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MASTER

SOIL-STRUCTURE INTERACTION METHODS SLAVE CODE

C.J. COSTANTINO
C.A. MILLER

THE CITY UNIVERSITY OF NEW YORK
Under Contract to the
STRUCTURAL ANALYSIS GROUP
of
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK 11973

September 1979

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1.0 Introduction

This report presents a detailed description of SLAVE Code, a program which performs the exact deconvolution analysis for horizontal earthquake ground motions. The objective of the analysis is to determine the horizontal motion-time histories (accelerograms) which must be input at the basement of a horizontally bedded soil system which will yield the specified surface (or near surface) criteria motion history.

In the deconvolution analysis, the soil overburden is represented by a vertical soil column (linear shear beam) to which criteria motion is input at (or near) the top. The accelerogram generated by SLAVE Code at the basement or bottom of the soil column will regenerate this criteria motion when input at the bottom of the soil column.

Two different methods of analysis can be used to perform the deconvolution, these methods being based on either an exact solution (continuous soil model) or a lumped mass (finite element) solution. The exact solution is used in SLAVE Code, since the finite element solution always introduces errors into the column response due to assumptions inherent in the analysis (Ref. 1). In both methods of analysis (exact and finite element), Fourier Transform methods are used to generate transfer functions for the soil column. Thus the only difference between the two methods is the frequency transmission characteristics of the finite element mesh as compared to that of the continuous soil model. It is well known that any finite element solution (as all lumped mass solutions) has inadequate frequency transmission capability above a certain mesh cut off frequency, and it is this feature which introduces errors into the computed solution. It is for this reason that the exact solution is used in SLAVE Code.

2.0 Analysis

In the deconvolution analysis, only horizontal motion of the soil system is considered. Since Fourier Transform methods are used, the material must be represented by a linear-damped constitutive law in which the damping parameter is used to represent the nonlinear cyclic behavior of the soil. SLAVE Code can be used in one of two ways. Firstly, the stiffness and damping data of all the soil layers can be input and the desired response generated. Alternatively, if laboratory data for the soils are available as a function of shear strain (from, say, resonant column laboratory tests), SLAVE Code can be run so as to generate the proper stiffness/damping parameters for a particular problem, computing the peak shear strain in each soil layer that will be developed by the input accelerogram.

2.1 Modal Decomposition of Input Accelerogram

If the criteria motion input to SLAVE Code is an acceleration pulse, the first step in the analysis is to decompose the time history into its Fourier components, or

$$\ddot{y}(t) = \sum_{n=1}^N C_n \sin \omega_n(t+t_n) \quad (1)$$

where C_n is the magnitude of the mode component of the pulse and t_n is the modal phase time. The modal circular frequency is given by

$$\omega_n = \frac{2\pi n}{T} \quad (2)$$

where T is the total duration time of the specified pulse. In SLAVE Code, the maximum frequency content in the pulse is specified so that at least 8 time points of the pulse can be utilized in one cycle. Therefore

$$\omega_N = \frac{2\pi}{8 \Delta t} \quad (3)$$

where Δt is the specified time step in the criteria pulse and ω_N is the highest circular frequency considered. Higher frequencies than those specified by equation (3) have been found to contain significant errors. The maximum number of mode components used in the deconvolution analysis is then

$$N = \frac{T}{8 \Delta t} \quad (4)$$

Thus, if an input accelerogram has been a 20 second duration with a 10 millisecond time increment, the number of modes used in the analysis would be 250, with frequencies varying from .05 cps to 12.5 cps in increments of .05 cps.

2.2 Deconvolution Analysis

As mentioned above, the soil system is considered to be a vertical soil column composed of an arbitrary number of uniform soil layers, as shown in Figure 1. Each soil layer is assumed to behave in a linear fashion, with all nonlinear effects "lumped" into an equivalent damping term, which will be described more fully in a following section. For each layer, the shear stress-strain relation is written as

$$\tau = G \gamma + \eta \dot{\gamma} \quad (5)$$

where

τ	=	shear stress
γ	=	shear strain
$\dot{\gamma}$	=	shear strain rate
G	=	shear modulus
η	=	viscosity coefficient

The exact solution for the effects of soil amplification on horizontal motion begins with the shear wave equation for the vertical soil column. For each soil layer, this relationship is

$$\rho \frac{\partial^2 u}{\partial t^2} = G \frac{\partial^2 u}{\partial x^2} + \eta \frac{\partial}{\partial t} \frac{\partial^2 u}{\partial x^2} \quad (6)$$

Figure 1. Configuration of Vertical Soil Column

where

u	=	horizontal displacement of any point in the layer
x	=	vertical distance (positive downward) of the point from the top of the soil layer
t	=	time
ρ	=	soil mass density

Each soil layer is assumed to possess constant properties G , η , and ρ . The displacement of any point in any soil layer can be written as

$$u(x,t) = y(x,t) + \tilde{u}(t) \quad (7)$$

where $\tilde{u}(t)$ is the displacement of the base of the layer and $y(x,t)$ is the displacement relative to that of the base of the layer (Figure 1). Considering the steady state solution at a given forcing frequency, ω , all displacements can be written as

$$\left. \begin{aligned} u(x,t) &= U(x) \\ \tilde{u}(x,t) &= \tilde{U}(x) \\ y(x,t) &= Y(x) \end{aligned} \right\} e^{i\omega t} \quad (8)$$

Substituting equations (7) and (8) into equation (6) yields for each layer

$$\frac{d^2 Y}{dx^2} + p^2 Y = -p^2 \tilde{U} \quad (9)$$

where

$$p^2 = \omega^2 / \left[\left(\frac{G}{\rho} \right) + i \left(\frac{\eta \omega}{\rho} \right) \right] \quad (10)$$

The solution to equation (9) is then

$$Y(x) = A \sin px + B \cos px - \tilde{U} \quad (11)$$

where the coefficients A and B are determined from the interface conditions at the top and bottom of each soil layer. For the surface layer, the shear stress is zero at the top, while at all

interfaces the displacements and shear stress are continuous. Utilizing these conditions together with equations (7) leads to the following matrix equation (specialized to the case of four soil layers)

$$\begin{bmatrix} \alpha & -1 & 0 & 0 & 0 \\ 0 & \gamma & -\delta_2 & 0 & 0 \\ 0 & -\delta_2 & \xi_3 & -\delta_3 & 0 \\ 0 & 0 & -\delta_3 & \xi_4 & -\delta_4 \end{bmatrix} \begin{Bmatrix} \tilde{u}_0 \\ \tilde{u}_1 \\ \tilde{u}_2 \\ \tilde{u}_3 \\ \tilde{u}_4 \end{Bmatrix} = 0 \quad (12)$$

If any of the interface motion parameters are specified, the remaining parameters can be easily determined. Note that beyond the second equation, the form of the matrix equation (12) remains constant. The terms of the matrix coefficients can be defined as follows:

$$\begin{aligned} \alpha &= (\cos \beta)_1, \quad \beta_i = (\rho H)_i \\ \gamma &= \left(\frac{\rho}{p} \frac{\cos \beta}{\sin \beta} \right)_2 - \left(\frac{\rho}{p} \frac{\sin \beta}{\cos \beta} \right)_1 \\ \delta_i &= \left(\frac{\rho}{p} \frac{1}{\sin \beta} \right)_i, \quad i > 1 \\ \xi_i &= \left(\frac{\rho}{p} \frac{\cos \beta}{\sin \beta} \right)_{i-1} + \left(\frac{\rho}{p} \frac{\cos \beta}{\sin \beta} \right)_i, \quad i > 2 \end{aligned} \quad (13)$$

where the subscripts of equation (13) refer to the soil layer, numbered from the top down. With the Fourier transform of the specified interface motion history, a solution of equation (12) is obtained for all frequencies over the frequency range of interest to obtain any other interface motion history.

2.3 Material Property Specification

As mentioned above in equation (5), each soil material is modelled as a linear material with both shear stiffness and damping properties specified. This linear relation has been found adequate for typical seismic problems (Ref. 2), provided that the damping parameter is interpreted as representing the nonlinear behavior of the soil under cyclic shear loadings, as in resonant column shear testing.

The energy lost per cycle of loading due to nonlinear soil behavior is measured by the hysteretic damping ratio, D , which has been found experimentally to be essentially independent of frequency. If this energy loss per cycle is equated to the energy loss per cycle due to the viscosity term of equation (5), the hysteretic damping ratio is related to the viscosity coefficient by

$$D = \eta \omega / 2G \quad (14)$$

where

D	=	hysteretic damping ratio
η	=	viscosity coefficient
ω	=	circular frequency
G	=	shear modulus

In SLAVE Code, the material properties are entered in one of two ways. The first option available is to enter the specific stiffness and damping parameters for each soil layer of the problem. For this option, the shear stiffness (G) is entered for each soil layer, while three suboptions are used to enter the damping characteristics for each soil layer, as follows:

- (a) The damping coefficient, η , can be entered directly. This is not usually done since this would indicate that the energy loss per cycle increases with frequency (equation (14))
- (b) The damping coefficient, η , can be entered by using a fraction of the critical damping at a given frequency, or

$$\eta = \frac{(1.5)G}{\pi f_i} \quad (15)$$

where N is the fraction of critical damping (varying between 0 & 1) at the particular frequency f_i . This still has the disadvantage of keeping η constant over all frequencies.

- (c) The hysteretic damping ratio (D of equation (14)) can be entered. The value of η is then computed at each frequency by equation (14) and the energy loss per cycle is maintained constant.

The second primary option available to enter soil property data (stiffness/damping) is to enter the results of laboratory test data, usually placed in the form of shear stiffness and hysteretic damping ratio as functions of peak shear strain for each soil layer. The shear modulus is entered in one of two fashions

- (a) directly in psf units at a given peak cyclic shear strain
- (b) the parameter K_2 as a function of peak cyclic shear strain, from which the shear modulus is computed as

$$G = 1000 K_2 \sqrt{\sigma_{eff}} \quad (16)$$

where K_2 is the measured test parameter and σ_{eff} is the confining pressure of the test in psf.

The damping data is also entered as a function of shear strain, with the same three suboptions mentioned above (viscosity coefficient, fraction of critical at a specific frequency, or hysteretic damping ratio) available to the user. Again the last suboption is usually used. SLAVE Code then not only performs the deconvolution analysis, but also computes the peak RMS shear strain in each soil layer caused by the specified input motion from which the proper shear modulus and damping values are determined. Thus an iterative cycle is used in the deconvolution analysis.

3.0 GENERAL FORMATION OF SLAVE CODE

The remainder of this report emphasizes the usage and operations of SLAVE Code. The program consists of 33 subroutines together with the MAIN Program as shown in Figure 2. As may be noted, the subroutines can be divided into two groups, one group of primary importance to the calculations, and the second associated with the handling of data.

This secondary set of subroutines consists of three separate packages. The first package (ACCPLT) is merely a Calcomp plot program available for plotting either input or output acceleration time histories. The second package of service programs is the response spectra package (SPECTA). Given an acceleration pulse (either input or output), the response spectra is computed and can be plotted either on the on-line printer or the Calcomp Plotter or both. The third service package is the Fourier transform package (FORIER) which converts time data to Fourier modal components. Again the resulting modes can be plotted on either the on-line printer or the Calcomp Plotter or both.

The primary computational subroutines shown in Figure 2 perform the following tasks. Subroutine INDATA reads all the input/output control counters which determine which functions available in SLAVE Code are to be run. Subroutine SOIL is used to enter the data required to specify the soil profile.

If the soil stiffness and damping parameters are to be determined from available shear laboratory test data, routine SLAVE 1 is run to determine the proper soil parameters for the given input motion history. This program is run iteratively such that the peak shear strain data in each soil layer correspond to the final set of stiffness and damping parameters.

If the soil stiffness and damping parameters are to be entered directly, the program SLAVE 2 is run to determine the output response directly.

SLAVE
MAIN

Primary Routines:

INDATA

SOIL

SLAVE1

SLAVE2

OUTDAT

ITERAT
CONVOL
SET

COMBIN
FORMIC
SOLVE

Service Routines

ACCPLT

SPECTA

FORIER

FRQS
SETUP
XDT
XDDOT

OLPLOT
MAXIM
SCLE
LABEL

FOLPLT
FLABEL
FSCLE
FMAXIM

CCPLOT
LGRIDX
TIC
YGRID

FCCPLT
FXGRID
FYGRID

Figure 2. Subroutines of Slave Code

4.0 Use of SLAVE Code

The control card input data required for use of SLAVE Code are given in this section of the report.

4.1 Control Data for SLAVE Code

There are several possible ways to use SLAVE Code and the required Control Cards for each are listed below. The source update decks for SLAVE Code are stored on Tape K2593 at Brookhaven. These same decks may be on a Permanent File (PF) SLAV1, ID = ZZGCAM.

(a) General Control Card: (Aname, STMFZ, TP(k), T(l), P(m)).

Aname = any title you wish

k = number of tapes required to be handled
by operator

l = running time in octal seconds

m = priority of job

(b) Accounting Card: ACCOUNT (k, l)

k = any ID

l = any valid charge number

(c) Call in Program: FILE, TAPE, RT=W, BT=I, MBL=5120.

STAGE, TAPE, NT, PE, E, VSN = K2593

UPDATE(F)

(d) Attach tape with input accelerogram: ATTACH (TAPE8, k, ID = l)

(Omit if accelerogram

k = name given to tape when created

input is on cards)

l = ID given to tape when created

(e) Set up permanent file to save output

accelerogram for SIM or SLAVE runs: REQUEST, TAPE14, * PF.

(Omit if data is not to be saved).

- (f) Set up permanent file to save output
 accelerogram in Fourier modal component
 form (omit if not to be saved): REQUEST, TAPE12, *PF.
- (g) For Microfiche copies of output: IDCARD (MIKE, \$Title of Problem\$,
 T129, PRFJ)
- (h) For Microfiche Calcomp: IDCARD (TAPE99, Name, T129, \$Title of Problem\$,
 PLFI)
- (i) Set up Calcomp routines
 ATTACH (LIB1, FR80LIB)
 ATTACH, LIB2, CALCOMPLIB.
 LIBRARY (LIB1, LIB2)
- (j) Execute Program: FTN(I=COMPILE, L=0)
 LGO.
- (k) Save *PF: CATALOG (TAPE12, K₁, ID = ℓ_1 , RP = 30)
 CATALOG (TAPE14, k₂, ID = ℓ_2 , RP = 30)
- (l) If Microfiche Copies of
 Output warranted: REWIND OUTPUT
 COPY (OUTPUT, MIKE)
- (m) Two End of Records: 7_{89}
 7_{89}
- (n) SLAVE Data: See Section 4.2
- (o) End of Record: 7_{89}
- (p) End of File: $6_{7_{89}}$

4.2 Input Data

The data input stream is read from cards and/or tape in the primary subroutines listed in Section 3.0. For card input, five card columns are typically used for integer numbers and ten card columns for floating point numbers. The data read in each routine is listed below. Depending upon options chosen, not all data segments are used.

The primary options available to the user are as follows:

- (1) Any pulse treated in SLAVE Code (either input or output) can be read in or written out in punched card or tape format. Both acceleration time history or Fourier mode components can be used as either input or output. Both on-line and Calcomp plotting options can be utilized to plot the motion histories, Fourier components and/or response spectra.
- (2) If a specific soil site is described (geometry and soil properties), the amplification function of the site can be generated without specifying a specific input motion pulse. The amplification function is defined as the magnitude of the surface response for a given unit input at the base of the soil column, at a given frequency. The site amplification function is then generated over a range of frequencies of interest.
- (3) If a specific soil site is described (geometry and soil properties) together with a specified criteria motion pulse at some depth in the soil column, the output response can be generated at up to six different output depths. Various output forms and plots can be generated as described above.

- (4) If the geometry of a soil site is specified together with a given criteria input motion pulse, but the laboratory soil test data is input for each soil layer, the correct soil properties are first generated for the problem, such that the peak shear strains in each soil layer correspond to the final stiffness and damping data generated. The output at various depths described in (3) above can then be determined.

(a) SLAVE MAIN

The parameter KRUN is read which determines the specific conditions to be run in the problem.

If KRUN = 0, only the Routine INDATA is accessed implying that the specified input motion pulse is treated (plots, Fourier components, response spectra, transfer from card to tape format or vice-versa, etc.).

If KRUN = 1, only soil amplification is performed for a given site. Required data in routines SOIL, SLAVE2 and OUTDAT are entered.

If KRUN = 2, all properties (geometric and stiffness) of the soil site are needed together with the specified pulse data. Complete output response is generated. Requires data in routines INDATA, SOIL, SLAVE2, OUTDAT.

If KRUN = 3, only geometric layering data is specified together with laboratory soil test data and specified motion history. The corresponding layer stiffness and damping soil data are generated; output response history is computed. Requires data in routines INDATA, SOIL, and SLAVE1.

If KRUN = 4, the requirements of KRUN = 3 are needed. In addition, the corresponding output response is generated. Requires data in routines INDATA, SOIL, SLAVE1, SLAVE2 and OUTDAT.

(b) INDATA

This routine defines the parameters which control the options desired for treating the input and output responses. Generally, if a counter name begins with a letter I, it refers to the input pulse, and if J, it refers to the output pulses.

(b) INDATA (continued)

If the counter name contains the letters ACC, it refers to the time-history form of either the input or output. If the counter name contains the letters MODE, it refers to the Fourier modal components of a particular pulse.

The pulse(s) can be placed in either card or tape format, can be plotted on-line or on a Calcomp plotter or both, and response spectra can be generated and plotted.

(c) SOIL, SLAVE1, SLAVE2 and OUTDAT

The data entered in these routines are fairly straight forward and are described in detail in the DATA FORMAT TABLES following.

(d) TAPE INPUT/OUTPUT FORMAT

If the motion input is to be entered via tape rather than cards, the file assigned for this input is Tape 8. If the specified input is a motion history (acceleration or displacement time records), the tape format is in two read statements as

```
READ (8)  NRCDS, TSTART, DT, ICOUNT
READ (8)  (Y(I), I=1, NRCDS)
```

NRCDS is the number of time records of the motion at time intervals DT seconds. The start time, TSTART, and fixed counter, ICOUNT, are not applicable to SLAVE Code. The maximum number of records allowed is 4000.

If the motion input is to be entered via Fourier modal components rather than motion history, the tape calls are

```
READ (8)  ANAME, NCOMPS, DFREQ
DO A  I = 1, NCOMPS
A READ (8)  M, OMEGA, FREQ, ACOEF, BCOEF, CCOEF, TLAG
```

NCOMPS is the number of modal components describing the pulse and ANAME is an alphaneumeric field dimensioned 8A10. The remainder of the parameters are described in the DATA CARD TABLES following.

The output response is also available on tape for the user. For each output depth of interest (limited to six depths), the output in Fourier modal component form is stored on TAPE 12 in the form

```
      READ (12) NFILES
      DO A I=1, NFILES
      READ (12) ANAME, NCOMPS, DFREQ
      DO B J=1, NCOMPS
      B READ (12) M, OMEGA, FREQ, ACOEF, BCOEF, CCOEF, TLAG
      A CONTINUE
```

where NFILES is the number of output depths specified by card input.

One of these output pulses can be stored on TAPE 14 as can accelerogram (acceleration in g.s) in the following form

```
      READ (14) NRCDS, TSTART, DT, ICOUNT
      READ (14) (Y(I), I = 1, NRCDS)
```

where the parameters are as described above.

ROUTINE	CARD GROUP	FORMAT	VARIABLES
MAIN	1.0	I5	KRUN If KRUN=0, only read data in INDATA =1, read data in SOIL, SLAVE2, and OUTDAT =2, read data in INDATA, SOIL, SLAVE2 and OUTDAT =3, read data in INDATA, SOIL, and SLAVE1 =4, read data in INDATA, SOIL, SLAVE1, SLAVE2 and OUTDAT

ROUTINE	CARD GROUP	FORMAT	VARIABLES
INDATA	2.0	8A10	ANAME (Problem Title, for printed output only)
	2.1	2I5	ITYPE, JTYPE ITYPE = 0 Input pulse is acceleration-time history in G's = 1 Input pulse in Fourier modal components (in/sec ²) = 2 Input pulse is displacement-time history (inches) JTYPE = 0 Output pulses are acceleration histories (G's) = 1 Output pulses in Fourier modal components (in/sec ²)
	2.2	6I5	ITACC, IPACC, IQACC, ISACC, ISPEC, ISPLOT
		4I5	ITMODE, IPMODE, IQMODE, ISMODE
		6I5	JTACC, JPACC, JQACC, JSACC, JSPEC, JSPLIT
		4I5	JTMODE, JPMODE, JQMODE, JSMODE
			(These counters refer to functions to be performed for both input and output pulses. The first letter I refers to the input pulse while the first letter J refers to the output pulses. The letters ACC refer to the acceleration form of the pulse, while the letters MODE refer to the modal form of the pulses.)
			ITACC = 0 Input acceleration pulse from cards = 1 Input acceleration pulse from Tape 8
			IPACC = 0 Don't print the accelerogram = 1 Print the accelerogram
			IQACC = 0 Don't plot the accelerogram = 1 Plot on Calcomp only = 2 Plot on-line only = 3 Plot both on-line and Calcomp
			ISACC = 0 Don't punch input pulse onto cards = 1 Punch input accelerogram onto cards (in G's, 8E9.3)
			ISPEC = 0 Don't compute response spectra for input pulse = 1 Compute and print response spectra
			ISPLOT = 0 Don't plot response spectra = 1 Plot input spectra on Calcomp = 2 Plot input spectra on-line = 3 Plot both on-line and Calcomp (Letters P, Q, S, T for same functions on Modal inputs)

ROUTINE	CARD GROUP	FORMAT	VARIABLES
INDATA (CONTD)	2.3	E10.0	FACTIN (Scale factor to modify either acceleration input pulse magnitude, or modal coefficient magnitude. If read in as 0.0, set to 1.0)
	2.4	I5	NDAMP (Number of equipment damping ratios to be used if motion response spectra are to be computed for either input or output pulses.)
	2.4.1	8E10.0	(EQDAMP(I), I=1, NDAMP) (Equipment damping ratios, in percent, for response spectra calculation. Omit this card if NDAMP read in as 0)
	2.5	8A10	TITLE (Title to be used on various plots)
	2.5.1	I5	NTITLE (No. of card columns used in TITLE)
	2.6	2A10	FMT (Card format, left justified, of input accelerogram.)
	2.6.1	15,2E10.3	NRCDS, TSTART, DT NRCDS = No. of records in input accelerogram, LE. 4000. TSTART = Starting time of pulse, usually set to 0.0 DT = Time increment of pulse, in seconds.
	2.6.2	FMT	(Y(I), I=1,NRCDS) Y(I) = Input accelerogram (Omit cards 2.6, 2.6.1, and 2.6.2 if ITYPE=1 or ITACC=1)
	2.7	15,E10.0	NCOMPS, DFREQ NCOMPS = No. of Fourier modal components of input pulse DFREQ = Frequency increment of mode components (in cps)
	2.7.1	15,6E12.5	MODE, OM, FREQ, ACOEF, BCOEF, CCOEF, TLAG MODE = Fourier mode number OM = Circular frequency of mode (radians/second) FREQ = Frequency of mode (cps) ACOEF = Coefficient of cosine term of Fourier expansion (in/sec ²) BCOEF = Coefficient of sine term of Fourier expansion (in/sec ²) CCOEF = Modal magnitude (in/sec ²) TLAG = Phase time of mode in seconds (Cards 2.7.1 repeated NCOMPS times) (Omit cards 2.7 and 2.7.1 if ITMODE=1)
	2.7.2	2E10.0	DT, TMAX DT = Time increment of acceleration pulse to be computed from modes (seconds) TMAX = Duration of acceleration pulse to be computed from modes (sec) (Omit card 2.7.2 if no acceleration pulse needs to be computed from modes, or if IPACC+IQACC+ISACC+ISPEC=0) (Omit cards 2.7, 2.7.1, 2.7.2 if ITYPE=0 or 2)

ROUTINE	CARD GROUP	FORMAT	VARIABLES
SOIL	3.0	8A10	ANAME (Title card for printing only)
	3.1	3I5	MLAYER, IDAMP, NSPEC MLAYER = No. of soil layers in problem (LE. 11) IDAMP = Counter for soil damping type = 0 Viscous damping for all soils = 1 Equivalent-viscous damping, fraction of critical at a specified frequency FREQI cps = 2 Hysteretic damping NSPEC = Level or interface of input motion = 0 Input at ground surface = 1 Input at bottom of layer 1, etc. = MLAYER, input at bottom of soil column
	3.2	2E10.0	DWATER, FREQI DWATER = Depth to ground water table (ft) FREQI = Frequency (cps) for equivalent damping, only if IDAMP=1, ignored otherwise
	3.3	8A10	ANAME (Title card for printing only)
	3.3.1	I5, 2E10.0, I5	L, PCF(L), THICK(L), IZONE(L) L = Layer number (numbered from top down) PCF = Unit weight of soil in pcf THICK = Thickness of layer in feet IZONE = Soil zone number, ignored unless lab. data is to be used to generate stiffness and damping properties. (Card 3.3.1 repeated MLAYER times)
	3.4	8A10	ANAME (Title card for printing only)
	3.4.1	I5, 2E10.0	L, GMOD(L), ETA(L) L = Layer number GMOD = Shear modulus in psf ETA = Damping factor = psf-sec if IDAMP is 0 = fraction of critical if IDAMP is 1 = hysteretic damping factor if IDAMP is 2 (Omit cards 3.4 and 3.4.1 if KRUN = 3 or 4)

ROUTINE	CARD GROUP	FORMAT	VARIABLES
SLAVE1	4.0	8A10	ANAME (Title for printing only)
	4.1	3I5	NPTS, NZONES, INTYPE NPTS = No. of data points for laboratory test data (LE.20) Same amount of data must be specified for all soil types NZONES = No. of soil types in problem for which shear data is to be read. Not the same as soil layer number. INTYPE = Input counter for shear modulus calculation = 0 Gmod data read in directly in psf = 1 GMOD data read in in terms of parameter AK2
	4.2	8E10.0	(SVAL(J), J=1,NPTS) SVAL = Shear strain values at which all the laboratory data is to be specified. Same for all soil types.
	4.3.1	I5	JZONE
	4.3.2	8E10.0	(GZAL(J), J=1,NPTS)
	4.3.3	8E10.0	(DZAL(J), J=1,NPTS) JZONE = Number of soil type GZAL = Appropriate shear modulus data for soil JZONE DZAL = Appropriate shear damping data for soil JZONE (Card group 4.3 repeated NZONES times. Each soil layer defined in card group 3 is assigned the property of data associated with soil type specified by IZONE of card 3.3.1)

ROUTINE	CARD GROUP	FORMAT	VARIABLES
SLAVE2	5.0	2E10.0	FREQMX, DELTAF FREQMX = Maximum frequency (cps) for amplification analysis DELTAF = Frequency increment (cps) ;Card 5.0 is for amplification analysis only. Omit if KRUN.NE.1)
	5.1	8A10	ANAMB (Title for printing only)
	5.2	I5	NDPTH\$ NDPTH\$ = No. of depths at which output desired (LE.6)
	5.3	8E10.0	(DEPTH(I), I = 1,NDPTH\$) DEPTH = Depth in feet at which output motions desired
OUTDAT	6.0	8A10	ANAME (Title for printing only)
	6.1	2E10.0,I5	TMAX, DT, IDEPTH TMAX = Maximum time duration of output pulses (seconds) DT = Time increment of output pulses (seconds) IDEPTH = Output depth number to be saved on Tape 14. for use as input to SIM or SLAM Codes

5.0 Typical Output

A sample of some of the output that is generated from SLAVE Code is shown in the following sheets. As may be noted, both on-line and Calcomp plotting is available to the user and makes up a significant portion of the output.

Output response motions in the soil column can be generated at any depths of interest, with up to six output depths allowed. The output can then be placed in either card or tape format, which can be used directly as input to either SLAM or SIM Code.

RLN CL ITIC, KRLN= 2

FFTF PULSE

ITYPE = 0
JTYPE = 0

ITACC = 0
IPACC = 1
IQACC = 3
ISACC = 0
ISPEC = 1
ISPLIT = 3

ITHODE = 0
IPHODE = 1
IQHODE = 3
ISHODE = 0

JTACC = 0
JPACC = 1
JQACC = 3
JSACC = 1
JSPEC = 1
JSPLIT = 3

JTHODE = 0
JPHODE = 1
JQHODE = 3
JSHODE = 0

INPUT SCALE FACTOR= 1.00000E+00
NO. OF SPECTRA DAMPING FACTORS= 1

EQUIP. DAMPING (PERCENT)
2.00E+00

INPUT RECORD TITLE= FFTF CRITERIA PULSE , 0.25 0'S , DT= 0.01 SEC

NO. OF LETTERS IN TITLE= 80

NRCDS = 2000

TSTART= 0.

DT = .10000E-01

TMAX = .19990E+02

INPUT ACCELERATION, G,S

.216E-01	.186E-01	.142E-01	.118E-01	.133E-01	.167E-01	.266E-01	.347E-01	.402E-01	.399E-01
.325E-01	.211E-01	.114E-01	.795E-02	.988E-02	.118E-01	.859E-02	.237E-03	.744E-02	.722E-02
.420E-02	.238E-01	.434E-01	.584E-01	.571E-01	.470E-01	.308E-01	.142E-01	.576E-03	.534E-02
.189E-01	.156E-01	.114E-01	.123E-02	.159E-01	.370E-01	.580E-01	.751E-01	.847E-01	.849E-01
.760E-01	.620E-01	.451E-01	.429E-01	.441E-01	.496E-01	.547E-01	.571E-01	.566E-01	.538E-01
.411E-01	.389E-01	.278E-01	.129E-01	.126E-01	.133E-01	.133E-01	.153E-01	.164E-01	.232E-01
.215E-01	.314E-01	.259E-01	.256E-01	.227E-01	.246E-01	.307E-01	.368E-01	.376E-01	.302E-01
.157E-01	.139E-02	.159E-01	.221E-01	.204E-01	.134E-01	.758E-02	.683E-02	.123E-01	.208E-01
.277E-01	.253E-01	.254E-01	.203E-01	.162E-01	.152E-01	.146E-01	.954E-02	.368E-02	.239E-01
.411E-01	.557E-01	.643E-01	.602E-01	.513E-01	.392E-01	.228E-01	.122E-02	.236E-01	.468E-01
.640E-01	.740E-01	.799E-01	.842E-01	.870E-01	.865E-01	.810E-01	.703E-01	.559E-01	.397E-01
.203E-01	.711E-02	.625E-02	.266E-01	.448E-01	.615E-01	.724E-01	.734E-01	.637E-01	.468E-01
.206E-01	.133E-01	.204E-02	.727E-02	.172E-01	.256E-01	.407E-01	.522E-01	.633E-01	.755E-01
.502E-01	.106E-00	.126E-00	.126E-00	.122E-00	.168E-00	.885E-01	.685E-01	.569E-01	.376E-01
.259E-01	.201E-01	.164E-01	.139E-01	.114E-01	.893E-02	.737E-02	.789E-02	.157E-01	.154E-01
.229E-01	.317E-01	.415E-01	.478E-01	.457E-01	.330E-01	.126E-01	.105E-01	.324E-01	.524E-01
.658E-01	.818E-01	.844E-01	.700E-01	.610E-01	.224E-01	.574E-01	.795E-01	.113E-00	.145E-00
.177E-00	.154E-00	.262E-00	.202E-00	.196E-00	.163E-00	.163E-00	.137E-00	.112E-00	.943E-01
.926E-01	.110E-00	.135E-00	.101E-00	.173E-00	.163E-00	.136E-00	.796E-01	.201E-01	.467E-01
.573E-01	.146E-00	.163E-00	.208E-00	.223E-00	.232E-00	.232E-00	.244E-00	.250E-00	.253E-00
.253E-00	.246E-00	.232E-00	.208E-00	.181E-00	.155E-00	.135E-00	.120E-00	.105E-00	.866E-01
.050E-01	.428E-01	.198E-01	.779E-02	.426E-01	.819E-01	.119E-00	.149E-00	.174E-00	.201E-00
.243E-00	.221E-00	.226E-00	.198E-00	.180E-00	.169E-00	.151E-00	.102E-00	.124E-01	.959E-01
.154E-00	.248E-00	.262E-00	.255E-00	.244E-00	.231E-00	.210E-00	.177E-00	.140E-00	.104E-00
.604E-01	.159E-01	.407E-01	.164E-00	.151E-00	.171E-00	.167E-00	.146E-00	.116E-00	.755E-01
.711E-01	.164E-01	.488E-01	.518E-01	.275E-01	.114E-01	.505E-01	.764E-01	.869E-01	.865E-01
.811E-01	.547E-01	.547E-01	.111E-00	.130E-00	.148E-00	.158E-00	.157E-00	.144E-00	.122E-00
.956E-01	.807E-01	.647E-01	.456E-01	.179E-01	.173E-01	.515E-01	.755E-01	.829E-01	.757E-01
.559E-01	.420E-01	.271E-01	.175E-01	.124E-01	.753E-02	.215E-02	.164E-01	.365E-01	.483E-01
.485E-01	.352E-01	.277E-01	.197E-01	.150E-01	.961E-02	.209E-02	.462E-02	.680E-02	.520E-02
.519E-02	.107E-01	.159E-01	.239E-01	.152E-01	.604E-02	.104E-01	.253E-01	.566E-01	.566E-01
.816E-01	.109E-00	.127E-00	.131E-00	.119E-00	.984E-01	.774E-01	.618E-01	.500E-01	.376E-01
.253E-01	.219E-01	.265E-01	.691E-01	.103E-00	.113E-00	.106E-00	.699E-01	.285E-01	.312E-02
.154E-01	.235E-01	.211E-01	.180E-01	.210E-01	.379E-01	.705E-01	.108E-00	.136E-00	.117E-00
.609E-01	.166E-02	.495E-01	.688E-01	.514E-01	.262E-01	.850E-02	.263E-01	.347E-01	.397E-01
.402E-01	.568E-01	.788E-01	.925E-01	.112E-00	.123E-00	.121E-00	.110E-00	.637E-01	.641E-01
.515E-01	.412E-01	.224E-01	.222E-01	.118E-01	.359E-02	.171E-02	.527E-02	.065E-02	.123E-01
.149E-01	.152E-01	.127E-01	.707E-02	.178E-02	.316E-02	.604E-02	.743E-02	.102E-01	.178E-01
.317E-01	.454E-01	.652E-01	.731E-01	.707E-01	.583E-01	.373E-01	.854E-02	.271E-01	.666E-01
.111E-00	.124E-00	.141E-00	.124E-00	.111E-00	.471E-01	.826E-01	.645E-01	.396E-01	.647E-02
.272E-01	.529E-01	.636E-01	.588E-01	.463E-01	.378E-01	.434E-01	.630E-01	.873E-01	.103E-00
.112E-00	.849E-01	.556E-01	.340E-01	.119E-01	.742E-02	.267E-01	.479E-01	.719E-01	.976E-01
.123E-00	.143E-00	.155E-00	.159E-00	.156E-00	.151E-00	.146E-00	.143E-00	.144E-00	.145E-00
.144E-00	.141E-00	.164E-00	.164E-00	.151E-01	.192E-02	.136E-01	.179E-01	.252E-01	.512E-01
.812E-01	.104E-00	.104E-00	.840E-01	.438E-01	.138E-02	.377E-01	.561E-01	.554E-01	.417E-01
.249E-01	.126E-01	.627E-02	.232E-02	.234E-02	.107E-01	.292E-01	.341E-01	.563E-01	.937E-01
.144E-00	.174E-00	.184E-00	.102E-00	.974E-01	.161E-01	.584E-01	.896E-01	.828E-01	.498E-01
.131E-01	.156E-01	.376E-01	.571E-01	.722E-01	.737E-01	.833E-01	.115E-01	.423E-01	.974E-01
.217E-00	.185E-00	.204E-00	.229E-00	.190E-00	.159E-00	.138E-00	.109E-00	.938E-01	.774E-01
.556E-01	.359E-01	.189E-01	.290E-02	.319E-01	.652E-01	.422E-01	.121E-00	.131E-00	.130E-00
.142E-00	.109E-00	.957E-01	.846E-01	.801E-01	.846E-01	.947E-01	.109E-00	.124E-00	.136E-00
.142E-00	.137E-00	.121E-00	.999E-01	.842E-01	.766E-01	.712E-01	.591E-01	.382E-01	.178E-01
.243E-02	.180E-01	.418E-01	.640E-01	.789E-01	.807E-01	.758E-01	.737E-01	.820E-01	.107E-00
.144E-00	.136E-00	.125E-00	.899E-01	.437E-01	.568E-02	.139E-01	.141E-01	.696E-02	.276E-02
.237E-02	.149E-02	.862E-02	.263E-01	.440E-01	.515E-01	.421E-01	.150E-01	.253E-01	.694E-01
.117E-00	.127E-00	.127E-00	.110E-00	.818E-01	.569E-01	.378E-01	.227E-01	.757E-02	.605E-02
.147E-01	.126E-01	.160E-02	.223E-01	.549E-01	.126E-00	.160E-00	.160E-00	.185E-00	.196E-00
							.150E-01	.964E-02	.158E-01

CALCOMP MOTION HISTORY READY
TITLE = FFTF CRITERIA PULSE . 0.25 G'S . DT= 0.01 SEC
NTITLE = 80
NODE = 1
MAX. G.S= 2.30998E-01
MIN. G.S= -2.62038E-01
THAX = 1.99900E+01
DT = 1.00000E-02
NRCD5 = 2000
Y1 = -3.00000E-01
DELTAY = 1.00000E-01
T1 = 0.
DELTAT = 2.49875E+00

COMPUTING RESPONSE SPECTRA

NO. OF INPUT RECORDS = 2000
FINAL DISPLACEMENT (IN.) = .11445E+03
FINAL VELOCITY (IN/SEC) = .84051E+01
PEAK ACCELERATION (G,S) = .26204E+00

NO. OF RECORDS ADDED = 85
FINAL NO. OF RECORDS = 2085
FINAL VELOCITY (IN/SEC) = 0.
FINAL DISPLACEMENT (IN.) = .11787E+03
TMAX. (DURATION, SECS) = .20840E+02

AMPING RATIO= 2.00000E+00 PERCENT

FREQUENCY (CPS)	ACCELERATION (G,S)	VELOCITY (IPS)	DISPLACEMENT (IN)	MAX. TIME (SECS)
.50000	.22098	27.17987	8.85156	12.22000
.51171	.23459	28.19348	8.76897	12.14000
.52369	.24446	28.70751	8.72459	12.07000
.53595	.25235	28.93628	8.59888	12.01000
.54849	.25880	28.79295	8.35478	11.98000
.56133	.26388	27.35339	7.75550	11.89000
.57448	.26591	27.38554	7.58977	8.12000
.58792	.26234	28.53284	7.99467	8.07000
.60169	.30108	30.77239	8.13972	8.03000
.61578	.31527	31.48844	8.13807	8.74000
.63019	.32584	31.79704	8.03035	8.68000
.64495	.32315	30.81302	7.60382	8.60000
.66004	.30601	28.51178	6.87498	8.54000
.67550	.28866	26.27834	6.19172	12.01000
.69131	.31705	28.20381	6.49309	11.94000
.70750	.32422	28.18216	6.33973	12.53000
.72406	.34682	29.45709	6.47484	12.46000
.74101	.35661	29.59571	6.35880	12.40000
.75836	.33628	27.26980	5.72305	12.32000
.77611	.28882	23.88603	4.85722	6.85000
.79428	.31672	24.52218	4.91385	6.08000
.81288	.35945	27.19405	5.32438	6.03000
.83191	.39150	28.94107	5.53880	5.98000
.85138	.40882	29.53751	5.52184	5.93000
.87132	.40379	28.49862	5.20575	5.88000
.89172	.37340	25.75192	4.58825	5.82000
.91259	.40426	27.24225	4.75102	4.54000
.93386	.43088	28.35854	4.83256	4.49000
.95562	.45080	29.00443	4.82956	4.45000
.97820	.46267	29.10000	4.73463	4.41000
1.00110	.48850	28.85732	4.55594	4.85000
1.02434	.47321	28.40419	4.41240	4.81000
1.04852	.45835	26.88271	4.08052	4.78000
1.07307	.45801	26.24830	3.89308	6.02000
1.09819	.52514	29.40718	4.26182	5.98000
1.12388	.56804	31.08167	4.40145	5.91000
1.15022	.57435	30.70813	4.24908	5.87000
1.17714	.54239	28.33594	3.83114	5.83000
1.20470	.48484	25.25051	3.33588	6.98000
1.23291	.47362	23.62401	3.04981	6.94000
1.26177	.48416	23.59734	2.97848	11.25000
1.29131	.54588	28.00232	3.20481	12.30000
1.32154	.58813	28.48437	3.18955	12.62000
1.35248	.51478	23.40808	2.75434	12.58000
1.38414	.58809	28.12879	3.00440	6.87000
1.41655	.61834	28.89884	3.02195	6.83000
1.44971	.58463	24.80048	2.72289	7.12000
1.48365	.64032	28.54113	2.84713	13.85000
1.51839	.60530	24.51578	2.56871	14.14000
1.55393	.62888	24.81231	2.54129	17.29000
1.59031	.63812	24.59888	2.48178	2.17000
1.62754	.71171	28.88223	2.62975	19.57000
1.66565	.67881	24.88112	2.38888	5.88000
1.70464	.78888	28.74857	2.68413	5.31000
1.74455	.88718	30.58823	2.78882	5.28000
1.78519	.83807	28.88707	2.57329	5.22000

FFTF CRITERIA PULSE . 0.25 0.1S , DT= 0.01 SEC
 NODE POINT= 1 EQUIPMENT DAMPING= 2.00000E-02
 RESPONSE SPECTRA IN 0.8

CALCOMP SPECTRA PLOT READY
TITLE = FFTF CRITERIA PULSE , 0.25 0'S , DT= 0.01 SEC
NODE NO. = 1
DAMPING = 2.00000E+00 PERCENT
PEAK O.S = 1.12333E+00
MAX SCALE = 1.30000E+01 O.S
FIRSTY = 0. O.S
DELTAA = 2.36384E-01 O.S/INCH
FIRSTX = 0.
DELTAX = 1.00000E+00
IPOWER = -1

FILE TO BE PRINTED = FFTF CRITERIA PULSE , 0.25 015 , DT= 0.01 SEC
 NO. OF LETTERS IN TITLE= 80

MAX. RECORD TIME (SEC) = 1.99900E+01
 RECORD TIME INCREMENT (SEC) = 1.00000E-02
 NO. OF RECORDS IN INPUT = 2000
 NO. OF MODE COMPONENTS = 499
 FREQUENCY INTERVAL (CPS) = 2.50125E-02
 MAXIMUM FREQUENCY (CPS) = 1.25000E+01
 MAX. ACCEPTABLE FREQ. (CPS) = 1.25000E+01
 MODE COEF., AMODE = 1.00000E+00

MODE (N)	OMEGA(1/SEC) (N*PI/TMAX)	FREQ (CPS) (OMEGA/2*PI)	COS. COEF. (1/SEC ²)	SIN. COEF. (1/SEC ²)	SUM COEF. (1/SEC ²)	LAG TIME (SEC)
1	1.57158E-01	2.50125E-02	1.83759E-01	5.84735E-03	1.83863E-01	9.76789E+00
2	3.14316E-01	5.00250E-02	4.41902E-01	4.23220E-02	4.43924E-01	4.69372E+00
3	4.71473E-01	7.50375E-02	1.52959E-01	8.86321E-02	1.67650E-01	2.43708E+00
4	6.28633E-01	1.00050E-01	4.00112E-01	1.04320E-01	4.13488E-01	2.09303E+00
5	7.85791E-01	1.25062E-01	6.58092E-02	7.82620E-02	1.00801E-01	9.04115E-01
6	9.42949E-01	1.50075E-01	3.78227E-01	5.89891E-02	3.80977E-01	1.49820E+00
7	1.10011E+00	1.75088E-01	6.38874E-02	5.48753E-02	8.42042E-02	7.82633E-01
8	1.25727E+00	2.00100E-01	4.05794E-01	6.85744E-02	4.11218E-01	1.12004E+00
9	1.41442E+00	2.25113E-01	1.14113E-02	8.00426E-02	8.08520E-02	1.00120E-01
10	1.57158E+00	2.50125E-01	3.83748E-01	-7.30120E-03	3.83816E-01	1.01130E+00
11	1.72874E+00	2.75138E-01	4.71820E-02	2.73027E-02	5.44948E-02	6.05080E-01
12	1.88590E+00	3.00150E-01	5.17821E-01	-3.63188E-02	5.19093E-01	8.70047E-01
13	2.04306E+00	3.25163E-01	9.58373E-02	1.18458E-01	1.50822E-01	3.37029E-01
14	2.20021E+00	3.50175E-01	5.88341E-01	-3.48888E-02	5.89410E-01	7.41778E-01
15	2.35737E+00	3.75188E-01	1.31718E-01	1.70413E-01	2.15384E-01	2.79131E-01
16	2.51453E+00	4.00200E-01	7.44212E-01	-5.23954E-02	7.48054E-01	6.52640E-01
17	2.67168E+00	4.25213E-01	2.29144E-01	4.13940E-01	4.73131E-01	1.89236E-01
18	2.82885E+00	4.50225E-01	1.12238E+00	-3.94420E-02	1.12308E+00	5.67695E-01
19	2.98601E+00	4.75238E-01	5.88948E-01	2.04027E+00	2.12302E+00	9.38098E-02
20	3.14316E+00	5.00250E-01	-1.82731E+00	9.26880E-01	1.87277E+00	-3.35028E-01
21	3.30032E+00	5.25263E-01	-1.18522E+00	-9.55918E-01	1.46883E+00	1.21332E+00
22	3.45748E+00	5.50275E-01	5.88988E-01	-1.53107E+00	1.64388E+00	8.00826E-01
23	3.61464E+00	5.75288E-01	1.84124E+00	-8.83387E-02	1.84338E+00	4.47828E-01
24	3.77180E+00	6.00300E-01	1.05100E+00	1.18897E+00	1.59441E+00	1.90819E-01
25	3.92896E+00	6.25313E-01	3.34741E-01	1.07738E+00	1.12818E+00	7.66719E-02
26	4.08611E+00	6.50325E-01	9.48808E-02	1.50343E+00	1.50842E+00	1.54245E-02
27	4.24327E+00	6.75338E-01	-1.43880E+00	1.15184E+00	1.84133E+00	-2.10915E-01
28	4.40043E+00	7.00350E-01	-1.41350E+00	-6.75223E-01	1.58655E+00	9.88624E-01
29	4.55759E+00	7.25363E-01	1.09730E-01	-1.77532E+00	1.77871E+00	6.75766E-01
30	4.71473E+00	7.50375E-01	2.55842E+00	-2.08418E-01	2.58474E+00	3.50255E-01
31	4.87189E+00	7.75388E-01	4.44808E-01	2.38075E+00	2.42194E+00	3.79125E-02
32	5.02905E+00	8.00400E-01	-5.73153E-01	1.17828E-01	5.85158E-01	-2.71994E-01
33	5.18622E+00	8.25413E-01	1.03721E+00	1.03327E+00	1.46408E+00	1.51807E-01
34	5.34338E+00	8.50425E-01	-4.88775E-01	1.80122E+00	1.88304E+00	-4.70929E-02
35	5.50054E+00	8.75438E-01	-1.13018E+00	1.22743E+00	1.88850E+00	-1.35291E-01
36	5.65770E+00	9.00450E-01	-1.51048E+00	8.89900E-01	1.65075E+00	-2.04248E-01
37	5.81486E+00	9.25463E-01	-1.28231E+00	8.33488E-02	1.38550E+00	-2.58370E-01
38	5.97201E+00	9.50475E-01	-1.75218E+00	-2.37237E-01	1.37284E+00	7.59997E-01
39	6.12917E+00	9.75488E-01	-9.08858E-01	-8.50812E-01	1.11805E+00	6.67514E-01
40	6.28633E+00	1.00050E+00	-8.28378E-01	-2.83284E-01	8.83045E-01	6.97678E-01
41	6.44349E+00	1.02551E+00	-1.35484E+00	-8.88021E-01	1.64090E+00	6.38282E-01
42	6.60064E+00	1.05053E+00	-8.88808E-01	-1.78808E+00	1.89281E+00	5.27339E-01
43	6.75780E+00	1.07554E+00	3.79013E-01	-1.87848E+00	1.91730E+00	4.35438E-01
44	6.91496E+00	1.10055E+00	1.13832E+00	-1.18387E+00	1.84082E+00	3.43690E-01
45	7.07212E+00	1.12556E+00	1.21251E+00	-9.13383E-01	1.51804E+00	3.13488E-01
46	7.22928E+00	1.15058E+00	1.88227E+00	-1.34440E-02	1.92232E+00	2.18247E-01
47	7.38644E+00	1.17559E+00	9.18883E-01	8.83873E-01	1.13426E+00	1.08117E-01
48	7.54359E+00	1.20060E+00	1.40358E+00	5.98188E-01	1.52494E+00	5.52247E-01

FFTF CRITERIA PULSE . 0.25 G'S . DT= 0.01 SEC
 MODE POINT= 1
 FOURIER COMPONENTS IN INCHES/SEC2

CALCOMP FOURIER PLOT READY
 TITLE = FFTF CRITERIA PULSE , 0.25 G'S , DT= 0.01 SEC
 NTITLE = 80
 MODE = 1
 PEAK CCOEF = 3.3088E+00
 PEAK FREQUENCY= 1.2481E+01
 MAX. C SCALE = 3.8000E+01
 DELTAC = 8.5454E-01
 DELTAY = 9.1666E-01
 JPONER = -1
 MAX. F SCALE = 1.3000E+01
 DELTAF = 1.6250E+00
 DELTAX = 1.2307E+00
 IPONER = 0

SOIL OVERBURDEN DATA

NO. OF SOIL LAYERS= 1
DAMPING TYPE = 2
INTERFACE INPUT = 0

TOP MOTION SPECIFIED

IF IDAMP=0, INPUT DAMPING IS ETA (LB-SEC/FT²)
IF IDAMP=1, INPUT DAMPING IS HYSTERETIC DAMPING RATIO
CONVERT TO ELEMENT DAMPING AT FREQ1 CPS
 $ETA = (INPUT\ DAMPING) * GHOD / (PI * FREQ1)$
IF IDAMP=2, INPUT DAMPING IS HYSTERETIC DAMPING
 $ETA = 2 * (INPUT\ DAMPING) * GHOD / OMEGA$
EFFECTIVE MODE DAMPING = $2 * (INPUT\ DAMPING)$

DEPTH TO GWT (FT) = 4.00000E+02
LAYER NO. = 1
UNIT WEIGHT (PCF) = 1.30000E+02
LAYER THICKNESS (FT) = 4.00000E+02
MASS DENSITY = 4.03727E+00
DEPTH TO BOT. OF LAYER = 4.00000E+02
EFFECT. STRESS (PSF) = 2.60000E+04
ZONE NO. OF LAYER = -0

SHEAR MODULUS (PSF) = 1.15600E+07
DAMPING RATIO = 1.00000E-02

SLAVE2 DATA
NO. OF DEPTHS FOR OUTPUT= 3

OUTPUT DEPTH NO.= 1
DEPTH (FT) = 4.00000E+01
INTERFACE BELOW = 1
INTERFACE ABOVE = 0
REL. DEPTH (FT) = 4.00000E+01

OUTPUT DEPTH NO.= 2
DEPTH (FT) = 8.00000E+01
INTERFACE BELOW = 1
INTERFACE ABOVE = 0
REL. DEPTH (FT) = 8.00000E+01

OUTPUT DEPTH NO.= 3
DEPTH (FT) = 4.00000E+02
INTERFACE BELOW = 1
INTERFACE ABOVE = 0
REL. DEPTH (FT) = 4.00000E+02

NO. OF FILES ON TAPE 12= 3

FILE NO.= 1
TITLE = FFTF CRITERIA PULSE , 0.25 G'S , DT= 0.01 SEC
NOMEGA = 499
DFRO = 2.50125E-02

DEPTH 1

FILE NO.= 2
TITLE = FFTF CRITERIA PULSE , 0.25 G'S , DT= 0.01 SEC
NOMEGA = 499
DFRO = 2.50125E-02

DEPTH 2

FILE NO.= 3
TITLE = FFTF CRITERIA PULSE , 0.25 G'S , DT= 0.01 SEC
NOMEGA = 499
DFRO = 2.50125E-02

DEPTH 3

OUTPUT ACCEL. PULSE DATA

TMAX (SEC) = 2.00100E+01
DT (SEC) = 1.00000E-02
NRCD5 = 2000
TSTART (SEC) = 0.
FILE ON 14 = 3

NOMEGA = 499
DFRQ (CPS) = 2.50125E-02

MODE (N)	OMEGA(1/SEC) (N*PI/TMAX)	FREQ (CPS) (OMEGA/2*PI)	COS. COEF. (1/SEC2)	SIN. COEF. (1/SEC2)	SUM COEF. (1/SEC2)	LAG TIME (SEC)
1	1.57158E-01	2.50125E-02	1.63758E-01	5.84728E-03	1.63862E-01	9.76789E+00
2	3.14316E-01	5.00250E-02	4.41800E-01	4.23214E-02	4.43812E-01	4.69372E+00
3	4.71475E-01	7.50375E-02	1.52948E-01	8.88278E-02	1.67840E-01	2.43709E+00
4	6.28633E-01	1.00500E-01	4.00888E-01	1.04308E-01	4.13442E-01	2.09303E+00
5	7.85791E-01	1.25063E-01	6.55881E-02	7.82404E-02	1.00584E-01	8.04120E-01
6	9.42949E-01	1.50075E-01	3.76134E-01	5.99524E-02	3.80882E-01	1.49821E+00
7	1.10011E+00	1.75088E-01	8.38461E-02	5.48563E-02	8.41757E-02	7.82640E-01
8	1.25727E+00	2.00100E-01	4.05615E-01	6.65414E-02	4.11037E-01	1.12004E+00
9	1.41442E+00	2.25113E-01	1.14058E-02	7.98978E-02	8.08068E-02	1.00127E-01
10	1.57158E+00	2.50125E-01	3.93478E-01	-7.30158E-03	3.93544E-01	1.01131E+00
11	1.72874E+00	2.75138E-01	4.71231E-02	2.72782E-02	5.44484E-02	6.05089E-01
12	1.88590E+00	3.00150E-01	5.17308E-01	-3.62938E-02	5.18578E-01	8.70058E-01
13	2.04306E+00	3.25163E-01	9.57283E-02	1.18320E-01	1.50646E-01	3.37041E-01
14	2.20021E+00	3.50175E-01	5.87572E-01	-3.48371E-02	5.68940E-01	7.41791E-01
15	2.35737E+00	3.75188E-01	1.31518E-01	2.15048E-01	2.15048E-01	2.79145E-01
16	2.51453E+00	4.00200E-01	7.42888E-01	-5.23282E-02	7.44737E-01	6.52654E-01
17	2.67168E+00	4.25213E-01	2.28704E-01	4.13108E-01	4.72188E-01	1.89251E-01
18	2.82885E+00	4.50225E-01	1.11888E+00	-3.94040E-02	1.12057E+00	5.67711E-01
19	2.98601E+00	4.75238E-01	5.85588E-01	2.03518E+00	2.11773E+00	9.38266E-02
20	3.14316E+00	5.00250E-01	-1.62277E+00	8.24413E-01	1.88760E+00	-3.35010E-01
21	3.30032E+00	5.25263E-01	-1.11318E+00	-9.52942E-01	1.46536E+00	1.21333E+00
22	3.45748E+00	5.50275E-01	5.98588E-01	-1.52600E+00	1.63848E+00	8.00845E-01
23	3.61464E+00	5.75288E-01	1.83452E+00	-8.81487E-02	1.83864E+00	4.47848E-01
24	3.77180E+00	6.00300E-01	1.04683E+00	1.19413E+00	1.58808E+00	1.90840E-01
25	3.92896E+00	6.25313E-01	3.33391E-01	1.07272E+00	1.12333E+00	7.66939E-02
26	4.08611E+00	6.50325E-01	9.45788E-02	1.49841E+00	1.49841E+00	1.54474E-02
27	4.24327E+00	6.75338E-01	-1.42827E+00	1.14620E+00	1.83210E+00	-2.10891E-01
28	4.40043E+00	7.00350E-01	-1.40600E+00	-8.71422E-01	1.55809E+00	9.69648E-01
29	4.55759E+00	7.25363E-01	1.08888E-01	-1.78505E+00	1.78840E+00	6.75792E-01
30	4.71475E+00	7.50375E-01	2.54054E+00	-2.05453E-01	2.54884E+00	3.50282E-01
31	4.87190E+00	7.75388E-01	4.42178E-01	2.38482E+00	2.40591E+00	3.79398E-02
32	5.02906E+00	8.00400E-01	-5.89082E-01	1.17177E-01	5.81031E-01	-2.71966E-01
33	5.18622E+00	8.25413E-01	1.02988E+00	1.02538E+00	1.45307E+00	1.51836E-01
34	5.34338E+00	8.50425E-01	-4.84580E-01	1.88618E+00	1.94741E+00	-4.70629E-02
35	5.50054E+00	8.75438E-01	-1.12043E+00	1.21728E+00	1.65442E+00	-1.35260E-01
36	5.65770E+00	9.00450E-01	-1.49887E+00	8.60225E-01	1.63601E+00	-2.04216E-01
37	5.81485E+00	9.25463E-01	-1.34844E+00	8.27220E-02	1.35263E+00	-2.58337E-01
38	5.97201E+00	9.50475E-01	-1.33878E+00	-2.34608E-01	1.35918E+00	7.60030E-01
39	6.12917E+00	9.75488E-01	-8.98871E-01	-8.43807E-01	1.10634E+00	6.67549E-01
40	6.28633E+00	1.00050E+00	-8.27228E-01	-2.79860E-01	8.73317E-01	6.97714E-01
41	6.44349E+00	1.02551E+00	-1.33917E+00	-9.14981E-01	1.62181E+00	6.38318E-01
42	6.60064E+00	1.05053E+00	-6.22583E-01	-1.78323E+00	1.86982E+00	5.27376E-01
43	6.75780E+00	1.07554E+00	3.73711E-01	-1.85584E+00	1.88290E+00	4.35476E-01
44	6.91496E+00	1.10055E+00	1.12087E+00	-1.18820E+00	1.61888E+00	3.43729E-01
45	7.07212E+00	1.12556E+00	1.19538E+00	-9.00982E-01	1.48688E+00	3.13440E-01
46	7.22928E+00	1.15058E+00	1.89428E+00	-1.38088E-02	1.89433E+00	2.18291E-01
47	7.38644E+00	1.17559E+00	9.05808E-01	6.53504E-01	1.11702E+00	1.28054E-01
48	7.54360E+00	1.20060E+00	1.38150E+00	5.88285E-01	1.50078E+00	1.55025E-01
49	7.70075E+00	1.22561E+00	4.88813E-01	1.87235E+00	1.93010E+00	3.18466E-02
50	7.85791E+00	1.25063E+00	-5.17548E-01	1.34787E+00	1.44382E+00	-4.66557E-02
51	8.01507E+00	1.27564E+00	-1.78338E+00	7.78940E-01	1.94388E+00	-1.44955E-01
52	8.17223E+00	1.30065E+00	-8.80121E-01	-2.11188E+00	2.22179E+00	4.23071E-01
53	8.32939E+00	1.32566E+00	2.41873E+00	-1.77010E-01	2.41922E+00	1.97377E-01
54	8.48654E+00	1.35068E+00	5.45910E-01	2.11182E+00	2.18133E+00	2.98064E-02
55	8.64370E+00	1.37569E+00	-7.83880E-01	1.18977E+00	1.42220E+00	-6.55789E-02
56	8.80086E+00	1.40070E+00	-8.43132E-01	9.22855E-01	1.12468E+00	-6.91683E-02
57	8.95802E+00	1.42571E+00	-1.44448E+00	9.43872E-01	1.72552E+00	-1.10740E-01
58	9.11518E+00	1.45073E+00	-1.87565E+00	-2.52481E-01	1.89256E+00	5.02304E-01

FFTF CRITERIA PULSE , 0.25 G'S , DT= 0.01 SEC
 NODE POINT= 1
 FOURIER COMPONENTS IN INCHES/SEC2

DEPTH 1

CALCOMP FOURIER PLOT READY
TITLE = FFTF CRITERIA PULSE , 0.25 G'S , DT= 0.01 SEC
NTITLE = 80
NODE = 1

DEPTH 1

PEAK CCOEF = 3.21387E+00
PEAK FREQUENCY= 1.24812E+01

MAX. C SCALE = 3.50000E+01
DELTAC = 6.36364E-01
DELTAY = 9.42857E-01
JPOWER = -1
MAX. F SCALE = 1.30000E+01
DELTAF = 1.62500E+00
DELTAX = 1.23077E+00
IPOWER = 0

.11E-02	.954E-02	.131E-01	.169E-01	.203E-01	.231E-01	.251E-01	.263E-01	.269E-01
.55E-01	.229E-01	.191E-01	.143E-01	.945E-02	.554E-02	.363E-02	.435E-02	.770E-02
.93E-01	.251E-01	.296E-01	.318E-01	.315E-01	.286E-01	.236E-01	.171E-01	.101E-01
.292E-03	.177E-03	.433E-02	.126E-01	.237E-01	.360E-01	.475E-01	.564E-01	.620E-01
.637E-01	.618E-01	.594E-01	.571E-01	.552E-01	.534E-01	.515E-01	.492E-01	.464E-01
.395E-01	.355E-01	.312E-01	.268E-01	.228E-01	.196E-01	.176E-01	.171E-01	.180E-01
.228E-01	.254E-01	.275E-01	.288E-01	.292E-01	.286E-01	.271E-01	.245E-01	.208E-01
.104E-01	.437E-02	.150E-02	.668E-02	.108E-01	.138E-01	.159E-01	.178E-01	.187E-01
.209E-01	.216E-01	.214E-01	.201E-01	.171E-01	.121E-01	.507E-02	.390E-02	.141E-01
.338E-01	.405E-01	.434E-01	.418E-01	.356E-01	.253E-01	.119E-01	.347E-02	.197E-01
.503E-01	.626E-01	.718E-01	.773E-01	.787E-01	.762E-01	.701E-01	.611E-01	.498E-01
.220E-01	.647E-02	.922E-02	.240E-01	.368E-01	.457E-01	.504E-01	.504E-01	.462E-01
.290E-01	.182E-01	.698E-02	.471E-02	.168E-01	.297E-01	.430E-01	.563E-01	.689E-01
.898E-01	.970E-01	.101E+00	.103E+00	.100E+00	.944E-01	.851E-01	.732E-01	.601E-01
.360E-01	.272E-01	.209E-01	.168E-01	.140E-01	.125E-01	.124E-01	.138E-01	.171E-01
.270E-01	.312E-01	.327E-01	.303E-01	.236E-01	.131E-01	.245E-03	.135E-01	.268E-01
.495E-01	.567E-01	.634E-01	.693E-01	.753E-01	.824E-01	.918E-01	.104E+00	.120E+00
.154E+00	.169E+00	.178E+00	.180E+00	.175E+00	.165E+00	.153E+00	.141E+00	.134E+00
.130E+00	.132E+00	.133E+00	.130E+00	.121E+00	.105E+00	.813E-01	.498E-01	.121E-01
.739E-01	.116E+00	.154E+00	.185E+00	.208E+00	.224E+00	.234E+00	.240E+00	.242E+00
.237E+00	.228E+00	.218E+00	.198E+00	.181E+00	.162E+00	.142E+00	.123E+00	.104E+00
.604E-01	.348E-01	.709E-02	.220E-01	.514E-01	.803E-01	.108E+00	.135E+00	.159E+00
.196E+00	.204E+00	.202E+00	.188E+00	.185E+00	.130E+00	.853E-01	.343E-01	.199E-01
.124E+00	.166E+00	.198E+00	.217E+00	.222E+00	.215E+00	.198E+00	.187E+00	.131E+00
.464E-01	.285E-02	.377E-01	.720E-01	.971E-01	.111E+00	.113E+00	.104E+00	.863E-01
.432E-01	.249E-01	.122E-01	.848E-02	.768E-02	.152E-01	.275E-01	.431E-01	.599E-01
.908E-01	.102E+00	.111E+00	.118E+00	.123E+00	.127E+00	.130E+00	.130E+00	.126E+00
.100E+00	.794E-01	.552E-01	.302E-01	.694E-02	.130E-01	.290E-01	.408E-01	.485E-01
.518E-01	.470E-01	.380E-01	.260E-01	.126E-01	.261E-03	.111E-01	.189E-01	.239E-01
.277E-01	.277E-01	.264E-01	.235E-01	.187E-01	.123E-01	.518E-02	.145E-02	.654E-02
.109E-01	.114E-01	.120E-01	.137E-01	.168E-01	.220E-01	.290E-01	.380E-01	.490E-01
.751E-01	.873E-01	.961E-01	.996E-01	.989E-01	.980E-01	.972E-01	.991E-01	.954E-01
.559E-01	.592E-01	.630E-01	.654E-01	.654E-01	.628E-01	.578E-01	.508E-01	.417E-01
.148E-01	.288E-02	.219E-01	.399E-01	.545E-01	.636E-01	.685E-01	.637E-01	.565E-01
.352E-01	.234E-01	.119E-01	.182E-02	.553E-02	.844E-02	.550E-02	.376E-02	.184E-01
.545E-01	.703E-01	.819E-01	.889E-01	.920E-01	.921E-01	.902E-01	.885E-01	.805E-01
.609E-01	.480E-01	.347E-01	.225E-01	.126E-01	.535E-02	.487E-03	.283E-02	.536E-02
.919E-02	.100E-01	.958E-02	.770E-02	.441E-02	.118E-03	.576E-02	.125E-01	.203E-01
.373E-01	.445E-01	.488E-01	.482E-01	.422E-01	.304E-01	.134E-01	.740E-02	.303E-01
.741E-01	.908E-01	.101E+00	.105E+00	.100E+00	.882E-01	.709E-01	.505E-01	.296E-01
.673E-02	.209E-01	.330E-01	.435E-01	.530E-01	.611E-01	.674E-01	.713E-01	.724E-01
.663E-01	.592E-01	.489E-01	.350E-01	.171E-01	.454E-02	.287E-01	.535E-01	.767E-01
.112E+00	.124E+00	.134E+00	.141E+00	.148E+00	.152E+00	.153E+00	.150E+00	.143E+00
.117E+00	.101E+00	.838E-01	.655E-01	.456E-01	.237E-01	.294E-03	.230E-01	.433E-01
.644E-01	.628E-01	.537E-01	.403E-01	.252E-01	.109E-01	.136E-02	.111E-01	.187E-01
.267E-01	.260E-01	.208E-01	.108E-01	.437E-02	.230E-01	.435E-01	.640E-01	.822E-01
.105E+00	.108E+00	.991E-01	.842E-01	.627E-01	.376E-01	.130E-01	.683E-02	.182E-01
.113E-01	.278E-02	.181E-01	.293E-01	.323E-01	.247E-01	.638E-02	.207E-01	.529E-01
.117E+00	.141E+00	.157E+00	.184E+00	.182E+00	.153E+00	.139E+00	.121E+00	.100E+00
.462E-01	.329E-01	.912E-02	.148E-01	.380E-01	.593E-01	.774E-01	.915E-01	.101E+00
.78E+00	.108E+00	.104E+00	.101E+00	.998E-01	.100E+00	.103E+00	.108E+00	.113E+00
.10E+00	.118E+00	.111E+00	.101E+00	.887E-01	.757E-01	.637E-01	.464E-01	.417E-01
.97E-01	.404E-01	.440E-01	.504E-01	.584E-01	.701E-01	.810E-01	.905E-01	.969E-01
.910E-01	.903E-01	.798E-01	.685E-01	.513E-01	.358E-01	.210E-01	.930E-02	.198E-02
.944E-02	.914E-02	.181E-01	.208E-01	.204E-01	.137E-01	.871E-03	.165E-01	.358E-01
.856E-01	.798E-01	.843E-01	.830E-01	.758E-01	.638E-01	.488E-01	.328E-01	.189E-01
.11E+00	.138E-01	.278E-01	.475E-01	.707E-01	.941E-01	.115E+00	.132E+00	.142E+00
.11E+00	.134E+00	.119E+00	.101E+00	.805E-01	.618E-01	.467E-01	.367E-01	.320E-01
.10E+00	.354E-01	.358E-01	.334E-01	.278E-01	.187E-01	.878E-02	.817E-03	.110E-01
.11E+00	.269E-01	.242E-01	.172E-01	.888E-02	.487E-02	.183E-01	.251E-01	.312E-01
.11E+00	.313E-01	.287E-01	.287E-01	.287E-01	.313E-01	.362E-01	.362E-01	.372E-01
.11E+00	.258E-01	.182E-01	.441E-02	.844E-02	.202E-01	.297E-01	.356E-01	.373E-01
.11E+00	.144E-01	.812E-02	.104E-02	.628E-02	.148E-01	.245E-01	.463E-01	.463E-01

CALCOMP MOTION HISTORY READY
 TITLE = FFTF CRITERIA PULSE , 0.25 0'S , DT= 0.01 SEC
 NTITLE = 80
 NODE = 1
 MAX. G.S= 2.03840E-01
 MIN. G.S= -2.42486E-01
 TMAX = 1.99900E+01
 DT = 1.00000E-02
 NRCDS = 2000
 YI = -3.00000E-01
 DELTAY = 1.00000E-01
 TI = 0.
 DELTAT = 2.49875E+00

DEPTH 1

NO. OF INPUT RECORDS	=	2000
FINAL DISPLACEMENT (IN.)	=	.71131E+02
FINAL VELOCITY (IN/SEC)	=	.39480E+01
PEAK ACCELERATION (G.S)	=	.24248E+00
NO. OF RECORDS ADDED	=	44
FINAL NO. OF RECORDS	=	2044
FINAL VELOCITY (IN/SEC)	=	0.
FINAL DISPLACEMENT (IN.)	=	.71958E+02
TMAX. (DURATION, SECS)	=	.20430E+02

SCALE RATIO= 2.00000E+00 PERCENT

FREQUENCY (CPS)	ACCELERATION (G,S)	VELOCITY (IPS)	DISPLACEMENT (IN)	MAX. TIME (SECS)
.50000	.22096	27.17683	8.65065	12.22000
.51171	.23478	28.21564	8.77686	12.14000
.52369	.24460	28.72412	8.72864	12.07000
.53595	.25232	28.95265	8.59781	12.01000
.54849	.25816	28.72062	8.33377	11.95000
.56133	.24895	27.27403	7.73300	11.89000
.57448	.25511	27.30917	7.56584	8.12000
.58792	.26090	29.38286	7.95413	8.07000
.60169	.26852	30.61285	8.09752	8.03000
.61578	.31304	31.26358	8.08047	8.74000
.63019	.32339	31.55791	7.96995	8.66000
.64495	.32995	30.60395	7.55213	8.60000
.66004	.30420	28.34317	6.83432	8.54000
.67550	.28787	26.18933	6.17051	12.01000
.69131	.31596	28.10729	6.47091	11.94000
.70750	.32254	28.03801	6.30685	12.54000
.72406	.34394	29.21237	6.42115	12.46000
.74101	.35329	29.32021	6.29742	12.40000
.75836	.33292	26.99725	5.66585	12.32000
.77611	.29547	23.41263	4.80115	6.84000
.79428	.31460	24.35783	4.88072	6.08000
.81288	.35683	26.99586	5.26557	6.03000
.83191	.38907	28.76131	5.50241	5.98000
.85138	.40611	29.33400	5.48360	5.93000
.87132	.40120	28.31669	5.17233	5.88000
.89172	.37185	25.84509	4.57718	5.82000
.91259	.40171	27.07031	4.72103	4.54000
.93396	.42833	28.20380	4.80619	4.49000
.95582	.44805	28.82766	4.80012	4.45000
.97820	.45861	28.83180	4.69099	4.41000
1.00110	.46014	28.26634	4.49378	4.85000
1.02454	.46560	27.94729	4.34142	4.81000
1.04852	.45149	26.48068	4.01949	4.78000
1.07307	.45339	25.98348	3.85380	6.02000
1.09819	.51905	29.06626	4.21241	5.86000
1.12390	.55942	30.61032	4.33470	5.92000
1.15022	.56548	30.23374	4.18343	5.87000
1.17714	.53455	27.82670	3.77581	5.83000
1.20470	.48368	24.89070	3.26193	6.98000
1.23291	.46428	23.15832	2.98949	6.94000
1.26177	.47577	23.18837	2.92489	11.25000
1.29131	.53501	25.47955	3.14038	12.30000
1.32154	.55854	25.99128	3.13017	12.62000
1.35248	.50389	22.90275	2.69511	12.56000
1.38414	.57464	25.53124	2.93570	6.87000
1.41655	.60622	26.31803	2.95684	6.83000
1.44971	.57105	24.22405	2.65941	7.12000
1.48365	.62554	25.92884	2.78143	13.88000
1.51839	.58497	23.69234	2.48340	14.14000
1.55393	.60939	24.11700	2.47008	17.29000
1.59031	.61565	23.80707	2.38256	15.95000
1.62754	.68208	26.15061	2.55723	15.57000
1.66565	.66114	24.41009	2.33242	5.68000
1.70464	.77448	27.94054	2.80868	5.31000
1.74455	.83938	29.58900	2.89940	5.26000
1.78539	.80895	27.88407	2.48388	5.22000

FFT CRITERIA PULSE, 0.25 G+S , DT= 0.01 SEC DEPTH 1
 NOISE POINT= 1 EQUIPMENT DAMPING= 2.00000E-02
 RESPONSE SPECTRA IN G+S

Figure 3

IMP SPECTRA PLOT READY

FILE = FFTF CRITERIA PULSE , 0.25 G'S , DT= 0.01 SEC

DEPTH 1

NO. = 1

AMPLING = 2.00000E+00 PERCENT

PEAK G.S = 1.02542E+00

MAX SCALE = 1.20000E+01 G.S

FIRSTY = 0. G.S

DELTA A = 2.18182E-01 G.S/INCH

FIRSTX = 0.

DELTA X = 1.00000E+00

POWER = -1

OMEGA = 499
FREQ (CPS) = 2.50125E-02

ULPIN 2

	OMEGA(1/SEC) (N*PI/TMAX)	FREQ (CPS) (OMEGA/2*PI)	COS. COEF. (1N/SEC2)	SIN. COEF. (1N/SEC2)	SUM COEF. (1N/SEC2)	LAG TIME (SEC)
1	1.57158E-01	2.50125E-02	1.63754E-01	5.84710E-03	1.63859E-01	9.76790E+00
2	3.14316E-01	5.00250E-02	4.41853E-01	4.23172E-02	4.43875E-01	4.69373E+00
3	4.71475E-01	7.50375E-02	1.52821E-01	6.86143E-02	1.67609E-01	2.43710E+00
4	6.28633E-01	1.00050E-01	3.99938E-01	1.04271E-01	4.13306E-01	2.09304E+00
5	7.85791E-01	1.25083E-01	6.55650E-02	7.62093E-02	1.00532E-01	9.04133E-01
6	9.42949E-01	1.50075E-01	3.75855E-01	5.98021E-02	3.80588E-01	1.49822E+00
7	1.10011E+00	1.75088E-01	6.37825E-02	5.47994E-02	8.40903E-02	7.82658E-01
8	1.25727E+00	2.00100E-01	4.05080E-01	6.64425E-02	4.10493E-01	1.12007E+00
9	1.41442E+00	2.25113E-01	1.13894E-02	7.98633E-02	8.06713E-02	1.00151E+00
10	1.57158E+00	2.50125E-01	3.92662E-01	-7.30277E-03	3.92730E-01	1.01133E+00
11	1.72874E+00	2.75138E-01	4.70065E-02	2.72085E-02	5.43131E-02	6.05118E-01
12	1.88590E+00	3.00150E-01	5.15762E-01	-3.62165E-02	5.17032E-01	8.70090E-01
13	2.04306E+00	3.25163E-01	9.54018E-02	1.15906E-01	1.50119E-01	3.37075E-01
14	2.20021E+00	3.50175E-01	5.65267E-01	-3.47419E-02	5.66333E-01	7.41828E-01
15	2.35737E+00	3.75188E-01	1.30922E-01	1.69340E-01	2.14048E-01	2.79184E-01
16	2.51453E+00	4.00200E-01	7.38954E-01	-5.21307E-02	7.40791E-01	6.52697E-01
17	2.67169E+00	4.25213E-01	2.27385E-01	4.10607E-01	4.69384E-01	1.89296E-01
18	2.82885E+00	4.50225E-01	1.11236E+00	-3.92900E-02	1.11306E+00	5.67759E-01
19	2.98601E+00	4.75238E-01	5.81514E-01	2.01986E+00	2.10191E+00	9.38770E-02
20	3.14316E+00	5.00250E-01	-1.60918E+00	9.17027E-01	1.85213E+00	-3.34957E-01
21	3.30032E+00	5.25263E-01	-1.10319E+00	-9.44037E-01	1.45198E+00	1.21339E+00
22	3.45748E+00	5.50275E-01	5.90313E-01	-1.51083E+00	1.62206E+00	8.00904E-01
23	3.61464E+00	5.75288E-01	1.81441E+00	-8.75853E-02	1.81652E+00	4.47909E-01
24	3.77180E+00	6.00300E-01	1.03472E+00	1.17963E+00	1.56914E+00	1.90904E-01
25	3.92896E+00	6.25313E-01	3.29354E-01	1.05875E+00	1.10879E+00	7.67607E-02
26	4.08611E+00	6.50325E-01	9.36741E-02	1.47544E+00	1.47841E+00	1.55169E-02
27	4.24327E+00	6.75338E-01	-1.40734E+00	1.12932E+00	1.80443E+00	-2.10819E-01
28	4.40043E+00	7.00350E-01	-1.38339E+00	-6.60062E-01	1.53278E+00	9.69723E-01
29	4.55759E+00	7.25363E-01	1.06378E-01	-1.73434E+00	1.73760E+00	6.75869E-01
30	4.71475E+00	7.50375E-01	2.49310E+00	-2.02571E-01	2.50132E+00	3.50363E-01
31	4.87190E+00	7.75388E-01	4.34317E-01	2.31766E+00	2.35801E+00	3.80233E-02
32	5.02906E+00	8.00400E-01	-5.56869E-01	1.14933E-01	5.68704E-01	-2.71879E-01
33	5.18622E+00	8.25413E-01	1.06882E+00	1.00176E+00	1.42029E+00	1.51925E-01
34	5.34338E+00	8.50425E-01	-4.72067E-01	1.84121E+00	1.90076E+00	-4.69710E-02
35	5.50054E+00	8.75438E-01	-1.09137E+00	1.18693E+00	1.61242E+00	-1.35165E-01
36	5.65770E+00	9.00450E-01	-1.45631E+00	6.43297E-01	1.59207E+00	-2.04119E-01
37	5.81485E+00	9.25463E-01	-1.31110E+00	9.08580E-02	1.31425E+00	-2.58237E-01
38	5.97201E+00	9.50475E-01	-1.29886E+00	-2.26784E-01	1.31851E+00	7.60134E-01
39	6.12917E+00	9.75488E-01	-8.71903E-01	-6.22745E-01	1.07146E+00	6.67655E-01
40	6.28633E+00	1.00050E+00	-7.99873E-01	-2.70123E-01	8.44348E-01	6.97823E-01
41	6.44349E+00	1.02551E+00	-1.28314E+00	-8.82164E-01	1.66538E+00	6.38430E-01
42	6.60064E+00	1.05053E+00	-6.01111E-01	-1.69828E+00	1.80152E+00	5.27492E-01
43	6.75780E+00	1.07554E+00	3.57955E-01	-1.78477E+00	1.82031E+00	4.35594E-01
44	6.91496E+00	1.10055E+00	1.07492E+00	-1.12220E+00	1.55395E+00	3.43850E-01
45	7.07212E+00	1.12556E+00	1.14438E+00	-8.64153E-01	1.43401E+00	3.13564E-01
46	7.22928E+00	1.15058E+00	1.81111E+00	-1.48678E-02	1.81118E+00	2.18418E-01
47	7.38644E+00	1.17559E+00	8.84988E-01	6.22720E-01	1.06583E+00	1.28185E-01
48	7.54359E+00	1.20060E+00	1.31602E+00	5.56841E-01	1.42902E+00	1.55158E-01
49	7.70075E+00	1.22561E+00	4.47135E-01	1.77858E+00	1.83393E+00	3.19832E-02
50	7.85791E+00	1.25063E+00	-4.89292E-01	1.27847E+00	1.36890E+00	-4.65160E-02
51	8.01507E+00	1.27564E+00	-1.68828E+00	7.33141E-01	1.83874E+00	-1.44812E-01
52	8.17223E+00	1.30065E+00	-8.53780E-01	-1.99257E+00	2.09707E+00	4.23217E-01
53	8.32939E+00	1.32566E+00	2.27181E+00	-1.88510E-01	2.27813E+00	1.97526E-01
54	8.48654E+00	1.35068E+00	5.15421E-01	1.98338E+00	2.04925E+00	2.99588E-02
55	8.64370E+00	1.37569E+00	-7.14191E-01	1.12538E+00	1.33285E+00	-6.54232E-02
56	8.80086E+00	1.40070E+00	-8.00034E-01	8.83397E-01	1.05143E+00	-6.90093E-02
57	8.95802E+00	1.42571E+00	-1.34571E+00	8.82125E-01	1.60907E+00	-1.10578E-01
58	9.11518E+00	1.45073E+00	-1.74491E+00	-2.32202E-01	1.76029E+00	5.02444E-01

FFTF CRITERIA PULSE . 0.25 015 . DT= 0.01 SEC
NODE POINT= 1
FOURIER COMPONENTS IN INCHES/SEC2

DEPTH 2

FOURIER PLOT READY
= FFTF CRITERIA PULSE , 0.25 G'S , DT= 0.01 SEC
= 80
= 1

DEPTH 2

PEAK CCOEF = 2.93146E+00
PEAK FREQUENCY= 1.24812E+01

MAX. C SCALE = 3.20000E+01
DELTAC = 5.81818E-01
DELTAY = 1.03125E+00
JPOWER = -1
MAX. F SCALE = 1.30000E+01
DELTAF = 1.62500E+00
DELTAX = 1.23077E+00
IPOWER = 0

127E-01	170E-01	200E-01	210E-01	199E-01	174E-01	150E-01	137E-01	138E-01
156E-01	158E-01	154E-01	154E-01	168E-01	201E-01	249E-01	291E-01	307E-01
208E-01	110E-01	158E-02	414E-02	407E-02	202E-02	124E-01	240E-01	340E-01
426E-01	412E-01	375E-01	331E-01	200E-01	261E-01	255E-01	278E-01	336E-01
534E-01	634E-01	697E-01	700E-01	638E-01	527E-01	402E-01	299E-01	250E-01
313E-01	377E-01	417E-01	412E-01	383E-01	288E-01	218E-01	179E-01	179E-01
256E-01	268E-01	285E-01	248E-01	180E-01	128E-01	803E-02	580E-02	604E-02
914E-02	900E-02	643E-02	145E-02	518E-02	121E-01	179E-01	215E-01	223E-01
159E-01	101E-01	373E-02	251E-02	811E-02	127E-01	160E-01	176E-01	172E-01
976E-02	388E-02	186E-02	661E-02	838E-02	105E-01	112E-01	129E-01	170E-01
326E-01	414E-01	481E-01	510E-01	488E-01	444E-01	388E-01	284E-01	203E-01
631E-02	454E-03	453E-02	828E-02	105E-01	114E-01	116E-01	119E-01	130E-01
144E-01	111E-01	258E-02	116E-01	287E-01	484E-01	638E-01	730E-01	751E-01
659E-01	611E-01	597E-01	618E-01	681E-01	688E-01	708E-01	679E-01	617E-01
450E-01	374E-01	314E-01	272E-01	248E-01	242E-01	253E-01	269E-01	276E-01
186E-01	768E-02	563E-02	178E-01	252E-01	258E-01	204E-01	124E-01	737E-02
233E-01	458E-01	735E-01	100E+00	122E+00	134E+00	138E+00	136E+00	130E+00
119E+00	117E+00	118E+00	124E+00	134E+00	148E+00	165E+00	178E+00	183E+00
149E+00	113E+00	716E-01	333E-01	468E-02	115E-01	175E-01	194E-01	242E-01
611E-01	925E-01	127E+00	159E+00	184E+00	200E+00	208E+00	211E+00	208E+00
195E+00	186E+00	177E+00	168E+00	157E+00	145E+00	128E+00	105E+00	762E-01
905E-02	212E-01	447E-01	611E-01	728E-01	841E-01	978E-01	115E+00	132E+00
144E+00	130E+00	101E+00	641E-01	265E-01	383E-02	222E-01	312E-01	337E-01
474E-01	681E-01	906E-01	115E+00	131E+00	133E+00	120E+00	936E-01	607E-01
641E-02	409E-02	308E-02	470E-02	116E-01	105E-01	280E-02	278E-01	590E-01
106E+00	108E+00	934E-01	687E-01	428E-01	258E-01	233E-01	361E-01	591E-01
104E+00	114E+00	107E+00	107E+00	980E-01	911E-01	868E-01	830E-01	771E-01
538E-01	395E-01	277E-01	204E-01	172E-01	154E-01	117E-01	413E-02	688E-02
265E-01	263E-01	235E-01	144E-01	500E-02	138E-02	343E-02	237E-02	103E-02
629E-02	125E-01	177E-01	194E-01	164E-01	101E-01	303E-02	205E-02	393E-02
372E-02	719E-02	157E-01	288E-01	441E-01	582E-01	682E-01	723E-01	705E-01
557E-01	423E-01	426E-01	499E-01	641E-01	826E-01	100E+00	111E+00	111E+00
934E-01	669E-01	371E-01	135E-02	763E-02	222E-01	372E-01	424E-01	424E-01
730E-02	231E-01	473E-01	557E-01	455E-01	220E-01	329E-02	179E-01	144E-01
361E-02	622E-01	745E-01	691E-01	503E-01	281E-01	130E-01	119E-01	245E-01
641E-02	351E-01	720E-01	630E-01	524E-01	465E-01	479E-01	552E-01	634E-01
446E-01	629E-01	512E-01	354E-01	206E-01	104E-01	617E-02	805E-02	816E-02
671E-01	700E-03	370E-02	510E-02	182E-02	610E-02	169E-01	351E-01	372E-01
229E-01	923E-02	523E-02	177E-01	282E-01	302E-01	306E-01	293E-01	285E-01
324E-01	363E-01	395E-01	411E-01	409E-01	395E-01	378E-01	358E-01	324E-01
129E-01	528E-02	271E-01	481E-01	632E-01	687E-01	637E-01	509E-01	354E-01
136E-01	956E-02	673E-02	989E-03	103E-01	270E-01	462E-01	640E-01	777E-01
941E-01	102E+00	112E+00	124E+00	134E+00	138E+00	133E+00	119E+00	101E+00
682E-01	682E-01	594E-01	534E-01	458E-01	163E-01	188E-02	151E-01	186E-01
806E-03	115E-01	130E-01	213E-02	178E-01	382E-01	494E-01	449E-01	256E-01
213E-01	258E-01	970E-02	229E-01	604E-01	887E-01	971E-01	827E-01	514E-01
106E-01	181E-01	443E-02	248E-01	582E-01	870E-01	997E-01	943E-01	727E-01
544E-02	271E-01	529E-01	702E-01	788E-01	800E-01	754E-01	677E-01	599E-01
559E-01	634E-01	770E-01	937E-01	108E+00	118E+00	117E+00	104E+00	804E-01
198E-01	857E-02	368E-01	342E-01	368E-01	362E-01	380E-01	455E-01	598E-01
997E-01	117E+00	127E+00	129E+00	125E+00	116E+00	106E+00	980E-01	918E-01
837E-01	805E-01	778E-01	785E-01	767E-01	782E-01	795E-01	791E-01	759E-01
643E-01	605E-01	609E-01	655E-01	724E-01	781E-01	793E-01	743E-01	640E-01
414E-01	388E-01	382E-01	447E-01	528E-01	587E-01	598E-01	551E-01	451E-01
151E-01	227E-02	198E-01	353E-01	471E-01	527E-01	509E-01	420E-01	291E-01
936E-02	101E-01	188E-01	325E-01	487E-01	573E-01	627E-01	640E-01	641E-01
724E-01	808E-01	887E-01	924E-01	900E-01	844E-01	728E-01	659E-01	651E-01
824E-01	943E-01	103E+00	105E+00	100E+00	904E-01	780E-01	649E-01	523E-01
272E-01	147E-01	333E-02	491E-02	838E-02	654E-02	450E-03	755E-02	147E-01
189E-01	156E-01	102E-01	447E-02	428E-03	355E-02	428E-02	203E-02	368E-02
248E-01	375E-01	478E-01	530E-01	511E-01	421E-01	280E-01	126E-01	254E-01
914E-02	558E-02	258E-03	548E-02	794E-02	683E-02	261E-02	345E-02	954E-02
183E-01	182E-01	140E-01	527E-02	800E-02	246E-01	423E-01	581E-01	...

1	.164E-01	.231E-01	.329E-01	.431E-01	.527E-01	.597E-01	.630E-01	.625E-01	.587E-01
2	.460E-01	.401E-01	.358E-01	.332E-01	.315E-01	.293E-01	.250E-01	.179E-01	.865E-01
3	-.916E-02	-.133E-01	-.129E-01	-.854E-02	-.241E-02	.303E-02	.592E-02	.577E-02	.345E-02
4	-.782E-03	-.249E-03	.208E-02	.520E-02	.819E-02	.107E-01	.129E-01	.157E-01	.193E-01
5	.259E-01	.260E-01	.229E-01	.160E-01	.831E-02	.224E-02	.889E-04	.268E-02	.888E-02

SP PUNCHING OUTPUT ACCEL., G.S

• ALCOMP SPECTRA PLOT READY
 TITLE = FFTF CRITERIA PULSE , 0.25 0'S , DT= 0.01 SEC
 NODE NO. = 1
 DAMPING = 2.00000E+00 PERCENT
 PEAK G.S = 8.16977E-01
 MAX SCALE = 9.90000E+01 0.S
 FIRSTY = 0. 0.S
 DELTAA = 1.78182E-01 0.S/INCH
 FIRSTX = 0.
 DELTAX = 1.00000E+00
 IPOWER = -2

DEPTH 2

NO. OF INPUT RECORDS	=	2000
FINAL DISPLACEMENT (IN.)	=	.69698E+02
FINAL VELOCITY (IN/SEC)	=	.37004E+01
PEAK ACCELERATION (G.S)	=	.21091E+00
NO. OF RECORDS ADDED	=	47
FINAL NO. OF RECORDS	=	2047
FINAL VELOCITY (IN/SEC)	=	0.
FINAL DISPLACEMENT (IN.)	=	.70527E+02
TMAX. (DURATION, SECS)	=	.20460E+02

• AMPLING RATIO= 2.00000E+00 PERCENT

FREQUENCY (CPS)	ACCELERATION (G,S)	VELOCITY (IPS)	DISPLACEMENT (IN)	MAX. TIME (SECS)
.50000	.21913	26.95209	8.57912	12.22000
.51171	.23278	27.97601	8.70133	12.14000
.52369	.24215	28.43617	8.84213	12.07000
.53595	.24945	28.62317	8.49996	12.01000
.54849	.25258	28.31960	8.21743	11.95000
.56133	.24587	26.93631	7.63725	11.89000
.57448	.25180	26.95525	7.46779	8.12000
.58792	.27663	28.93535	7.83288	8.08000
.60169	.29507	30.15834	7.97729	8.02000
.61578	.30948	30.80736	7.98840	8.74000
.63019	.31888	31.11770	7.85678	8.68000
.64495	.31625	30.15556	7.44157	8.60000
.66004	.29970	27.82352	6.73313	8.54000
.67550	.28263	25.73046	6.06240	12.01000
.69131	.30997	27.57438	6.34823	11.94000
.70750	.31806	27.64681	6.21930	12.54000
.72406	.33688	28.61256	6.28931	12.48000
.74101	.34587	28.70390	6.18505	12.39000
.75836	.32584	26.42290	5.54531	12.32000
.77611	.28914	22.91113	4.88831	6.84000
.79428	.30857	23.89115	4.78721	6.08000
.81288	.34937	26.43158	5.17509	6.03000
.83191	.38103	28.16717	5.38875	5.98000
.85138	.39631	28.62667	5.35137	5.93000
.87132	.39116	27.60802	5.04289	5.87000
.89172	.36354	25.07132	4.47477	5.82000
.91259	.39090	26.34196	4.59401	4.53000
.93386	.41740	27.48450	4.68362	4.49000
.95562	.43509	27.99347	4.66122	4.45000
.97820	.44242	27.81398	4.52539	4.41000
1.00110	.44076	27.07557	4.30448	4.37000
1.02434	.44386	26.64223	4.13869	4.81000
1.04792	.43280	25.38432	3.85308	4.77000
1.07307	.43708	25.04918	3.71523	6.02000
1.09819	.49202	27.94445	4.04883	5.97000
1.12390	.53451	29.24740	4.14170	5.92000
1.15022	.53986	28.88442	3.98396	5.87000
1.17714	.51133	26.71329	3.81175	5.83000
1.20470	.45518	23.23576	3.06971	6.98000
1.23291	.43781	21.83815	2.81907	6.94000
1.26177	.44889	21.88857	2.75842	11.25000
1.29131	.50400	24.00257	2.95834	12.30000
1.32154	.52585	24.46114	2.94589	12.62000
1.35248	.47015	21.37761	2.51584	12.58000
1.38414	.53721	23.88826	2.74448	6.87000
1.41655	.58700	24.81340	2.78584	6.83000
1.44971	.52731	22.38858	2.45971	7.13000
1.48385	.58019	24.04811	2.57881	13.88000
1.51870	.52837	21.40009	2.24313	14.14000
1.55393	.55889	22.15005	2.28882	17.29000
1.59031	.58541	21.88448	2.18815	15.94000
1.62784	.63210	23.88423	2.37580	15.57000
1.66655	.61162	22.58148	2.15789	5.86000
1.70644	.70895	25.93478	2.38584	5.31000
1.74752	.76206	26.88348	2.45075	5.28000
1.78989	.72762	25.08249	2.23414	5.22000

REF. CRITERIA-PULSE, 0.20-G/S, DIF=0.01 SEC
ACCE POINT= 1 EQUIPMENT DAMPING= 2.0000E-02
RESPONSE SPECTRA IN G/S

DEPTH 2

AMP MOTION HISTORY READY
PULSE = FFTF CRITERIA PULSE . 0.25 G'S . DT= 0.01 SEC
SCALE = 80
MODE = 1

DETA 2

MAX. G.S= 1.82691E-01
MIN. G.S= -2.10914E-01
THAX = 1.99900E+01
DT = 1.00000E-02
NRCDS = 2000
YI = -3.00000E-01
DELTAY = 1.00000E-01
TI = 0.
DELTAT = 2.49875E+00

PULSE . 0.25 G'S . DT= 0.01 SEC
 MEJA . 499
 CPS . 2.50125E-02

DEPTH 3

	OMEGA (1/SEC) (IN/P1/TMAX)	FREQ (CPS) (OMEGA/2*P1)	COS. COEF. (IN/SEC2)	SIN. COEF. (IN/SEC2)	SUM COEF. (IN/SEC2)	LAG TIME (SEC)
1	1.57158E-01	2.50125E-02	1.63848E-01	6.84108E-03	1.63750E-01	9.76798E+00
2	3.14316E-01	5.00250E-02	4.40888E-01	4.21817E-02	4.42700E-01	4.69390E+00
3	4.71474E-01	7.50375E-02	1.62018E-01	8.81878E-02	1.66811E-01	2.43735E+00
4	6.28632E-01	1.00060E-01	3.88787E-01	1.03083E-01	4.08933E-01	2.09338E+00
5	7.85791E-01	1.25085E-01	6.46071E-02	7.49889E-02	9.88712E-02	9.04559E-01
6	9.42949E-01	1.50078E-01	3.88853E-01	5.83008E-02	3.71555E-01	1.49874E+00
7	1.10011E+00	1.75088E-01	6.17878E-02	5.28883E-02	8.13741E-02	7.83262E-01
8	1.25727E+00	2.00108E-01	3.88088E-01	6.33038E-02	3.93198E-01	1.12076E+00
9	1.41443E+00	2.25113E-01	1.08874E-02	7.65883E-02	7.63784E-02	1.00940E-01
10	1.57158E+00	2.50125E-01	3.88888E-01	-7.33413E-03	3.88882E-01	1.01222E+00
11	1.72874E+00	2.75138E-01	4.33844E-02	2.48788E-02	5.00895E-02	6.06103E-01
12	1.88590E+00	3.00150E-01	4.87181E-01	-3.37882E-02	4.88380E-01	8.71176E-01
13	2.04306E+00	3.25163E-01	8.51414E-02	1.02888E-01	1.33578E-01	3.38268E-01
14	2.20021E+00	3.50175E-01	4.93127E-01	-3.17283E-02	4.94146E-01	7.43131E-01
15	2.35737E+00	3.75188E-01	1.12308E-01	1.44253E-01	1.82812E-01	2.80604E-01
16	2.51453E+00	4.00200E-01	6.18440E-01	-4.58884E-02	6.18146E-01	6.54237E-01
17	2.67168E+00	4.25213E-01	1.88504E-01	3.3271E-01	3.81908E-01	1.90964E-01
18	2.82884E+00	4.50225E-01	8.80580E-01	-3.56018E-02	8.81300E-01	5.69562E-01
19	2.98599E+00	4.75238E-01	4.58888E-01	1.55025E+00	1.61595E+00	9.58237E-02
20	3.14316E+00	5.00250E-01	-1.19391E+00	6.90856E-01	1.37939E+00	-3.32857E-01
21	3.30032E+00	5.25263E-01	-7.98888E-01	-8.73444E-01	1.04484E+00	1.21565E+00
22	3.45748E+00	5.50275E-01	4.00588E-01	-1.05128E+00	1.12501E+00	8.03344E-01
23	3.61464E+00	5.75288E-01	1.20867E+00	-8.98787E-02	1.21068E+00	4.50542E-01
24	3.77180E+00	6.00300E-01	6.8852E-01	7.46015E-01	1.00182E+00	1.93745E-01
25	3.92896E+00	6.25313E-01	2.08510E-01	6.42832E-01	6.75803E-01	7.98314E-02
26	4.08611E+00	6.50325E-01	6.59108E-02	8.54422E-01	8.56960E-01	1.88415E-02
27	4.24327E+00	6.75338E-01	-7.62883E-01	6.31888E-01	9.90549E-01	-2.07211E-01
28	4.40043E+00	7.00350E-01	-7.21607E-01	-3.28122E-01	7.93119E-01	9.73650E-01
29	4.55758E+00	7.25363E-01	3.51533E-02	-8.42237E-01	8.42870E-01	6.80158E-01
30	4.71474E+00	7.50375E-01	1.12480E+00	-1.18588E-01	1.13082E+00	3.55067E-01
31	4.87190E+00	7.75388E-01	2.06144E-01	9.84662E-01	9.86442E-01	4.32129E-02
32	5.02906E+00	8.00400E-01	-2.12481E-01	5.03030E-02	2.18335E-01	-2.66116E-01
33	5.18622E+00	8.25413E-01	3.62748E-01	3.37532E-01	4.95494E-01	1.58379E-01
34	5.34338E+00	8.50425E-01	-1.25248E-01	5.82888E-01	5.95389E-01	-3.96652E-02
35	5.50054E+00	8.75438E-01	-2.88882E-01	3.42444E-01	4.46744E-01	-1.26783E-01
36	5.65770E+00	9.00450E-01	-3.40888E-01	1.73787E-01	3.82733E-01	-1.94327E-01
37	5.81486E+00	9.25463E-01	-2.84884E-01	3.85828E-02	2.67181E-01	-2.46514E-01
38	5.97202E+00	9.50475E-01	-2.17818E-01	-1.87822E-02	2.18628E-01	7.74688E-01
39	6.12917E+00	9.75488E-01	-1.20158E-01	-8.62123E-02	1.37194E-01	6.86675E-01
40	6.28633E+00	1.00050E+00	-7.52148E-02	-1.18724E-02	7.61152E-02	7.25134E-01
41	6.44349E+00	1.02551E+00	-7.89067E-02	-2.37058E-02	8.23907E-02	6.86048E-01
42	6.60064E+00	1.05053E+00	-3.45888E-02	-9.31212E-03	3.58282E-02	6.74095E-01
43	6.75780E+00	1.07554E+00	-4.00227E-02	4.38150E-02	5.91953E-02	-1.09869E-01
44	6.91496E+00	1.10055E+00	-9.19028E-02	5.88724E-02	1.07631E-01	-1.46967E-01
45	7.07212E+00	1.12558E+00	-1.37118E-01	7.16851E-02	1.54726E-01	-1.53996E-01
46	7.22928E+00	1.15058E+00	-2.84431E-01	-3.06840E-02	2.66205E-01	6.35868E-01
47	7.38644E+00	1.17558E+00	-1.46740E-01	-1.31418E-01	1.88479E-01	5.40010E-01
48	7.54360E+00	1.20060E+00	-2.85192E-01	-1.50017E-01	3.22241E-01	5.60494E-01
49	7.70075E+00	1.22561E+00	-8.38388E-02	-4.78213E-01	4.85506E-01	4.30496E-01
50	7.85791E+00	1.25063E+00	1.73375E-01	-3.78112E-01	4.15866E-01	3.45088E-01
51	8.01507E+00	1.27564E+00	5.91700E-01	-2.17482E-01	6.30396E-01	2.39922E-01
52	8.17223E+00	1.30065E+00	2.09063E-01	7.72455E-01	8.00246E-01	3.23432E-02
53	8.32939E+00	1.32566E+00	-9.56713E-01	2.48233E-02	9.57038E-01	-1.85458E-01
54	8.48654E+00	1.35068E+00	-1.95238E-01	-9.18820E-01	9.39138E-01	3.94862E-01
55	8.64370E+00	1.37568E+00	3.77303E-01	-5.43023E-01	6.61235E-01	2.93202E-01
56	8.80086E+00	1.40070E+00	3.7872E-01	-4.47785E-01	5.60953E-01	2.8351E-01
57	8.95802E+00	1.42571E+00	7.85634E-01	-4.74722E-01	9.17923E-01	2.3601E-01
58	9.11518E+00	1.45073E+00	1.05350E+00	1.77484E-01	1.06835E+00	1.6211E-01

FFTF CRITERIA PULSE , 0.25 0'S , DT= 0.01 SEC
 NODE POINT= 1
 FOURIER COMPONENTS IN INCHES/SEC2

DEPTH 3

4. DNP FOURIER PLOT READY
FILE = FFTF CRITERIA PULSE , 0.25.0'S , DT= 0.01 SEC
NMODE = 80
MODE = 1

DEPTH 3

PEAK CCOEF = 2.73154E+00
PEAK FREQUENCY= 1.24812E+01
MAX. C SCALE = 3.00000E+01
DELTAC = 5.45455E-01
DELTAY = 1.10000E+00
JPOWER = -1
MAX. F SCALE = 1.30000E+01
DELTAF = 1.62500E+00
DELTAX = 1.23077E+00
IPOWER = 0

.286E-01	.280E-01	.282E-01	.189E-01	.287E-02	-.685E-02	-.118E-01	-.127E-01	-.987E-02	-.326E-02
.551E-02	.156E-01	.257E-01	.347E-01	.408E-01	.432E-01	.413E-01	.359E-01	.289E-01	.227E-01
.197E-01	.207E-01	.308E-01	.398E-01	.388E-01	.388E-01	.348E-01	.293E-01	.239E-01	.197E-01
.183E-01	.195E-01	.281E-01	.244E-01	.251E-01	.238E-01	.208E-01	.175E-01	.148E-01	.134E-01
.136E-01	.153E-01	.181E-01	.213E-01	.249E-01	.288E-01	.278E-01	.257E-01	.212E-01	.142E-01
.560E-02	-.303E-02	-.108E-01	-.147E-01	-.188E-01	-.148E-01	-.111E-01	-.579E-02	.593E-03	.771E-02
.152E-01	.228E-01	.281E-01	.344E-01	.383E-01	.418E-01	.440E-01	.478E-01	.516E-01	.555E-01
.571E-01	.544E-01	.488E-01	.318E-01	.138E-01	-.483E-02	-.208E-01	-.318E-01	-.371E-01	-.379E-01
.360E-01	-.332E-01	-.388E-01	-.278E-01	-.224E-01	-.188E-01	-.588E-02	.601E-02	.188E-01	.302E-01
.393E-01	.448E-01	.488E-01	.444E-01	.384E-01	.283E-01	.181E-01	.808E-02	-.503E-02	-.137E-01
-.195E-01	-.287E-01	-.283E-01	-.288E-01	-.388E-01	-.488E-01	-.577E-01	-.684E-01	-.748E-01	-.751E-01
-.684E-01	-.588E-01	-.481E-01	-.238E-01	-.888E-02	.341E-02	.118E-01	.188E-01	.153E-01	.107E-01
-.243E-02	-.838E-02	-.288E-01	-.387E-01	-.388E-01	-.488E-01	-.584E-01	-.647E-01	-.588E-01	-.621E-01
-.620E-01	-.588E-01	-.488E-01	-.888E-01	-.888E-02	.278E-01	.483E-01	.611E-01	.656E-01	.639E-01
.594E-01	.888E-01	.884E-01	.887E-01	.888E-01	.788E-01	.888E-01	.883E-01	.903E-01	.907E-01
.858E-01	.738E-01	.888E-01	.381E-01	.888E-02	-.843E-02	-.181E-01	-.878E-02	.878E-02	.307E-01
.503E-01	.888E-01	.888E-01	.378E-01	.887E-02	-.217E-01	-.518E-01	-.781E-01	-.841E-01	-.107E+00
-.118E+00	-.124E+00	-.131E+00	-.137E+00	-.143E+00	-.147E+00	-.148E+00	-.148E+00	-.138E+00	-.125E+00
-.103E+00	-.888E-01	-.847E-01	-.311E-01	-.137E-01	-.384E-02	.488E-04	.243E-02	.881E-02	.240E-01
.482E-01	.824E-01	.118E+00	.188E+00	.178E+00	.188E+00	.205E+00	.207E+00	.205E+00	.198E+00
.188E+00	.188E+00	.138E+00	.188E+00	.838E-01	.254E-01	-.874E-02	-.388E-01	-.562E-01	-.725E-01
-.888E-01	-.181E+00	-.118E+00	-.127E+00	-.138E+00	-.138E+00	-.118E+00	-.988E-01	-.754E-01	-.106E+00
-.523E-01	-.388E-01	-.288E-01	-.388E-01	-.488E-01	-.883E-01	-.821E-01	-.118E+00	-.115E+00	-.106E+00
-.834E-01	-.944E-01	-.288E-01	-.238E-02	.134E-01	.242E-01	.348E-01	.504E-01	.730E-01	.101E+00
.138E+00	.198E+00	.178E+00	.178E+00	.178E+00	.188E+00	.188E+00	.132E+00	.132E+00	.104E+00
.638E-01	.132E-01	-.488E-01	-.834E-01	-.133E+00	-.188E+00	-.181E+00	-.184E+00	-.138E+00	-.119E+00
-.101E+00	-.813E-01	-.881E-01	-.383E-01	-.884E-02	.234E-01	.520E-01	.750E-01	.884E-01	.933E-01
.888E-01	.714E-01	.488E-01	.248E-01	.184E-02	-.181E-01	-.248E-01	-.133E-01	-.133E-01	.248E-02
.188E-01	.312E-01	.387E-01	.384E-01	.284E-01	.217E-01	.148E-01	.104E-01	.788E-02	.675E-02
.673E-02	.837E-02	.123E-01	.188E-01	.253E-01	.288E-01	.223E-01	.555E-02	.211E-01	-.520E-01
-.788E-01	-.838E-01	-.818E-01	-.748E-01	-.488E-01	-.233E-01	-.528E-02	.288E-02	.437E-02	.590E-02
.138E-01	.388E-01	.538E-01	.738E-01	.838E-01	.778E-01	.847E-01	.238E-01	-.683E-02	-.275E-01
-.337E-01	-.287E-01	-.124E-01	.218E-02	.188E-01	.188E-01	.188E-01	.188E-01	.240E-01	.331E-01
.423E-01	.473E-01	.448E-01	.388E-01	.105E-01	-.123E-01	-.317E-01	-.435E-01	-.458E-01	-.403E-01
-.382E-01	-.288E-01	-.138E-01	-.134E-01	-.187E-01	-.305E-01	-.427E-01	-.521E-01	-.558E-01	-.514E-01
-.404E-01	-.234E-01	-.183E-01	.171E-02	.888E-02	.152E-01	.218E-01	.327E-01	.488E-01	.674E-01
.823E-01	.872E-01	.784E-01	.488E-01	.114E-01	-.282E-01	-.631E-01	-.834E-01	-.878E-01	-.794E-01
-.632E-01	-.448E-01	-.274E-01	-.188E-01	.628E-02	.258E-01	.484E-01	.858E-01	.801E-01	.860E-01
.834E-01	.738E-01	.887E-01	.888E-01	.888E-01	.607E-01	.824E-01	.584E-01	.483E-01	.328E-01
.131E-01	-.588E-02	-.212E-01	-.323E-01	-.412E-01	-.487E-01	-.583E-01	-.684E-01	-.781E-01	-.828E-01
-.823E-01	-.771E-01	-.888E-01	-.813E-01	-.948E-01	-.488E-01	-.438E-01	-.384E-01	-.274E-01	-.185E-01
-.127E-01	-.121E-01	-.187E-01	-.248E-01	-.308E-01	-.387E-01	-.248E-01	-.143E-01	-.384E-02	.234E-02
.802E-03	-.738E-02	-.178E-01	-.251E-01	-.243E-01	-.188E-01	.588E-03	.188E-01	.288E-01	.335E-01
.323E-01	.313E-01	.343E-01	.458E-01	.833E-01	.848E-01	.182E+00	.182E+00	.188E+00	.744E-01
.357E-01	-.822E-02	-.523E-01	-.888E-01	-.187E+00	-.112E+00	-.182E+00	-.828E-01	-.588E-01	-.388E-01
-.288E-01	-.284E-01	-.378E-01	-.988E-01	-.773E-01	-.874E-01	-.112E+00	-.118E+00	-.118E+00	-.118E+00
-.981E-01	-.771E-01	-.988E-01	-.328E-01	-.114E-01	.338E-02	.888E-02	.888E-02	.818E-03	.661E-02
-.848E-02	-.183E-02	.158E-01	.378E-01	.582E-01	.788E-01	.714E-01	.623E-01	.495E-01	.409E-01
.433E-01	.582E-01	.888E-01	.112E+00	.138E+00	.148E+00	.144E+00	.123E+00	.931E-01	.688E-01
.315E-01	.187E-01	-.631E-04	-.884E-03	.838E-02	.181E-01	.338E-01	.488E-01	.538E-01	.538E-01
.31E-01	.288E-01	.523E-02	-.143E-01	-.287E-01	-.357E-01	-.358E-01	-.328E-01	-.278E-01	-.257E-01
-.218E-01	-.328E-01	-.384E-01	-.418E-01	-.388E-01	-.388E-01	-.153E-01	.588E-02	.384E-01	.544E-01
.748E-01	.852E-01	.858E-01	.727E-01	.583E-01	.234E-01	-.282E-02	-.282E-01	-.262E-01	-.195E-01
-.385E-02	.183E-01	.288E-01	.988E-01	.844E-01	.873E-01	.847E-01	.578E-01	.458E-01	.294E-01
.791E-02	-.171E-01	-.428E-01	-.844E-01	-.784E-01	-.818E-01	-.748E-01	-.582E-01	-.385E-01	-.164E-01
.432E-02	.218E-01	.553E-01	.443E-01	.477E-01	.443E-01	.347E-01	.182E-01	.848E-03	-.162E-01
-.278E-01	-.311E-01	-.251E-01	-.114E-01	.888E-02	.848E-01	.388E-01	.458E-01	.458E-01	.356E-01
.185E-01	-.432E-02	-.388E-01	-.548E-01	-.738E-01	-.848E-01	-.834E-01	-.728E-01	-.551E-01	-.357E-01
.197E-01	-.185E-01	-.822E-02	-.144E-01	-.238E-01	-.388E-01	-.482E-01	-.482E-01	-.512E-01	-.568E-01
.825E-01	-.638E-01	-.844E-01	-.814E-01	-.844E-01	-.448E-01	-.343E-01	-.255E-01	-.196E-01	-.166E-01
.185E-01	-.164E-01	-.177E-01	-.283E-01	-.251E-01	-.338E-01	-.448E-01	-.585E-01	-.678E-01	-.749E-01
.185E-01	.685E-01	.551E-01	-.378E-01	-.187E-01	-.403E-02	.871E-02	.113E-01	.983E-02	.352E-01
.185E-01	-.145E-01	-.288E-01	-.228E-01	-.188E-01	-.122E-01	-.278E-02	.111E-01	.128E-01	.128E-01

CALCOMP MOTION HISTORY READY
 TITLE = FIVE CRITERIA PULSE . 0.25 G'S . DT= 0.01 SEC
 NITILE = 00
 NUCR = 1

DEPTH 2

MAX. G,S= 1.82661E+01
 MIN. G,S= -2.18914E+01
 MAX = 1.99900E+01
 DT = 1.00000E+02
 FREQS = 2000
 Y1 = 2.00000E+01
 RELIAY = 1.00000E+01
 T1 = 0.
 RELIAT = 2.49675E+00

NO. OF INPUT RECORDS	=	2000
FINAL DISPLACEMENT (IN.)	=	.95188E+02
FINAL VELOCITY (IN/SEC)	=	.26874E+01
PEAK ACCELERATION (G.S)	=	.20744E+00
NO. OF RECORDS ADDED	=	34
FINAL NO. OF RECORDS	=	2034
FINAL VELOCITY (IN/SEC)	=	0.
FINAL DISPLACEMENT (IN.)	=	.95501E+02
THAX. DURATION, SECS)	=	.20330E+02

DAMPING RATIO= 2.00000E+00 PERCENT

FREQUENCY (CPS)	ACCELERATION (G.S)	VELOCITY (IPS)	DISPLACEMENT (IN)	MAX. TIME (SECS)
.50000	.16563	20.37110	6.40432	12.26000
.51171	.16605	20.05201	6.23000	12.10000
.52369	.16473	19.34414	5.87000	12.10000
.53595	.16220	18.62047	5.52000	12.02000
.54849	.16136	18.09175	5.24000	12.00000
.56133	.16425	17.90481	5.18207	12.72000
.57448	.15851	16.90830	4.70000	11.72000
.58792	.17313	18.10903	4.38247	8.63000
.60169	.18836	19.25202	5.08242	7.90000
.61578	.19831	19.86550	5.11000	7.93000
.63019	.20095	19.60972	4.95244	7.80000
.64495	.19511	18.60401	4.50000	7.63000
.66004	.18030	16.80005	4.05235	7.70000
.67550	.15934	14.50000	3.41704	7.74000
.69131	.16175	14.38023	3.31272	12.00000
.70750	.15084	13.80353	3.12345	12.90000
.72406	.16618	14.11300	3.18230	11.73000
.74101	.17120	14.21442	3.05200	11.00000
.75836	.16614	13.47293	2.82753	11.04000
.77611	.14037	11.12255	2.20007	11.90000
.79428	.15505	12.00479	2.46547	6.72000
.81288	.16384	12.30540	2.42002	6.60000
.83191	.16241	12.00570	2.20000	6.64000
.85138	.14855	10.73022	2.00007	6.60000
.87132	.14303	10.09527	1.84401	5.20000
.89172	.14837	10.23229	1.82620	5.15000
.91259	.14562	9.81200	1.71137	5.12000
.93386	.13396	8.82045	1.50309	5.09000
.95562	.11548	7.42002	1.23716	5.08000
.97820	.09802	6.03048	.98215	1.71000
1.00110	.09600	5.95153	.94617	1.71000
1.02434	.09732	5.84153	.90744	1.70000
1.04852	.09756	5.72187	.86852	1.70000
1.07367	.10417	5.97012	.88547	1.98000
1.09819	.11681	6.54121	.94798	5.12000
1.12300	.12608	6.94822	.98393	5.10000
1.15022	.14779	7.90167	1.09335	6.67000
1.17714	.16000	8.82349	1.19297	6.64000
1.20470	.17500	9.97849	1.18616	6.62000
1.23291	.18135	9.04591	1.16773	11.67000
1.26177	.22387	10.90144	1.37507	11.63000
1.29131	.23776	10.84666	1.33806	11.60000
1.32154	.22602	10.51779	1.26667	12.63000
1.35240	.24224	11.01404	1.29619	13.64000
1.38314	.27404	12.21506	1.40461	7.20000
1.41055	.33016	14.33340	1.61042	7.17000
1.44071	.33047	14.40000	1.50000	13.92000
1.46305	.30007	10.97001	1.77045	14.10000
1.51030	.41305	18.78174	1.75004	14.45000
1.55303	.42167	16.88771	1.70017	16.90000
1.59031	.45336	17.93010	1.70000	16.63000
1.62754	.52106	19.71000	1.82701	16.67000
1.66505	.54444	20.10144	1.88072	9.07000
1.70404	.64703	23.34550	2.17030	9.03000
1.74455	.67405	23.70070	2.17061	4.99000
1.78539	.42306	21.40126	1.91312	4.95000

TEST CRITERIA PULSE , 0.125 G'S , D1= 0.10 SEC
 ACCEPTANCE= 1 EQUIPMENT DAMPING= 2.0000CF=02 DEPTH 3
 RESPONSE SPECTRA IN G'S

CALCOMP SPECTRA PLOT READY
TITLE = FFTF CRITERIA PULSE , 0.25 0'S , DT= 0.01 SEC
NODE NO. = 1
DAMPING = 2.00000E+00 PERCENT
PEAK G.S = 9.57815E-01
MAX SCALE = 1.10000E+01 0.5
FIRSTY = 0. 0.5
DELTA A = 2.00000E-01 0.5/INCH
FIRSTX = 0.
DELTA X = 1.00000E+00
IPOWER = -1

DEPTH 3

• AM WRITING FILE NO. 3 ONTO TAPE 14

FFTF CRITERIA PULSE, 0.25 G'S, DT=0.01 SEC

FFTF CRITERIA PULSE, 0.25 G'S, DT=0.01 SEC, DEPTH 2

FFTF CRITERIA PULSE, 0.25 G'S, DT=0.01 SEC, DEPTH 3

FFTF CRITERIA PULSE, 0.25 G'S, DT=0.01 SEC, DEPTH 3

FFTF CRITERIA PULSE, 0.25 G'S, DT=0.01 SEC, DEPTH 3

REFERENCES

1. C. J. Costantino, L. A. Lufrano, "Finite Element Analysis for Soil Amplification Studies", Proceedings, ASCE Specialty Conference on Structural Design of Nuclear Plant Facilities, Chicago, December, 1973.
2. B. O. Harden, V. P. Drnevich, "Shear Modulus and Damping in Soils: Measurement and Parameter Effects", Journal, Soil Mechanics and Foundations Division, ASCE, vol. 98, no. SM6, 1972

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