LT-8	ROTZ	3.908E+05	0.000E+00
LT-7	X	49849.41	0.00
LT-7	Y	6373.05	0.00
LT-7	ROTZ	3.731E+05	0.000E+00
LT-6	X	47277.94	0.00
LT-6	Y	6016.54	0.00
LT-6	ROTZ	3.541E+05	0.000E+00
LT-5	X	56242.43	0.00
LT-5	Y	7173.62	0.00
LT-5	ROTZ	4.210E+05	0.000E+00
LT-4	X	51593.17	0.00
LT-4	Y	6541.45	0.00
LT-4	ROTZ	3.864E+05	0.000E+00
LT-3	X	45572.20	0.00
LT-3	Y	5737.21	0.00
LT-3	ROTZ	3.413E+05	0.000E+00
LT-2	X	38766.07	0.00
LT-2	Y	4780.17	0.00
LT-2	ROTZ	2.908E+05	0.000E+00
LT-1	X	25851.23	0.00
LT-1	Y	3106.33	0.00
LT-1	ROTZ	1.946E+05	0.000E+00

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

RESPONSE SPECTRUM LATERAL STORY SHEARS FOR ALL DIAPHRAGMS

VALUES ARE AT THE GLOBAL ORIGIN IN THE GLOBAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	59386.54	0.00
LT-10	Y	7601.39	0.00
LT-9	X	113585.24	0.00
LT-9	Y	14465.55	0.00
LT-8	X	163180.00	0.00
LT-8	Y	20716.87	0.00
LT-7	X	209247.51	0.00
LT-7	Y	26542.41	0.00
LT-6	X	251713.23	0.00
LT-6	Y	31918.87	0.00
LT-5	X	300443.52	0.00
LT-5	Y	38082.97	0.00
LT-4	X	340557.59	0.00
LT-4	Y	43163.64	0.00
LT-3	X	371799.53	0.00
LT-3	Y	47108.80	0.00
LT-2	X	393031.96	0.00
LT-2	Y	49779.12	0.00
LT-1	X	403246.20	0.00
LT-1	Y	51042.83	0.00

RESPONSE SPECTRUM LATERAL OVERTURNING MOMENTS FOR ALL DIAPHRAGMS

VALUES ARE AT THE GLOBAL ORIGIN IN THE GLOBAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	0.178E+06	0.000E+00
LT-10	Y	0.228E+05	0.000E+00
LT-9	X	0.518E+06	0.000E+00
LT-9	Y	0.661E+05	0.000E+00
LT-8	X	0.100E+07	0.000E+00
LT-8	Y	0.128E+06	0.000E+00
LT-7	X	0.163E+07	0.000E+00
LT-7	Y	0.206E+06	0.000E+00
LT-6	X	0.237E+07	0.000E+00
LT-6	Y	0.301E+06	0.000E+00
LT-5	X	0.356E+07	0.000E+00
LT-5	Y	0.451E+06	0.000E+00
LT-4	X	0.490E+07	0.000E+00
LT-4	Y	0.621E+06	0.000E+00
LT-3	X	0.636E+07	0.000E+00
LT-3	Y	0.806E+06	0.000E+00
LT-2	X	0.790E+07	0.000E+00
LT-2	Y	0.100E+07	0.000E+00
LT-1	X	0.948E+07	0.000E+00
LT-1	Y	0.120E+07	0.000E+00

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM. SATUAN : KN-METER-DETIK

FRAME ID .... /3-D FRAME

RESPONSE SPECTRUM LATERAL FRAME DISPLACEMENTS FOR DIAPHRAGM 1

VALUES ARE AT THE FRAME ORIGIN IN THE FRAME LOCAL COORDINATES

	/-LOAD	CONDITIONS-/	
LEVEL	DIRN	D1	D2
LT-10	X	0.1254	0.0000
LT-10	Y	0.0147	0.0000
LT-10	ROTZ	0.0009	0.0000
LT-9	X	0.1225	0.0000
LT-9	Y	0.0143	0.0000
LT-9	ROTZ	0.0009	0.0000
LT-8	X	0.1183	0.0000
LT-8	Y	0.0139	0.0000
LT-8	ROTZ	0.0009	0.0000
LT-7	X	0.1127	0.0000
LT-7	Y	0.0132	0.0000
LT-7	ROTZ	0.0008	0.0000
LT-6	X	0.1056	0.0000
LT-6	Y	0.0124	0.0000
LT-6	ROTZ	0.0008	0.0000
LT-5	X	0.0967	0.0000
LT-5	Y	0.0113	0.0000
LT-5	ROTZ	0.0007	0.0000
LT-4	X	0.0793	0.0000
LT-4	Y	0.0093	0.0000
LT-4	ROTZ	0.0006	0.0000
LT-3	X	0.0591	0.0000
LT-3	Y	0.0069	0.0000
LT-3	ROTZ	0.0005	0.0000
LT-2	X	0.0372	0.0000
LT-2	Y	0.0044	0.0000
LT-2	ROTZ	0.0003	0.0000
LT-1	X	0.0153	0.0000
LT-1	Y	0.0018	0.0000
LT-1	ROTZ	0.0001	0.0000

FRAME ID .... /3-D FRAME

RESPONSE SPECTRUM LATERAL FRAME DRIFT RATIOS FOR DIAPHRAGM 1

VALUES ARE AT THE FRAME ORIGIN IN THE FRAME LOCAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	0.00098	0.00000
LT-10	Y	0.00012	0.00000
LT-10	ROTZ	0.00001	0.00000
LT-9	X	0.00146	0.00000
LT-9	Y	0.00017	0.00000
LT-9	ROTZ	0.00001	0.00000
LT-8	X	0.00195	0.00000
LT-8	Y	0.00023	0.00000
LT-8	ROTZ	0.00001	0.00000
LT-7	X	0.00243	0.00000
LT-7	Y	0.00028	0.00000
LT-7	ROTZ	0.00002	0.00000
LT-6	X	0.00303	0.00000
LT-6	Y	0.00035	0.00000
LT-6	ROTZ	0.00002	0.00000
LT-5	X	0.00439	0.00000
LT-5	Y	0.00051	0.00000
LT-5	ROTZ	0.00003	0.00000
LT-4	X	0.00509	0.00000
LT-4	Y	0.00060	0.00000
LT-4	ROTZ	0.00004	0.00000
LT-3	X	0.00547	0.00000
LT-3	Y	0.00064	0.00000
LT-3	ROTZ	0.00004	0.00000
LT-2	X	0.00548	0.00000
LT-2	Y	0.00064	0.00000
LT-2	ROTZ	0.00004	0.00000
LT-1	X	0.00384	0.00000
LT-1	Y	0.00045	0.00000
LT-1	ROTZ	0.00003	0.00000

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN.STR
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

FRAME ID .... /3-D FRAME

RESPONSE SPECTRUM LATERAL FRAME STORY SHEARS FOR DIAPHRAGM 1

VALUES ARE AT THE FRAME ORIGIN IN THE FRAME LOCAL COORDINATES

	/-LOAD CONDITIONS-/		
LEVEL	DIRN	D1	D2
LT-10	X	59386.54	0.00
LT-10	Y	7601.39	0.00
LT-10	ROTZ	4.44E+05	0.00E+00
LT-9	X	113585.24	0.00
LT-9	Y	14465.55	0.00
LT-9	ROTZ	8.50E+05	0.00E+00
LT-8	X	163180.00	0.00
LT-8	Y	20716.87	0.00
LT-8	ROTZ	1.22E+06	0.00E+00
LT-7	X	209247.51	0.00
LT-7	Y	26542.41	0.00
LT-7	ROTZ	1.57E+06	0.00E+00
LT-6	X	251713.23	0.00
LT-6	Y	31918.87	0.00
LT-6	ROTZ	1.89E+06	0.00E+00
LT-5	X	300443.52	0.00
LT-5	Y	38082.97	0.00
LT-5	ROTZ	2.25E+06	0.00E+00
LT-4	X	340557.59	0.00
LT-4	Y	43163.64	0.00
LT-4	ROTZ	2.55E+06	0.00E+00
LT-3	X	371799.53	0.00
LT-3	Y	47108.80	0.00
LT-3	ROTZ	2.79E+06	0.00E+00
LT-2	X	393031.96	0.00
LT-2	Y	49779.12	0.00
LT-2	ROTZ	2.95E+06	0.00E+00
LT-1	X	403246.20	0.00
LT-1	Y	51042.83	0.00
LT-1	ROTZ	3.02E+06	0.00E+00

E T A B S

Extended Three Dimensional Analysis of Building Systems

Version 6.13

12 Jun 2001 11:35:33

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

LOAD CASE DEFINITION DATA

LOAD	LTYP	I	II	III	A	B	C	D1	D2
1	0	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
2	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SPECTRAL DIRECTION 1
DYNAMIC 2 . . . SPECTRAL DIRECTION 2

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . TIME HISTORY MODAL ANALYSIS
DYNAMIC 2 . . . NOT USED

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

DISPLACEMENT MAXIMA & MINIMA IN FRAME /3-D FRAME
WITH (COLUMN#,CASE#)

	LOCAL X-TRAN	LOCAL Y-TRAN	LOCAL Z-TRAN	LOCAL XX-ROTN	LOCAL YY-ROTN	LOCAL ZZ-ROTN
MIN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	(1, 2)	(1, 2)	(1, 2)	(1, 2)	(1, 2)	(1, 2)
MAX	0.13370	0.02041	0.00290	0.00073	0.00480	0.00091
	(16, 1)	(16, 1)	(16, 1)	(4, 1)	(16, 1)	(16, 1)

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

COLUMN FORCE MAXIMA & MINIMA IN FRAME /3-D FRAME
WITH (ELEM#,CASE#)

PROP ID		MAJOR MOMENT	MAJOR SHEAR	MINOR MOMENT	MINOR SHEAR	AXIAL FORCE	TORSIONAL MOMENT
1							
	MIN	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		(1, 2)	(1, 2)	(1, 2)	(1, 2)	(1, 2)	(1, 2)
	MAX	0.7104E+05	0.3304E+05	0.1103E+05	0.5127E+04	0.1485E+06	0.5523E+03
		(15, 1)	(15, 1)	(12, 1)	(12, 1)	(16, 1)	(16, 1)

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN.SUM
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

BEAM FORCE MAXIMA & MINIMA IN FRAME /3-D FRAME
WITH (ELEM#,CASE#)

PROP ID		MAJOR MOMENT	MAJOR SHEAR	MINOR MOMENT	MINOR SHEAR	AXIAL FORCE	TORSIONAL MOMENT
1							
	MIN	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		(1, 2)	(1, 2)	(1, 1)	(1, 1)	(1, 2)	(1, 2)
	MAX	0.6129E+05	0.2626E+05	0.0000E+00	0.0000E+00	0.1338E-08	0.2062E+03
		(12, 1)	(12, 1)	(24, 2)	(24, 2)	(9, 1)	(20, 1)

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

FRAME REACTION FORCES AT BASELINE (AT EACH COLUMN LINE)

VALUES ARE IN THE LOCAL COORDINATE SYSTEM OF THE FRAME

FRAME ID .... /3-D FRAME

COL ID	OUTPUT ID	FORCE ALONG-X	FORCE ALONG-Y	FORCE ALONG-Z	MOMENT ABOUT-XX	MOMENT ABOUT-YY	MOMENT ABOUT-ZZ
1	CASE 1	20896	2452	148475	6714	57268	397
1	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
2	CASE 1	27764.86	2581.04	19394.82	7073.00	66226.20	396.81
2	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
3	CASE 1	27764.86	2950.69	17962.17	8076.71	66226.20	396.81
3	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
4	CASE 1	20896	3504	133083	9549	57268	397
4	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
5	CASE 1	21400	3256	138713	7763	58613	397
5	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
6	CASE 1	28422.18	3429.18	4569.97	8179.09	67771.58	396.81
6	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
7	CASE 1	28422.18	3917.24	4090.54	9337.25	67771.58	396.81
7	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
8	CASE 1	21400	4638	138245	11027	58613	397
8	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
9	CASE 1	21908	3256	141066	7763	59994	397
9	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
10	CASE 1	29093.59	3429.18	4090.54	8179.09	69364.31	396.81
10	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
11	CASE 1	29093.59	3917.24	4569.97	9337.25	69364.31	396.81
11	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
12	CASE 1	21908	4638	141509	11027	59994	397
12	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
13	CASE 1	22454	2452	133083	6714	61450	397
13	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00
14	CASE 1	29805.59	2581.04	15060.07	7073.00	71036.99	396.81
14	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00

15	CASE 1	29805.59	2950.69	20656.43	8076.71	71036.99	396.81
15	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00

TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

FRAME REACTION FORCES AT BASELINE (AT EACH COLUMN LINE)

VALUES ARE IN THE LOCAL COORDINATE SYSTEM OF THE FRAME

FRAME ID .... /3-D FRAME

COL ID	OUTPUT ID	FORCE ALONG-X	FORCE ALONG-Y	FORCE ALONG-Z	MOMENT ABOUT-XX	MOMENT ABOUT-YY	MOMENT ABOUT-ZZ
16	CASE 1	22454	3504	148475	9549	61450	397
16	CASE 2	0.00	0.00	0.00	0.00	0.00	0.00

PROGRAM:ETABS/FILE:\ETABSF\EXAMPLES\TGADIAN.SUM
TGA : RANGKA GEDUNG 10 LANTAI 3-D
ANALISA RESPONS SPEKTRUM SATUAN : KN-METER-DETIK

SUMMATION OF FRAME REACTION FORCES AT BASELINE

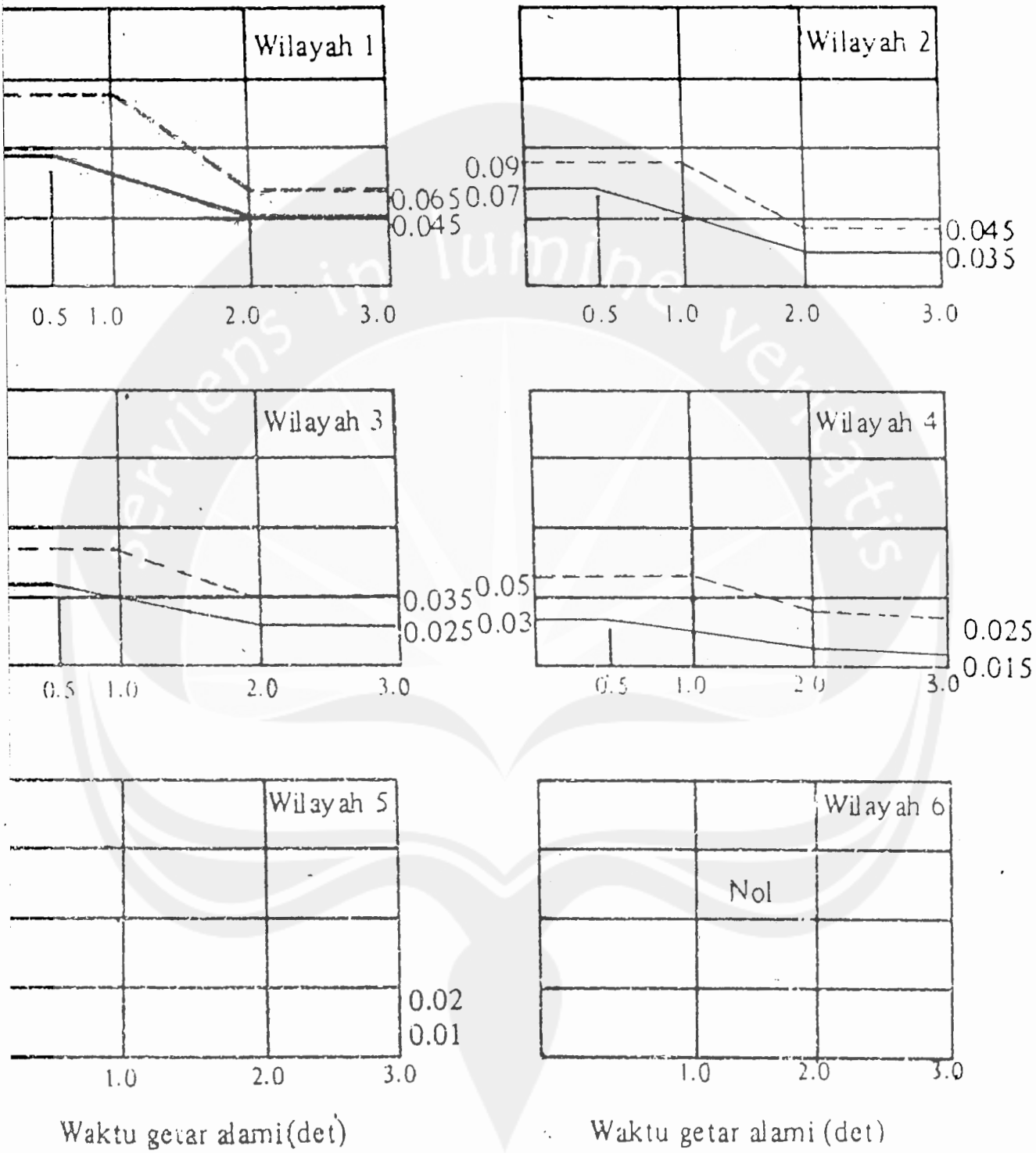
VALUES ARE IN THE LOCAL COORDINATE SYSTEM OF THE FRAME

FRAME ID .... /3-D FRAME

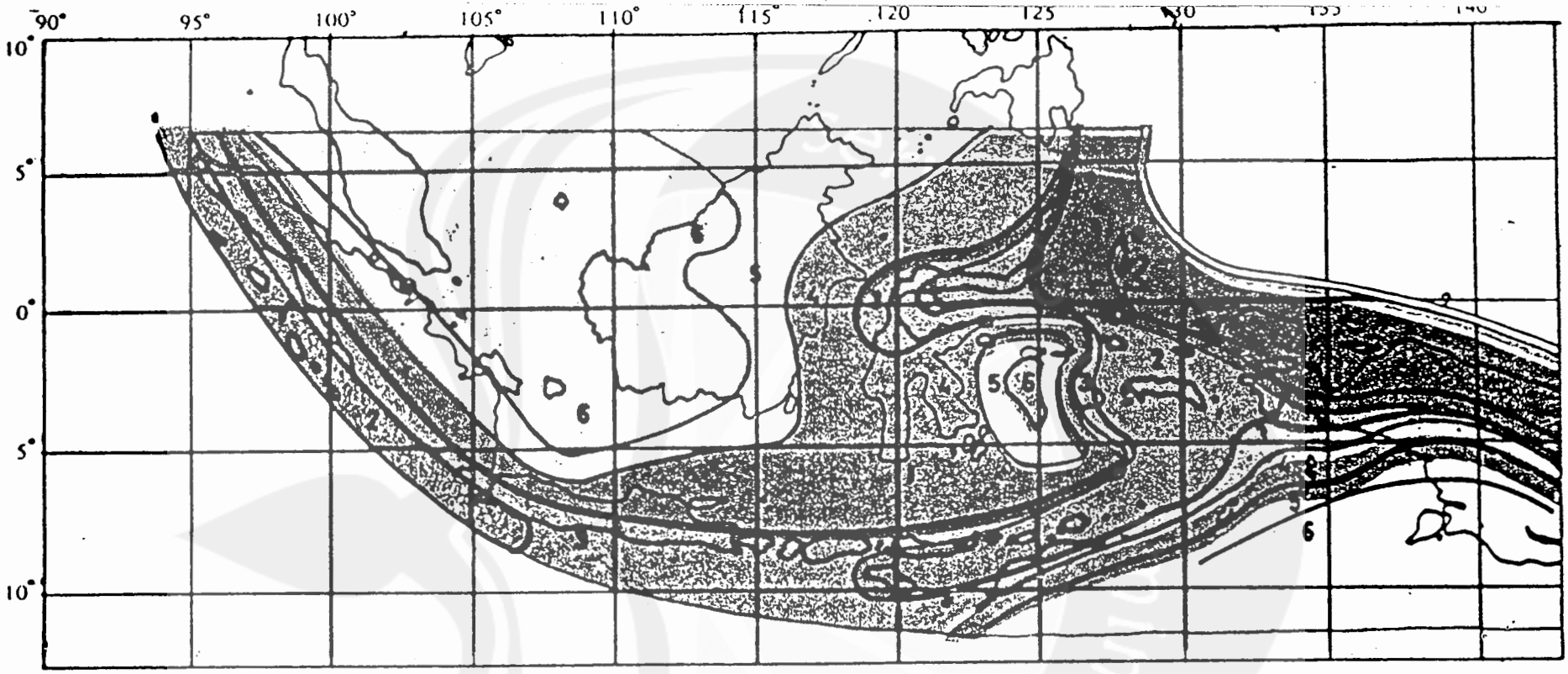
OUTPUT ID	FORCE ALONG-X	FORCE ALONG-Y	FORCE ALONG-Z
CASE 1	403246	51043	0
CASE 2	0.00	0.00	0.00

———— : Struktur di atas tanah keras

– – – – – – – – : Struktur di atas tanah lunak



Gambar 2.3.
Koefisien gempa dasar untuk berbagai wilayah gempa



Wilayah Gempa – 1

Wilayah Gempa – 2

Wilayah Gempa – 3

Wilayah Gempa – 4

Wilayah Gempa – 5

Wilayah Gempa – 6

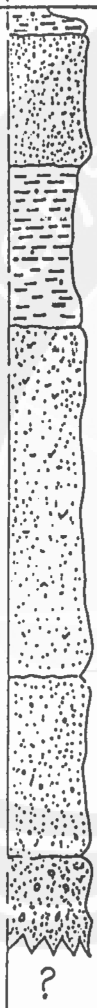
Gambar 2.2.
Pembagian wilayah gempa untuk Indonesia

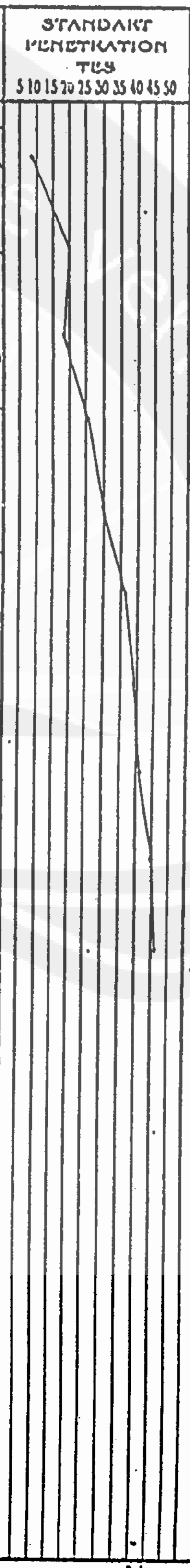
GEOLOGICAL RECORD OF DRILL HOLE

HOLE NO : DH - 1 -

PROYEK	PEMBUATAN PABRIK	LOKASI	DESA DUYUNGAN - SRAGEN . . .		
ELEVASI	49.09	KEDALAMAN LUBANG BOR	16 M	KEMIRINGAN LUBANG	90°
DIAMETER LUBANG BOR	64 mm.	MESIN	ATLAS COPO TYPE D500	TANGGAL	22-23 AGUSTUS 96
CORE RECOVERY	-	JURU BOR	MARIMAN	LOGGING	SUPRIYONO

KEDALAMAN (M)	ELEVASI (M)	TIPE BATUAN	KOLOM	CORE RECOVERY %	CORE RECOVERY CM	BIT & DESCRIPTION	DISKRIPSI	STANDART PENETRATION TEST 5 10 15 20 25 30 35 40 45 50	M.T.A	DEPTH (M)
0 - 0.5							lempung lanauan, coklat kehitaman, masif, terdapat fragmen ø 2mm - 4mm.			
0.5 - 3							pasir halus, abu-abu kekuningan, (kering), coklat keabu-abuan kondisi basah, porositas sedang, masif dan kurang padat.			
3 - 5.8							lempung hitam, warna hitam pekat, plastisitas sedang - tinggi, kondisi kering sangat keras, terdapat fragmen 2mm - 6mm, warna putih - coklat kehitaman.		▽ (3)	
5.8 - 11.6							lempung - pasir tufaan, warna basah coklat keabu-abuan, warna kering abu-abu kekuningan, porositas sedang - tinggi, dijumpai struktur laminasi sejajar & bergelombang kandungan tufa (volkanik) cukup tinggi, agak padat hingga padat.			
11.6 - 14.6							pasir tufaan, warna coklat kekuningan, pasir halus - sedang porositas sedang - tinggi, dijumpai fragmen ø 2mm - 5mm warna putih - coklat kehitaman, agak padat - padat			
14.6 - 16							pasir tufaan, abu-abu coklat kekuningan, pasir halus - sedang porositas sedang, fragmen ø 4mm - 14mm, masif dan cukup padat			





GEOLOGICAL RECORD OF DRILL HOLE

HOLE NO : BH-2-

PROYEK	PEMBUATAN PABRIK	LOKASI	DESA DUYUNGAN - SRAGEN		
ELEVASI	50.26	KEDALAMAN LUBANG BOR	16 M	KEMIRINGAN LUBANG	90.°
DIAMETER LUBANG BOR	64 mm	MESIN	ATLAS COPO TYPE D 500	TANGGAL	28-29 AGUSTUS 96
CORE RECOVERY		JURU BOR	MARIMAN	LOGGING	SUPRIYONO

TANGGAL	KEDALAMAN (M)	ELEVASI (M)	TIPE BATUAN	KOLOM	CORE RECOVERY %	CORE RECOVERY CM	BIT & DIAMETER	DISKRIPSI	STANDART PENETRATION TES 5 10 15 20 25 30 35 40 45 50	M.T.A	DEPTH (M)
28 AGUSTUS 1996	1							lempung - pasir - lanauan, coklat kehitaman masif, terdapat fragmen 3mm - 8mm.			1
	2							pasir halus, abu-abu kekuningan (kering), coklat keabu-abuan (basah), porositas sedang, masif kurang padat.			2
	3										3
	4							Lempung hitam, warna hitam pekat, masif, plastisitas sedang-tinggi, kondisi kering sangat keras, fragmen 2mm-5mm, warna putih - coklat kehitaman			4
	5										5
	6							lempung - pasir - tuffaan, warna basah : coklat keabu-abuan, warna kering abu-abu kekuningan, porositas sedang - tinggi, sering dijumpai struktur laminasi tejajar, bergelombang & gradasi, kandungan tufa (vulkanik) cukup tinggi, agak padat - padat.			6
	7										7
	8										8
	9										9
	10										10
	11							pasir tuffaan, warna coklat kekuningan, porositas sedang-tinggi, struktur laminasi sering dijumpai terdapat fragmen Ø3mm - 8mm warna putih hingga kecoklatan, ukuran pasir halus - sedang, agak padat hingga padat.			11
	12										12
	13										13
29 AGUSTUS 1996	14										14
	15							pasir tuffaan, warna abu-abu coklat kekuningan, pasir halus - sedang, porositas sedang, fragmen Ø3mm - 12mm, masif, padat			15
	16			?							16
	17										17
	18										18
	19										19
	20										20

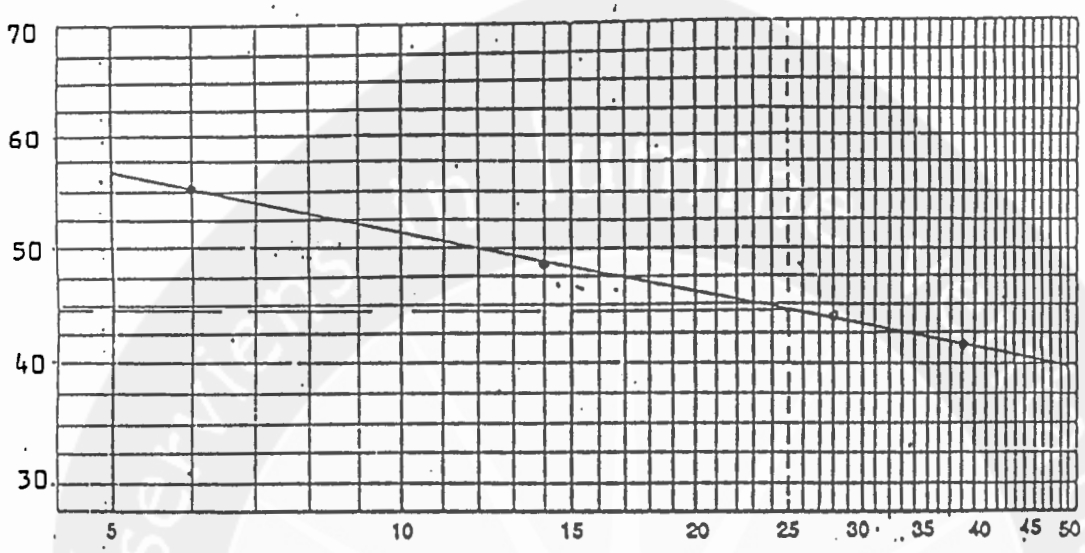
NO.	BOR.	DEPTH	MOISTURE CONTENT	UNIT WEIGHT		SPESIFIC GRAVITY	- UNCONFINE COMP. TEST - DIRECT SHEAR TEST - TRIAXIAL TEST			ATTERBERG LIMIT			VOID RATIO	DEGREE OF SATURATION	CONSOLIDATION	
		H	w	γ_b	γ_d	γ_s	φ^o	c	qu	LL	PL	SL	e	S_r	C_c	K
			%	gr/cc	gr/cc	gr/cc	-	kg/cm2	kg/cm2	%	%	%	-	-	-	cm/det.
1.	BH.1	2,75	53,944	1,5851	1,0296	2,631	22°28'	0,285	-	57,50	39,36	22,89	1,5554	0,9125	0,1494	$2,63.10^{-5}$
2.		7,00	49,849	1,7194	1,1474	2,688	38°17'	0,115	-	42,00	29,75	18,46	1,3427	0,9979	0,1229	$1,78.10^{-5}$
3.	BH.2	2,75	47,007	1,5599	1,0611	2,621	26°14'	0,100	-	44,70	32,83	20,38	1,4701	0,8381	0,1100	$1,95.10^{-5}$
4.		7,00	51,433	1,5977	1,0550	2,602	27°14'	0,300	-	56,80	37,83	23,24	1,4663	0,9127	0,1495	$2,43.10^{-5}$
5.	BH.3	2,50	27,229	1,6815	1,3216	2,645	27°39'	0,065	-	-	-	-	1,0014	0,7192	0,1000	$3,35.10^{-5}$
6.		8,00	47,685	1,6870	1,1423	2,652	33°11'	0,075	-	34,50	21,39	16,72	1,3216	0,9569	0,0930	$3,58.10^{-5}$

PEMERIKSAAN BATAS CAIR

PROYEK : Rencana Pabrik
LOKASI : Jl.Solo - Sragen
TANGGAL : 10 September 1996.

BORING NO. : BH.2
CONTOH NO. : 1.
KEDALAMAN : 2,70 m.

1. Batas Cair : 44,70 %
2. Batas Plastis : 32,88 %
3. Batas Susut : 20,38 %

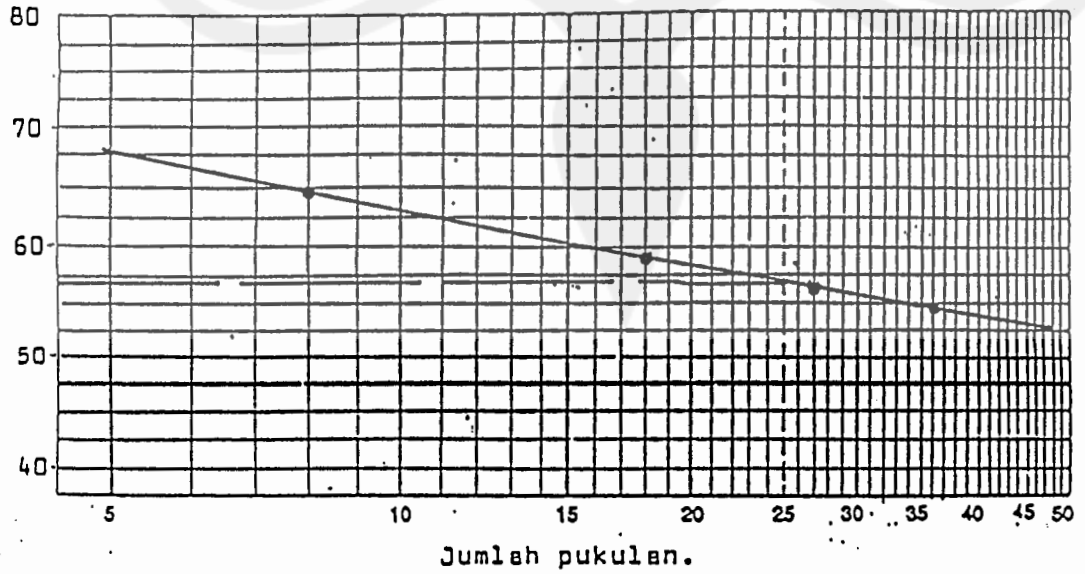


PEMERIKSAAN BATAS CAIR

PROYEK : Rencana Pabrik
LOKASI : Jl. Solo - Sragen
TANGGAL : 10 September 1996.

BORING NO. : BH.2
CONTOH NO. : 2.
KEDALAMAN : 7,00 m.

1. Batas Cair : 56,80 %
2. Batas Plastis : 37,83 %
3. Batas Susut : 23,24 %

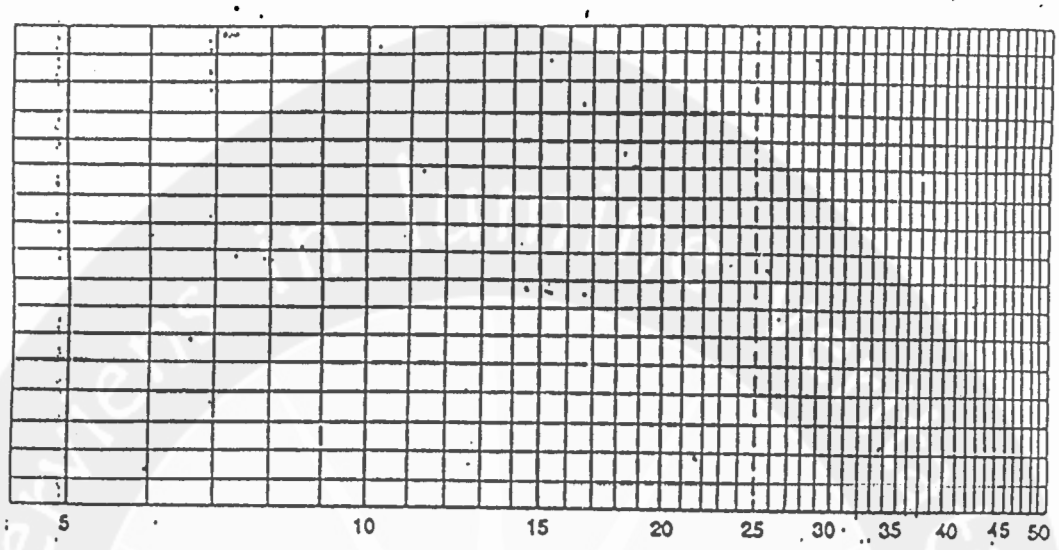


PEMERIKSAAN BATAS CAIR

PROYEK : Rencana Pabrik
LOKASI : Jl.Solo - Sragen.
TANGGAL : 10 September 1996.

BORING NO. : BH.3
CONTOH NO. : 1.
KEDALAMAN : 2,50 m.

1. Batas Cair : - %
2. Batas Plastis : - %
3. Batas Susut : - %.



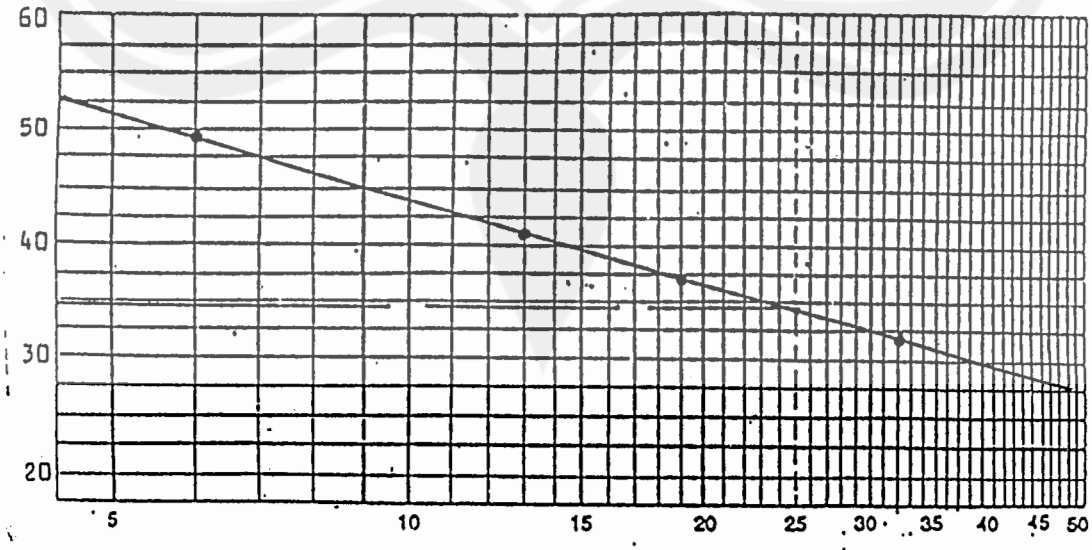
Jumlah pukulan.

PEMERIKSAAN BATAS CAIR

PROYEK : Rencana Pabrik
LOKASI : Jl.Solo - Sragen.
TANGGAL : 10 September 1996.

BORING NO. : BH.3
CONTOH NO. : 2.
KEDALAMAN : 8,00 m.

1. Batas Cair : 34,50 %
2. Batas Plastis : 21,39 %
3. Batas Susut : 16,72 %



Jumlah pukulan.

CONSOLIDATION TEST

Location of project JL.SOLO, SRAGEN
Description of soil _____
Tested by _____

Boring no. BH1
Sample no. 1
Depth of sample 2,75 – 3,00M
Date of testing _____

Ring dimensions : diameter = 6,40 cm
area, A = 32,17 cm^2
height = 5,57 cm
Specific gravity of soil, G = 2,631
Initial height of soil, H_i = 2,658 cm
Initial water content, w_i = 53,544 %

Weight of ring + specimen at begining of test = 564,63 GR
Weight of ring = 429,10 GR.
Weight of wet soil, W_t = 135,53 GR
Oven dry weight of soil, W_s = 88,04 GR

Computed height of soilds, $H_o = W_s/GA = \frac{88,04}{2,631 \times 32,17}$ cm = 1,0402cm
Initial height of voids, $H_v = H_i - H_o$ = (2,658 – 1,0402) cm = 1,6178 cm
Initial degree of saturation, $S_i = (W_t - W_s)/(H_i - H_o)\,A$

$= \frac{135,53 - 88,04}{1,6178 \times 32,17} = 0,9125$

Initial void ratio, $e_o = H_v/H_o = \frac{1,6178}{1,0402} = 1,5553$

Final water content determination :
oven dry weight of soil, W_s = 88,04 GR
final water content, w_f = 52,53 %
final degree of saturation, S = 100 %

Final test data (obtained at end of load testing) :
initial dial reading = 0.00
final dial reading = 180,3
change in sample height = 0,1803 cm
final height ot voids, H_{vf} = (46,25/32,17) cm = 1,4377 cm
final voids ratio, $e_f = H_{vf}/H_o = \frac{1,4377}{1,0402} = 1,382$

Sample no. 1

Initial sample volume, $V_1 = 85,51 \ cm^3$ Dry weight of soil solids, $W_s = 88,04$ gr

Specific gravity of soil, $G = 2,631$ Height of solids, $H_s = 1,0402$

Initial height of voids, $H_v = 1,6178$ cm Initial void ratio, $e_1 = 1,5553$

Load incr.	def. dial reading at end of load,[a]	Change in sample ht., ΔH, (cm)	Change in void ratio, $\Delta e = \Delta H/H_s$	Inst. void ratio e	Average height for load[b], cm	H[c] cm	Time[d] for 90% consol., t_{90}, min.	Coeff. of consolidation C_v, $cm^2/min.$
0.00	0			1,5553				
0,25	37,3	0,0373	0,0359	1,5194	2,6393	1,3196	38,44	$9,6036.10^{-3}$
0.50	39,3	0,0393	0,0378	1,5175	2,6197	1,3098	13,69	$26,567 . 10^{-3}$
1,00	56,3	0,0563	0,0541	1,5012	2,6102	1,3051	39,69	$9,0179. 10^{-3}$
2,00	86,6	0,0866	0,0833	1,472	2,5865	1,2932	29,16	$12,1585. 10^{-3}$
4,00	135,5	0,1355	0,1303	1,425	2,5469	1,2734	31,36	$10,962. 10^{-3}$
8,00	180,3	0,1803	0,1733	1,382	2,5001	1,2500	34,81	$9,516. 10^{-3}$
16.00								
@4,00								
@2,00								
@1.00								
@0.25								
@0,00								

[a] Final dial reading of preceding load = initial dial reading of following load.

[b] Average height for load increment = height at beginning of load $- \frac{1}{2}\Delta H$.

[c] H = lenght of longest drainage path;
for floating ring consolidation = $\frac{1}{2}$ average ht. for the given load increment.

[d] From the dial reading vs log t curves.