Rif – SEO-PR003-07 - RT - AF

Data: 25/09/07	**Versione:** 00	**Modifiche:** Versione Originale

File: PR03-07 - CENTRALE EOLICA T.S.GENNARO _Allegato F.doc

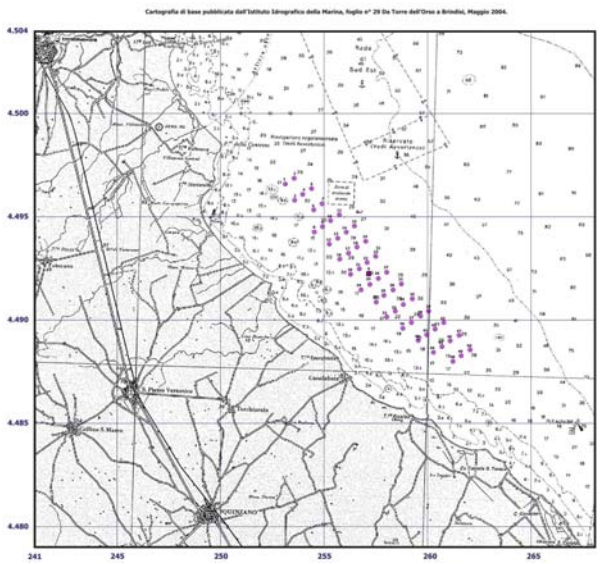
Redatto da:	Verificato da:	Approvato da:
ITALPROGETTI Srl - E.Meriggi	Giovanni Pagotto	Davide Trevisani

Committente: **TREVI Energy S.p.A**
Via Larga, 201 – 47023 CESENA (FC)

Opera: "CENTRALE EOLICA OFF-SHORE TORRE S. GENNARO (BRINDISI)**.**

Capitaneria di Porto di Brindisi (BR)

Oggetto: dimensionamento della fondazioni degli aerogeneratori.



Progettista: **ITALPROGETTI srl**
Via Elba,22
20144 - MILANO
Ing. E. Meriggi

Revisioni

Versione	Data	Totale Pagine	Modifiche
00	27/09/2007	85	Versione Originale

Indice della Relazione.

1 Introduzione

Nella seguente relazione viene riportato il dimensionamento della struttura di fondazione delle Torri Eoliche dell'impianto eolico off-shore Torre S.Gemmaro (BR).

Sul Dis. allegato (***Tavola I***) è rappresentata la struttura di fondazione prevista. L'accesso a tale struttura sarà riservata al solo personale autorizzato per manutenzione e al personale della Capitaneria di Porto e deve ritenersi di carattere definitivo.

Da un punto di vista tecnologico, la soluzione esaminata prevede l'impiego di monopalo in acciaio.

L'area interessata dall'impianto eolico è classificata come zona sismica 4 dalla Del. Giunta Regionale n° 153 del 02/03/2004 con un accelerazione di riferimento su suolo rigido pari a 0.05 g per periodo di ritorno T_R = 475 anni come riferito al paragrafo 7 INQUADRAMENTO SISMICO DELL'AREA della Relazione Geologica e Geotecnica Preliminare (**Allegato A**).

Il calcolo di dimensionamento e verifica viene condotto con il metodo delle tensioni ammissibili.

I carichi e le dimensioni della Torre Eolica sono stati ricevuti dalla società fornitrice della struttura stessa (**Allegato C**)

2 Normativa di riferimento

Prima di iniziare la parte prettamente di calcolo della relazione, viene riportato l'inquadramento normativo individuato per l'opera in esame.

2.1. Tipologia costruttiva

Come tipologia costruttiva, l'opera oggetto del presente studio si inquadra nella categoria delle fondazioni e come tale soggetta a:

- Decreto Ministeriale dei Lavori Pubblici 11 marzo 1988 "Norme tecniche riguardanti le indagini sui terreni e sulle rocce, la stabilità dei pendii naturali e delle scarpate, i criteri generali e le prescrizioni per la progettazione, l'esecuzione ed il collaudo delle opere di sostegno delle terre e delle opere di fondazione"
- relative "Istruzioni per applicazione", Circolare Ministero Lavori Pubblici, N. 30483 del 24 settembre 1988.

2.2. Criteri di progetto

Per quanto attiene ai criteri di progetto della struttura si deve fare riferimento a:

- Legge 2 febbraio 1974, N. 64 "Provvedimenti per le costruzioni con particolari prescrizioni per le zone sismiche"
- D.M. 16 gennaio 1996 "Norme tecniche per le costruzioni in zone sismiche"
- relative "Istruzioni per applicazione", Circolare Ministero Lavori Pubblici, N. 65/AA.GG. del 10 aprile 1997
- Ordinanza Presidente del Consiglio dei Ministri 20 marzo 2003, N. 3274 "Primi elementi in materia di criteri generali per la classificazione sismica del territorio nazionale e di normative tecniche per le costruzioni in zona sismica" e successivi Decreti (21/10/2003) ed Ordinanza (02/10/2003 N° 3316 – 03/05/2005 N° 3431 – PCM 28/04/2006 N° 3519)
- API-RP-2A – Recommended Practice for planning, Designing and Constructing Fixed Offshore Platform – Working Stress Design.

- Guida per la progettazione la costruzione e l'installazione di piattaforme marine fisse in acciaio – RINA.

Il D.M. 16 gennaio 1996 Norme tecniche relative ai "Criteri generali per la verifica di sicurezza delle costruzioni e dei carichi e sovraccarichi" e le relative "Istruzioni per applicazione" Circ. Min. dei Lav. Pubb. N. 156AA.GG./STC del 4 luglio 1996 riportano metodi generali di verifica nonché valori di azioni applicabili a tutte le costruzioni da realizzare nel campo dell'ingegneria civile per quanto non in contrasto con vigenti norme specifiche.

2.3. Materiale di riferimento

Si prevede di realizzare la fondazione come struttura metallica, conseguentemente i materiali sono soggetti a:

- Legge 5 novembre 1971, N. 1086 "Norme per la disciplina delle opere di conglomerato cementizio armato, normale e precompresso ed a struttura metallica".
- D.M. 14 febbraio 1992 "Norme tecniche per l'esecuzione delle opere in cemento armato normale e precompresso e per le strutture metalliche"
- Circolare Ministeriale N. 37406/STC del 24 giugno 1993 "Legge 5-11-1971, N. 1086 - Istruzioni relative alle norme tecniche per l'esecuzione delle opere in c.a. normale e precompresso e per le strutture metalliche, di cui al decreto ministeriale 14-02-1992"
- D.M. 09 gennaio 1996 "Norme tecniche per il calcolo, l'esecuzione ed il collaudo delle strutture in cemento armato, normale e precompresso e per le strutture metalliche"
- Circolare Ministeriale N. 252 del 15 ottobre 1996 "Istruzioni per l'applicazione delle «Norme tecniche per il calcolo, l'esecuzione ed il collaudo delle strutture in cemento armato, normale e precompresso e per le strutture metalliche» di cui al decreto ministeriale 09 gennaio 1996"

3 Programmi di calcolo

Le analisi strutturali e le verifiche sono state eseguite mediante l'impiego dei seguenti programmi sviluppati e dedicati specialmente a strutture offshore :

- "SACS" Structural Analysis Computer System by Engineering Dynamics, Inc. che è "an integrated package ", composto da diversi programmi di analisi strutturale compatibili fra di loro, capace di effettuare tutte le analisi richieste nel campo delle strutture marine e offshore con modellazione interattiva, generazione dei carichi d'onda, analisi statica/dinamica/afatica, verifiche secondo diverse normative:API,DNV,BS,etc.

- "LPILE PLUS VER. 4.0" by Ensoft, Inc.
  LymonC. Reese/Shin -Tower Wang per l'analisi e la verifica di pali caricati lateralmente in terreno elastico non lineare schematizzato con le curve p-y definite dalle normative API RP 2A.

- "APILE PLUS VER. 3.0" by Ensoft, Inc.
  Lymon C. Reese/Shin - Tower Wang per l'analisi della capacità e dei cedimenti a breve termine di pali caricati assialmente.

4 Materiali.

Le caratteristiche dei materiali previsti per la realizzazione dell'opera in esame sono:

Acciaio tipo Fe 510

f_{tk}	= tensione di rottura	$\geq$ 510.00 N/mm^2
f_{yk}	= tensione di snervamento	$\geq$ 355.00 N/mm^2
σ_s	= tensione ammissibile	= 240.00 N/mm^2

La tensione massima ammissibile per elementi tubolari è secondo la normativa API-RP-2A

$$\sigma_s = \left[0.72 - 0.58 \frac{f_{yk} \bullet D}{E \bullet t} \right] f_{yk}$$

Con D = 420 cm e t = 6.00 cm (Vedi paragrafo 8.)

Risulta:

σ_s = 230 N/mm^2

5 Natura dei terreni e parametri geotecnici.

Con riferimento al paragrafo 6. CARATTERIZZAZIONE GEOTECNICA PRELIMINARE – Relazione Geologica e Geotecnica preliminare (**Allegato A**) si sono adottate le seguenti due stratigrafie di calcolo e relativi parametri, che rappresentano da un punto di vista probabilistico, i limite inferiore e superiore relativamente all'interazione palo-terreno, in particolare per quello che concerne il comportamento della struttura soggetta alle azioni orizzontali. Lo strato di potenza indefinita è stato trascurato (dalla parte della sicurezza).

Stratigrafia 1 (riferita al fondale)

da 0.00 a – 10.00 m (soft clay)

C_u = 5 ÷ 15.4 kPa

γ' = 7 kN/m^3

strato di potenza non definita (cemented sand: Formazione di Gallipoli)

φ = 35° -38°

γ' = 9 kN/m^3

K =15.000 kN/m^3

> – 10.00 m (stiff to very stiff clay)

C_u = 200 kPa

γ' = 9 kN/m^3

K = 270.000 kN/m^3

Stratigrafia 2 (riferita al fondale)

da 0.00 a – 10.00 m (sand)

φ = 32°

γ' = 7 kN/m^3

K = 8.000 kN/m^3

strato di potenza non definita (cemented sand: Formazione di Gallipoli)

φ = 35° -38°

γ' = 9 kN/m^3

K =15.000 kN/m^3

> – 10.00 m (stiff to very stiff clay)

C_u = 200 kPa

γ' = 9 kN/m^3

K = 270.000 kN/m^3

Simbologia:

C_u = resistenza a taglio non drenata

γ' = peso specifico efficace

K = gradiente del modulo di reazione orizzontale iniziale per sabbie/argille

φ' = angolo di resistenza al taglio.

6 Descrizione delle opere.

Lo studio è stato condotto in base ai disegni architettonici dell'opera riportati sugli elaborati dell'impresa fornitrice degli aerogeneratori (Allegato D).

6.1. Struttura di fondazione

Da un punto di vista tecnologico, la soluzione esaminata prevede l'impiego di monopalo in acciaio.

Le principali caratteristiche del tubo d'acciaio sono:

- diametro esterno d = 4200 mm
- spessore t = 60 mm (*)
- lunghezza media L = 57.50 m (inclusi due metri extra per battitura)
- peso unitario p = 62.44 kN/m (fuori acqua)
  p' = 54.99 kN/m (immerso)
- momento d'inerzia I = 1.672 m^4

(*) "Scarpa" alla base del palo di spessore 80 mm, per una lunghezza di 1.5 m.

La lunghezza è considerata da quota +1.50 m sul livello medio mare (sommità), e quota -48.0/-60.0 m (base), avendo individuato il fondale a -18.0/-30.0 m e previsto un tratto infisso nel terreno di 30.0 m.

Nel seguito è riportata la sequenza esecutiva della struttura di fondazione e le lavorazioni previste:

- Infissione del tubo metallico fino alla quota di progetto mediante battipalo diesel/idraulico in grado di sviluppare una energia sufficiente a vincere la resistenza del terreno. Il tubo verrà realizzato e infisso per fasi ognuna delle quali prevede il posizionamento e la saldatura del nuovo spezzone sul tratto di tubo già infisso, e la sua successiva battitura. In alternativa il palo potrà essere infisso in unica soluzione che fra l'altro evita, essendo la battitura in continuo, eventuali fenomeni di "set-up" del terreno. Il battipalo sarà sospeso alla gru montata su pontone o piattaforma "self elevating". Nel caso durante la fase battitura si incontri lo strato di sabbie cementate (Formazione di Gallipoli) e si raggiunga il rifiuto all'infissione, si procederà allo scavo meccanico del livello cementato, a cui seguirà l'avanzamento del tubo mediante ripresa della battitura.

- Sul monopalo sarà fissato un elemento di transizione, e su questo la Torre Eolica, come rappresentato sul disegno allegato (***Tavola I***).

7 Condizioni di carico.

Per le verifiche è stata presa in considerazione la seguente combinazione di carico estrema che include la contemporaneità dei seguenti carichi elementari:

- peso proprio
- onda H_{100} + corrente (0.8 m/sec) + vento (~ 40 m/sec) tutti agenti nella stessa direzione
- carichi alla base della Torre Eolica che includono anche l'effetto del vento (più gravoso rispetto all'azione sismica della zona) valutati dal costruttore della macchina. (**Allegato C**)

N = 2564 kN (verticale)
H = 812 kN (orizzontale)
M = 57498 kN (momento)

L'azione complessiva sul palo di onde, corrente e vento è stata valutata mediante l'utilizzo del programma SACS secondo la teoria di Stoke del 5° ordine.

I dati meteomarini di ingresso sono stati:

H_{100} = 4.92 x 1.85 = 9.10 m (*)
T = 9.0 sec (*)
V_c = 0.8 (**) m/sec costante per tutta la profondità d'acqua
$V_w \cong$ 40.00 m/sec

Inoltre si è assunto:

D = 4.50 m (diametro elemento di transizione)
C_D = 0.75 (coefficiente di trascinamento)
C_M = 2.00 (coefficiente di inerzia)
Z = 5 cm (accrescimento marino sul raggio del palo
da – 3.0 a + 1.00 m s.l.m.m.)

(*) vedi studio meteomarino: grafico N°5 e Tab N°6 in Allegato B.
(**) in analogia con altre verifiche per opere ubicate nell'Adriatico

I calcoli sono riportati nell'Appendice 3 ed i risultati per i due fondali -17.00 e -30.00 sono rispettivamente

H = 1585.44 kN

e

H = 1535.88 kN

applicati come carichi distribuiti lungo il fusto del palo.

8 Analisi strutturale.

L'analisi strutturale è stata eseguita con il programma LPILE Plus ver.4 per le due tipologie stratigrafiche e per i due fondali estremi d=18.00/30.0 m.

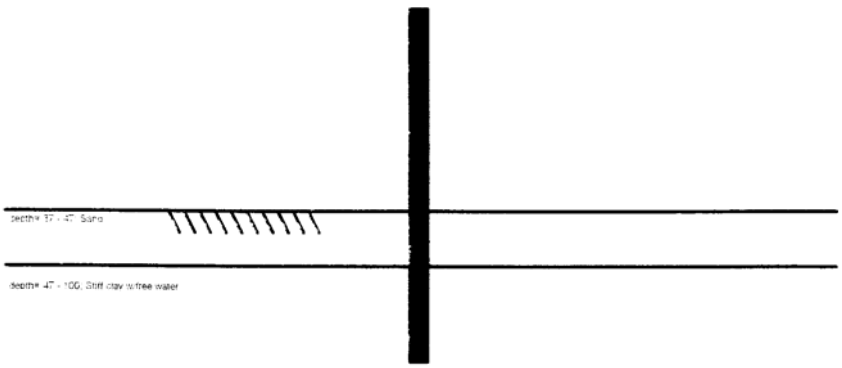
Di seguito sono riportati files di input ed output

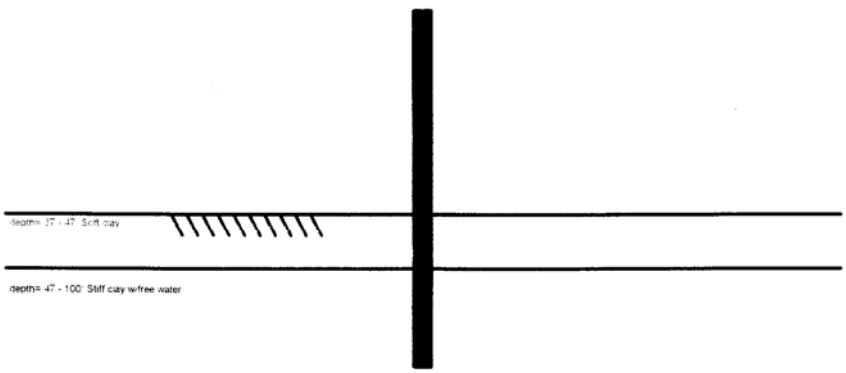
BRISTRA1/GENTRA1 per stratigrafia 1 (Appendice 1)

BRISTRA2/GENTRA2 per stratigrafia 2 (Appendice 2)

relativi a un palo D_e = 4200 mm t = 60 mm e di lunghezze complessive di 54.00 / 67.00 m, compreso il tratto di transizione, di cui 30.00 m infissi nel terreno.

Nel seguento sono riportati i due modelli utilizzati uno per ciascuna stratigrafia.





9 Risultati.

I risultati più significativi dei calcoli effettuati, come può leggersi nei tabulati delle Appendici 1 e 2 sono:

NOME FILE	BRISTRA 1	GENTRA 1	BRISTRA 2	GENTRA2
deformazione in sommità	44 cm	22 cm	51 cm	26 cm
deformazione al fondale	5 cm	4 cm	7 cm	6.0 cm
sollecitazione massima	164 N/mm^2	138 N/mm^2	181 N/mm^2	154 N/mm^2
deformazione alla punta del palo	0.14 mm	0 mm	~ 0.6	0.00
rotazione in sommità	1.4 %	1.0 %	1.6 %	1.1 %

si può osservare che:

- le sollecitazioni massime sono tutte inferiori al valore ammissibile
- lo spostamento della punta del palo è molto modesto, quindi la lunghezza di infissione (30.00 m) del palo è adeguata; un aumento della infissione non modificherebbe in modo apprezzabile il comportamento del palo.

La verifica di capacità portante assiale viene omessa in relazione all'eseguità del carico verticale (4500 ÷ 5000 kN), al diametro del palo (4.200 m) ed alle caratteristiche geotecniche del terreno di fondazione.

10 Calcoli Addizionali.

In una fase di progetto più avanzata saranno eseguite verifiche sismiche e di fatica quest'ultima mettendo in conto sia l'effetto del moto ondoso che il "Foundation fatigue load spectrum" fornito dal costruttore della Torre Eolica.

11 Controllo battitura palo metallico.

Nel seguito si descrivono modalità di verifica e risultati ottenuti relativamente alla possibilità di infissione del monopalo di fondazione mediante battitura con maglio idraulico agente in sommità del palo. Si ipotizza l'assenza dello strato di sabbie cementate (Formazione di Gallipoli). Nel caso questo litotipo sia incontrato, una volta raggiunto il rifiuto all'infissione mediante maglio idraulico, si procederà allo scavo meccanico del livello cementato, a cui seguirà l'avanzamento del tubo mediante ripresa della battitura.

Lo studio viene eseguito facendo uso dell'equazione di propagazione delle onde longitudinali in accordo con la trattazione svolta da E.A.L. Smith nell'articolo "Pile driving analysis by the wave equation" 1962, ASCE Paper n° 3306 Vol. 127 Part 1.

La sequenza di calcolo è la seguente:

1. Scelta del palo da infiggere in base alle esigenze strutturali del progetto e delle condizioni geotecniche del sito in esame e valutazione della portata statica dello stesso, intesa come resistenza massima;
2. Valutazione della resistenza statica residua offerta dal palo durante la battitura per effetto delle condizioni dinamiche;
3. Valutazione delle caratteristiche del sistema maglio-cuscino-palo-terreno, e in particolare:
   - caratteristiche del maglio;
   - caratteristiche del palo;
   - caratteristiche del sistema di accoppiamento maglio-palo (adattatore,cuscino etc.);
   - parametri dinamici del terreno (smorzamento laterale e alla base, ground quake).

Il calcolo viene condotto con il metodo delle differenze finite. In fig. 1 si riporta il modello impiegato, in pratica si suddivide il palo in un numero di elementi tale che ad ognuno di essi sia lecito associare ad ogni istante un unico valore di velocità e spostamento.

Ogni elemento è dotato di massa, e la rigidezza è simulata da molle. Il collegamento con il terreno è schematizzato mediante molla (componente elastica), blocco di scorrimento (componente plastica), e smorzatore (componente viscosa). Il collegamento con il sistema di battitura è anch'esso simulato mediante masse e molle.

Il fenomeno di propagazione dell'impulso generato dal colpo di maglio, viene inseguito a istanti successivi di tempo, valutando così l'evoluzione della situazione dinamica di ogni elemento e quindi il modo di dispersione dell'energia.

In dettaglio i dati di input utilizzati sono riportati nel seguito.

Caratteristiche del tubo metallico:

- diametro esterno d = 4200 mm
- spessore t = 60 mm (*)
- lunghezza L = 60+1.5+2 = 63.5 m
- sezione metallica (fusto) A = 7804 cm^2
- sezione metallica (base) A_b = 11360 cm^2
- peso unitario (fusto) p = 61.26 kN/m

(*) "Scarpa" alla base del palo di spessore 80 mm, per una lunghezza di 1 m.

Portata massima del palo:

- portata laterale statica (*)
  $P_{l\_stat} = \pi \times 4.2 \times (10 \times 23 + 20 \times 120) = 34702\ kN$
- portata laterale dinamica
  $P_{l\_dyn} = \pi \times 4.2 \times (10 \times 18 + 20 \times 48) = 15042\ kN$
- portata di base statica/dinamica
  $P_b = 1.0355 \times 3100 = 3210\ kN$

(*) Si ipotizza che per effetto della "scarpa" alla base del palo, risulti efficace solo l'attrito sulla superficie esterna del tubo

Caratteristiche del maglio (idraulico tipo Mench MHUT 500):

- peso della massa battente W_1 = 294 kN
- energia massima E_{max} = 550 kNm
- efficienza sistema battitura e = 0.85
- energia netta E_{eff} = 468 kNm

Cuffia + Adattatore: peso W_2 = 200 kN

Cuscino (formato da strati di funi d'acciaio arrotolate):

- costante di reazione (*) $k_1 = 1 \times 10^6 \div 1 \times 10^7\ kN/m$

(*) Si tratta di una dei parametri più difficili da valutare e che ha un'influenza rilevante sul risultato delle elaborazioni. Si esegue quindi un'analisi parametrica considerando un campo di variazione logica della costante.

Parametri che definiscono la reazione statica e viscosa del terreno:

- "ground quake" (*) Q = 0.25 cm
- smorzamento laterale J' = 0.005 s/cm
- smorzamento alla base J_p = 0.02 s/cm

(*) Il parametro "Q" individua l'estensione della fase elastica corrispondente alla componente statica della reazione del terreno. Sia per questo coefficiente che per quelli che descrivono lo smorzamento lungo il palo, si sono adottati i valori consigliati da Smith.

Nell'Appendice 4 si riportano i tabulati delle elaborazioni svolte, mentre nella seguente tabella si riportano i risultati dello studio parametrico.

P/P_{DYN}	P_L	P_B	Velocità di infissione [No.colpi/metro]			
[-]	[kN]	[kN]	k_1=1x10^6 kN/m	k_1=2x10^6 kN/m	k_1=5x10^6 kN/m	k_1=1x10^7 kN/m
0.2	3008	642	40	38	40	42
0.4	6016	1284	74	68	67	69
0.6	9024	1926	111	101	93	93
0.8	12032	2568	137	125	122	123
1.0	15040	3210	171	148	140	145
1.2	18048	3852	217	177	160	163
1.4	21056	4494	285	214	184	184
1.6	24064	5136	391	262	213	208

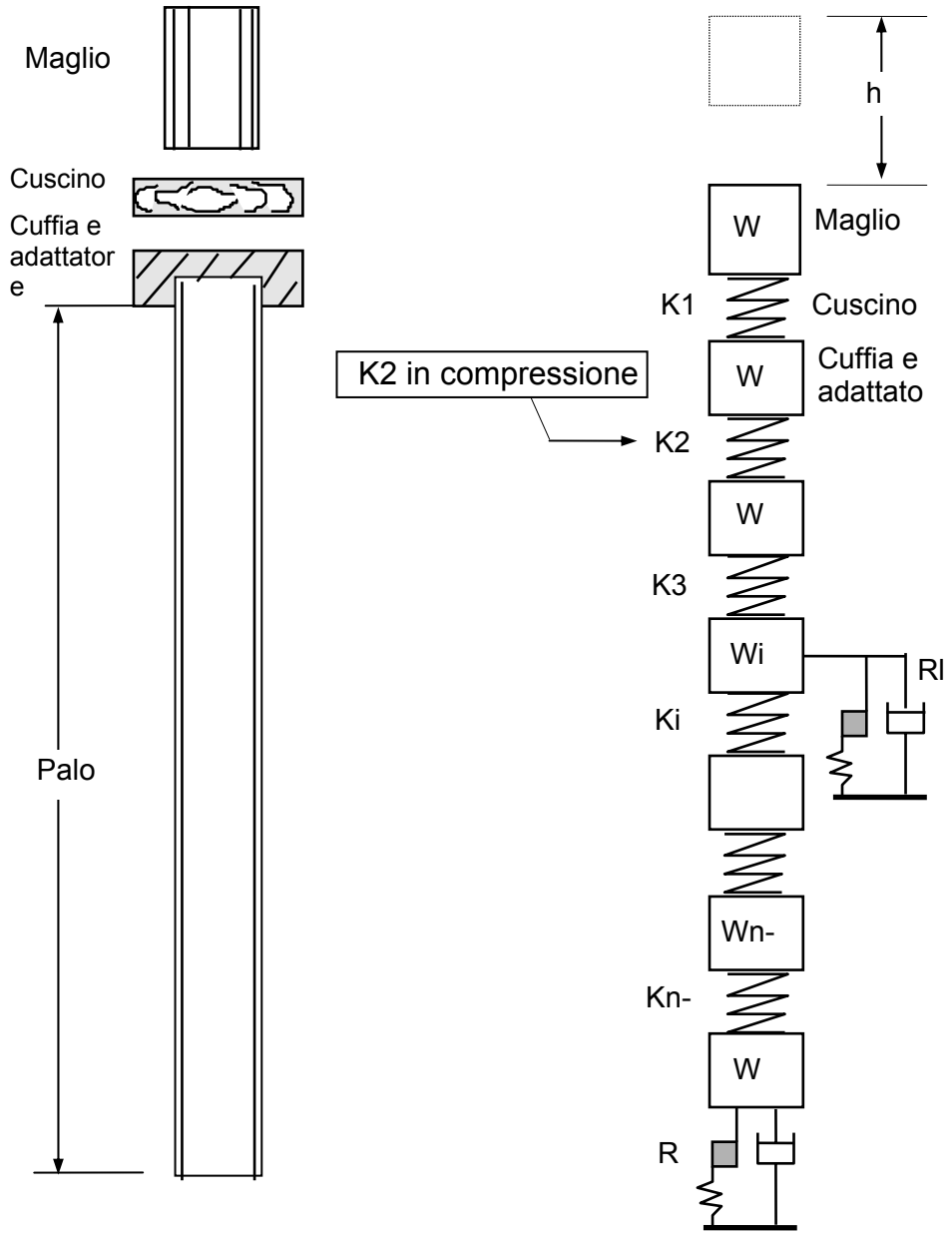


Figura 1

Dai risultati riassunti nella precedente tabella si evince che, nelle condizioni operative ipotizzate, in corrispondenza dei valori teorici di resistenza dinamica del terreno, il maglio è ancora sufficientemente lontano dalla "saturazione", limite oltre il quale la velocità di infissione diviene molto bassa, ovvero il maglio risulta non più idoneo a battere il palo in esame. In base alle valutazioni teoriche riportate sopra e a precedenti esperienze in terreni similari con magli e pali di fondazione analoghi, si può stimare che il tempo medio di battitura per palo possa essere di circa 1.5 ore.

12 Lista degli allegati e delle tavole.

Allegati

Allegato A **Relazione Geologica e Geotecnica Preliminare**
Autore: Studio Geologico Italiano Srl – Ing.A.Callerio.
Versione: 00

Allegato B **Individuazione Caratteristiche moto ondoso al largo di Torre S.Gennaro (BR) – Caratteristiche onda di progetto**
Autore: Ing.Girolamo Mauro Gentile
Versione: 00

Allegato C **Documentazione tecnica Illustrativa aerogeneratori Vestas V90 3.0 MW.**
Autore: Vestas Wind Systems AS
Versione: 00

Tavole:

Tavola I **Fondazione ed elemento di transizione degli aerogeneratori**
Rev. 00
Formato A0

Appendici.

Appendice 1 - Terreno stratigrafia 1 – Analisi strutturale
(FILE: BRISTRA1/GENTRA1)(SABBIA/ARGILLA)

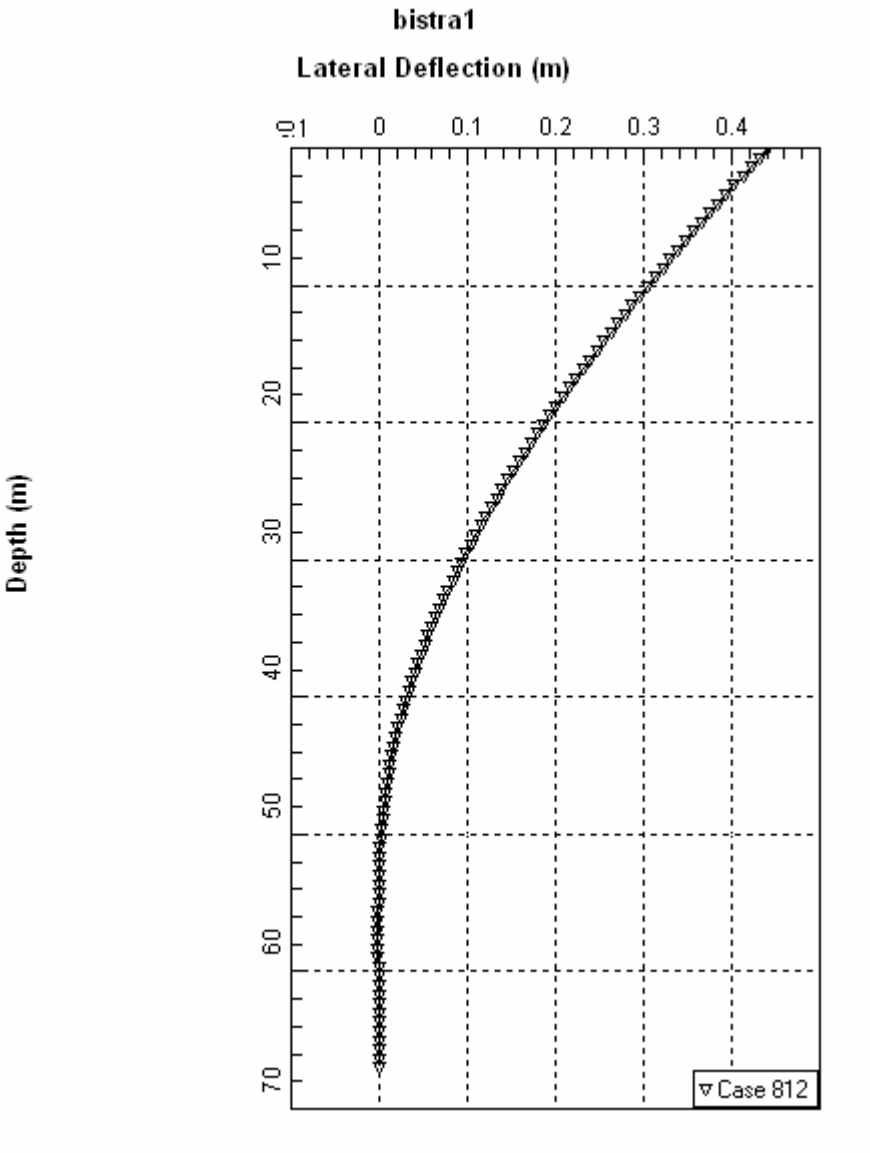
```
================================================================================

                    LPILE Plus for Windows, Version 4.0

               Analysis of Individual Piles and Drilled Shafts
              Subjected to Lateral Loading Using the p-y Method

                    (c) Copyright ENSOFT, Inc., 1985-2001
                              All Rights Reserved

================================================================================


This program is licensed to:

meriggi
ITALPROGETTI

Path to file locations:      C:\TREVI3\
Name of input data file:     bristra1.lpd
Name of output file:         bristra1.lpo
Name of plot output file:    bristra1.lpp
Name of runtime file:        bristra1.lpr


--------------------------------------------------------------------------------
                           Time and Date of Analysis
--------------------------------------------------------------------------------

               Date:  September 12, 2007     Time:  21:30:29


--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

TREVI SPA TORRE EOLICA LESINA-CHIETI  DIMENSIONAMENTO FONDAZIONE S2 H=24.00 M


--------------------------------------------------------------------------------
                                  Program Options
--------------------------------------------------------------------------------

Units Used in Computations - SI Units, meters, kilopascals

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments           =          100
- Deflection tolerance for closure    =   2.5400E-07 m
- Maximum number of iterations allowed =          100
- Maximum allowable deflection        =   2.5400E+00 m

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and
  soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) =  1


--------------------------------------------------------------------------------
                    Pile Structural Properties and Geometry
--------------------------------------------------------------------------------
```

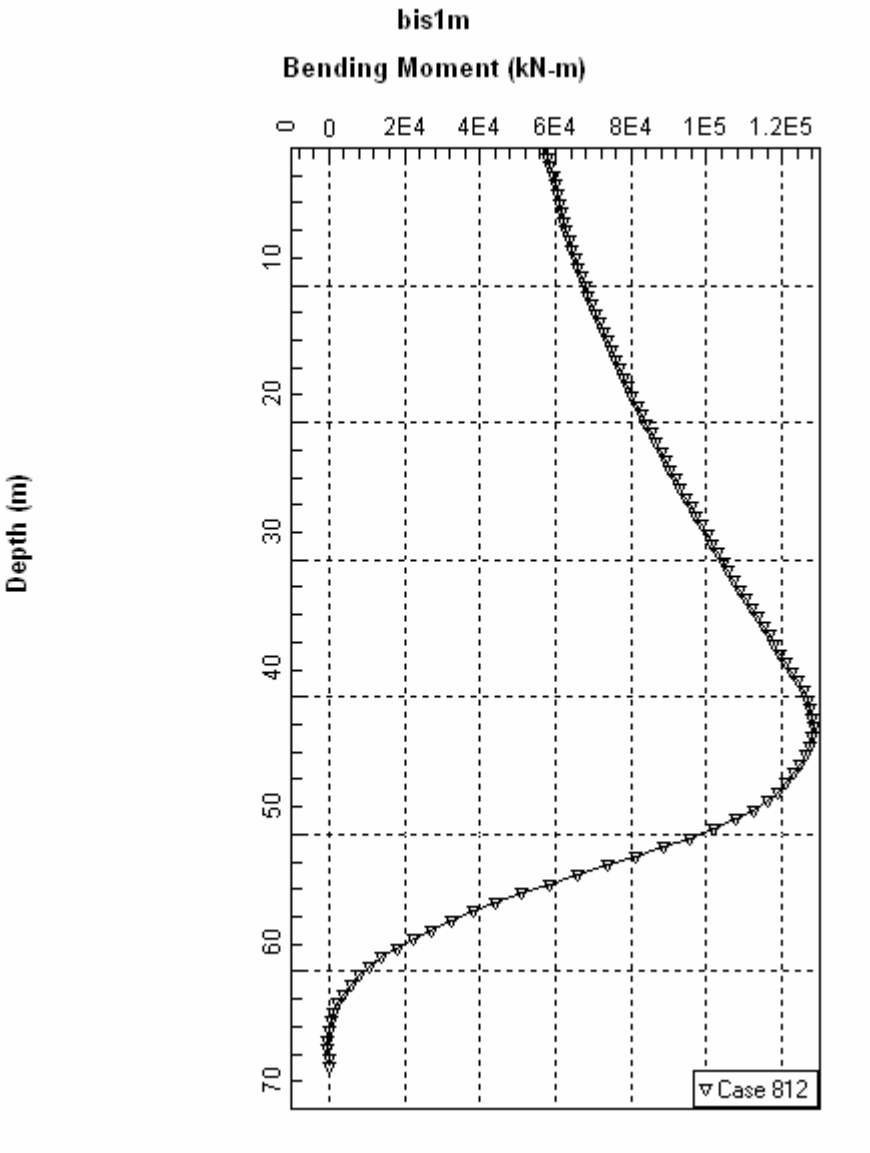
```
Pile Length                                =      67.00 m
Depth of ground surface below top of pile =      37.00 m
Slope angle of ground surface              =        .00 deg.

Structural properties of pile defined using  2 points

Point    Depth         Pile      Moment of       Pile      Modulus of
           X         Diameter     Inertia        Area      Elasticity
           m            m          m**4        Sq. m       kN/Sq. m
-----  ---------   -----------   ----------   ----------   -----------
  1       0.0000    4.20000000       1.6720        .7804  210000000.00
  2      64.5000    4.20000000       1.6720        .7804  210000000.00


---------------------------------------------------------------------------
                      Soil and Rock Layering Information
---------------------------------------------------------------------------

The soil profile is modelled using  2 layers

Layer  1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer    =       37.000 m
Distance from top of pile to bottom of layer =       47.000 m
p-y subgrade modulus k for top of soil layer =     8000.000  kN/ m**3
p-y subgrade modulus k for bottom of layer   =     8000.000  kN/ m**3

Layer  2 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       47.000 m
Distance from top of pile to bottom of layer =      100.000 m
p-y subgrade modulus k for top of soil layer =   270000.000  kN/ m**3
p-y subgrade modulus k for bottom of layer   =   270000.000  kN/ m**3


(Depth of lowest layer extends   33.00 m  below pile tip)


---------------------------------------------------------------------------
                    Effective Unit Weight of Soil vs. Depth
---------------------------------------------------------------------------

Distribution of effective unit weight of soil with depth
is defined using  4 points

Point        Depth X    Eff. Unit Weight
 No.            m           kN/ m**3
-----      ----------   ----------------
  1            37.00        7.00000
  2            47.00        7.00000
  3            47.00        9.00000
  4           100.00        9.00000



---------------------------------------------------------------------------
                           Shear Strength of Soils
---------------------------------------------------------------------------

Distribution of shear strength parameters with depth
defined using  4 points

Point    Depth X     Cohesion c     Angle of Friction     E50 or      RQD
 No.        m          kN/ m**2            Deg.            k_rm        %
-----   --------     ----------     ------------------    ------    ------
  1       37.000         .00000           32.00           ------    ------
  2       47.000         .00000           32.00           ------    ------
  3       47.000      200.00000             .00           .00500        .0
  4      100.000      200.00000             .00           .00500        .0

Notes:

(1)  Cohesion = uniaxial compressive strength for rock materials.
(2)  Values of E50 are reported for clay strata.
(3)  Default values will be generated for E50 when input values are 0.
(4)  RQD and k_rm are reported only for weak rock strata.
```

```
Static loading criteria was used for computation of  p-y curves


Distributed lateral load intensity defined using 16 points

Point      Depth X       Dist. Load
 No.         m             kN/ m
-----     ----------     ----------
  1          .000          .00000
  2         2.000         3.23000
  3         2.000         3.23000
  4         7.000       113.60000
  5         7.000        67.60000
  6        12.000        67.60000
  7        12.000        51.20000
  8        17.000        51.20000
  9        17.000        40.80000
 10        22.000        40.80000
 11        22.000        33.60000
 12        27.000        33.60000
 13        27.000        29.40000
 14        32.000        29.40000
 15        32.000        27.20000
 16        37.000        27.20000



--------------------------------------------------------------------------------
              Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------

Number of loads specified =  1

Load Case Number  1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head    =         812.000  kN
Bending moment at pile head =       57498.000  m- kN
Axial load at pile head     =        2564.000  kN

Non-zero moment at pile head for this load case indicates the pile-head
may rotate under the applied pile-head loading, but is not a free-head
(zero moment )condition.



--------------------------------------------------------------------------------
             Computed Values of Load Distribution and Deflection
                 for Lateral Loading for Load Case Number  1
--------------------------------------------------------------------------------

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head    =         812.000  kN
Specified bending moment at pile head =       57498.000  m- kN
Specified axial load at pile head     =        2564.000  kN

Non-zero moment for this load case indicates the pile-head may rotate under
the applied pile-head loading, but is not a free-head (zero moment )condition.

  Depth    Deflect.    Moment      Shear       Slope       Total     Soil Res
    X         y          M          V           S         Stress       p
    m         m         kN- m       kN         Rad.     kN/ m**2     kN/ m
-------- --------- ----------- ----------- ----------- ----------- -----------
   0.000   .441691  57498.0000    812.0000    -.014529  75501.8822      0.0000
    .670   .431993  58066.9050    812.3625    -.014419  76216.4159      0.0000
   1.340   .422369  58636.1053    813.4499    -.014307  76931.3207      0.0000
   2.010   .412821  59206.0849    815.3309    -.014195  77647.2041      0.0000
   2.680   .403348  59777.4195    822.5974    -.014082  78364.7894      0.0000
   3.350   .393952  60356.7462    839.7729    -.013967  79092.4127      0.0000
   4.020   .384633  60950.7021    866.8575    -.013851  79838.4100      0.0000
   4.690   .375391  61565.9245    903.8511    -.013734  80611.1175      0.0000
   5.360   .366229  62209.0502    950.7536    -.013616  81418.8710      0.0000
   6.030   .357146  62886.7162   1007.5652    -.013497  82270.0066      0.0000
   6.700   .348143  63605.5594   1074.2858    -.013376  83172.8599      0.0000
```

7.370	.339221	64372.2165	1132.7694	-.013254	84135.7665	0.0000
8.040	.330382	65169.0081	1178.0614	-.013130	85136.5216	0.0000
8.710	.321627	65995.9318	1223.3534	-.013005	86175.1219	0.0000
9.380	.312955	66852.9848	1268.6454	-.012879	87251.5640	0.0000
10.050	.304369	67740.1642	1313.9374	-.012750	88365.8444	0.0000
10.720	.295870	68657.4673	1359.2294	-.012620	89517.9595	0.0000
11.390	.287459	69604.8909	1404.5214	-.012488	90707.9055	0.0000
12.060	.279136	70582.4320	1444.3194	-.012354	91935.6784	0.0000
12.730	.270904	71582.7255	1478.6234	-.012219	93192.0278	0.0000
13.400	.262763	72605.7679	1512.9274	-.012081	94476.9495	0.0000
14.070	.254715	73651.5560	1547.2314	-.011942	95790.4394	0.0000
14.740	.246761	74720.0864	1581.5354	-.011800	97132.4931	0.0000
15.410	.238903	75811.3555	1615.8394	-.011656	98503.1062	0.0000
16.080	.231142	76925.3598	1650.1434	-.011511	99902.2743	0.0000
16.750	.223479	78062.0956	1684.4474	-.011363	1.013E+05	0.0000
17.420	.215916	79221.5592	1715.2674	-.011213	1.028E+05	0.0000
18.090	.208454	80399.0782	1742.6034	-.011060	1.043E+05	0.0000
18.760	.201095	81594.6488	1769.9394	-.010906	1.058E+05	0.0000
19.430	.193840	82808.2671	1797.2754	-.010749	1.073E+05	0.0000
20.100	.186691	84039.9290	1824.6114	-.010590	1.088E+05	0.0000
20.770	.179649	85289.6305	1851.9474	-.010428	1.104E+05	0.0000
21.440	.172717	86557.3676	1879.2834	-.010264	1.120E+05	0.0000
22.110	.165895	87843.1361	1904.2074	-.010098	1.136E+05	0.0000
22.780	.159186	89143.6997	1926.7194	-.009929	1.152E+05	0.0000
23.450	.152590	90459.0541	1949.2314	-.009758	1.169E+05	0.0000
24.120	.146110	91789.1950	1971.7434	-.009584	1.186E+05	0.0000
24.790	.139748	93134.1180	1994.2554	-.009407	1.203E+05	0.0000
25.460	.133504	94493.8188	2016.7674	-.009228	1.220E+05	0.0000
26.130	.127382	95868.2929	2039.2794	-.009047	1.237E+05	0.0000
26.800	.121382	97257.5358	2061.7914	-.008863	1.254E+05	0.0000
27.470	.115506	98661.5429	2082.8964	-.008676	1.272E+05	0.0000
28.140	.109756	1.001E+05	2102.5944	-.008486	1.290E+05	0.0000
28.810	.104135	1.015E+05	2122.2924	-.008294	1.308E+05	0.0000
29.480	.098643	1.030E+05	2141.9904	-.008099	1.326E+05	0.0000
30.150	.093283	1.044E+05	2161.6884	-.007901	1.344E+05	0.0000
30.820	.088056	1.059E+05	2181.3864	-.007700	1.363E+05	0.0000
31.490	.082965	1.074E+05	2201.0844	-.007497	1.381E+05	0.0000
32.160	.078011	1.088E+05	2220.0454	-.007290	1.400E+05	0.0000
32.830	.073196	1.104E+05	2238.2694	-.007081	1.419E+05	0.0000
33.500	.068522	1.119E+05	2256.4934	-.006869	1.438E+05	0.0000
34.170	.063991	1.134E+05	2274.7174	-.006654	1.457E+05	0.0000
34.840	.059605	1.149E+05	2292.9414	-.006436	1.477E+05	0.0000
35.510	.055366	1.165E+05	2311.1654	-.006216	1.496E+05	0.0000
36.180	.051276	1.181E+05	2329.3894	-.005992	1.516E+05	0.0000
36.850	.047337	1.196E+05	2347.6134	-.005765	1.536E+05	0.0000
37.520	.043551	1.212E+05	2326.6113	-.005535	1.555E+05	-89.8929
38.190	.039920	1.228E+05	2225.4726	-.005302	1.575E+05	-212.0137
38.860	.036446	1.242E+05	2041.8447	-.005067	1.593E+05	-336.1294
39.530	.033130	1.255E+05	1775.3283	-.004828	1.609E+05	-459.4421
40.200	.029975	1.266E+05	1427.6225	-.004588	1.623E+05	-578.4855
40.870	.026983	1.275E+05	1003.2410	-.004345	1.634E+05	-688.3252
41.540	.024153	1.280E+05	508.8407	-.004102	1.640E+05	-787.4965
42.210	.021486	1.282E+05	-47.7535	-.003857	1.642E+05	-873.9787
42.880	.018984	1.279E+05	-639.6893	-.003613	1.640E+05	-892.9940
43.550	.016645	1.273E+05	-1231.0245	-.003370	1.632E+05	-872.1856
44.220	.014469	1.263E+05	-1803.1678	-.003128	1.619E+05	-835.7047
44.890	.012454	1.249E+05	-2346.4679	-.002888	1.602E+05	-786.0868
45.560	.010599	1.232E+05	-2852.9522	-.002651	1.580E+05	-725.8065
46.230	.008901	1.211E+05	-3316.2817	-.002418	1.554E+05	-657.2668
46.900	.007358	1.187E+05	-3731.7008	-.002189	1.524E+05	-582.7902
47.570	.005967	1.161E+05	-4751.9817	-.001965	1.491E+05	-2462.8243
48.240	.004725	1.124E+05	-6311.1727	-.001747	1.444E+05	-2191.4773
48.910	.003626	1.076E+05	-7688.4524	-.001537	1.385E+05	-1919.8055
49.580	.002665	1.021E+05	-8882.9258	-.001337	1.315E+05	-1645.7868
50.250	.001834	95747.9210	-9891.6597	-.001149	1.235E+05	-1365.3591
50.920	.001126	88815.8704	-10707.3979	-9.725E-04	1.148E+05	-1069.6803
51.590	5.31E-04	81403.3492	-11311.8319	-8.101E-04	1.055E+05	-734.6004
52.260	4.00E-05	73660.7990	-11625.6223	-6.622E-04	95802.0484	-202.0871
52.930	-3.57E-04	65827.2905	-11491.6964	-5.291E-04	85963.3116	601.8657
53.600	-6.69E-04	58263.7436	-11013.8671	-4.107E-04	76463.6415	824.4904
54.270	-9.07E-04	51070.1196	-10416.0600	-3.064E-04	67428.5874	960.0084
54.940	-.001080	44307.2759	-9743.5720	-2.154E-04	58934.5852	1047.4184
55.610	-.001196	38014.4731	-9023.4294	-1.368E-04	51030.9453	1102.2611
56.280	-.001263	32216.3507	-8274.6483	-6.984E-05	43748.6146	1132.9062
56.950	-.001289	26926.6843	-7511.6837	-1.341E-05	37104.8948	1144.6003

```
  57.620  -.001281  22150.7407  -6746.0262   3.341E-05  31106.4010   1140.9443
  58.290  -.001244  17886.8944  -5987.0854   7.161E-05  25751.0916   1124.5507
  58.960  -.001185  14127.8002  -5242.7403   1.022E-04  21029.7413   1097.3749
  59.630  -.001107  10861.2714  -4519.7210   1.260E-04  16927.0436   1060.8917
  60.300  -.001016   8070.9412  -3823.8995   1.441E-04  13422.4423   1016.1875
  60.970 -9.14E-04   5736.7511  -3160.5368   1.572E-04  10490.7442    963.9996
  61.640 -8.05E-04   3835.2816  -2534.5193   1.664E-04   8102.5349    904.7093
  62.310 -6.91E-04   2339.9236  -1950.6167   1.723E-04   6224.3939    838.2834
  62.980 -5.75E-04   1220.8634  -1413.8073   1.757E-04   4818.8756    764.1327
  63.650 -4.56E-04    444.8183   -929.7541   1.772E-04   3844.1778    680.8024
  64.320 -3.37E-04    -25.6161   -505.6295   1.776E-04   3317.6679    585.2412
  64.990 -2.18E-04   -233.3356   -151.8902   1.774E-04   3578.5597    470.6971
  65.660 -9.93E-05   -229.7584    112.2093   1.770E-04   3574.0668    317.6596
  66.330  1.91E-05    -83.5830    171.9144   1.767E-04   3390.4733   -139.4355
  67.000  1.37E-04      0.0000      0.0000   1.766E-04   3285.4946   -373.7420

Output Verification:

Computed forces and moments are within specified convergence limits.


Output Summary for Load Case No.  1:

Pile-head deflection             =      .44169070 m
Computed slope at pile head      =     -.01452907
Maximum bending moment           =      128154.49  kN- m
Maximum shear force              =      -11625.62  kN
Depth of maximum bending moment  =          42.21  m
Depth of maximum shear force     =          52.26  m
Number of iterations             =             14
Number of zero deflection points =              2




--------------------------------------------------------------------------------
                        Summary of Pile-head Response
--------------------------------------------------------------------------------

Definition of symbols for pile-head boundary conditions:

y = pile-head displacment, m
M = pile-head moment,  kN- m
V = pile-head shear force,  kN
S = pile-head slope, radians
R = rotational stiffness of pile-head,  m- kN/rad

 BC    Boundary     Boundary       Axial    Pile Head    Maximum     Maximum
Type  Condition    Condition       Load     Deflection    Moment      Shear
          1            2             kN          m         m- kN       kN
---- ------------ ------------ ----------- ----------- ----------- -----------
  1  V=   812.000 M= 57498.000   2564.0000       .4417   1.282E+05 -11625.6223

The analysis ended normall
```


bistra1
Lateral Deflection (m)
-0.1
0
0.1
0.2
0.3
0.4
Depth (m)
10
20
30
40
50
60
70
Case 812


bis1m
Bending Moment (kN-m)
0
0
2E4
4E4
6E4
8E4
1E5
1.2E5
10
20
30
40
50
60
70
Depth (m)
Case 812

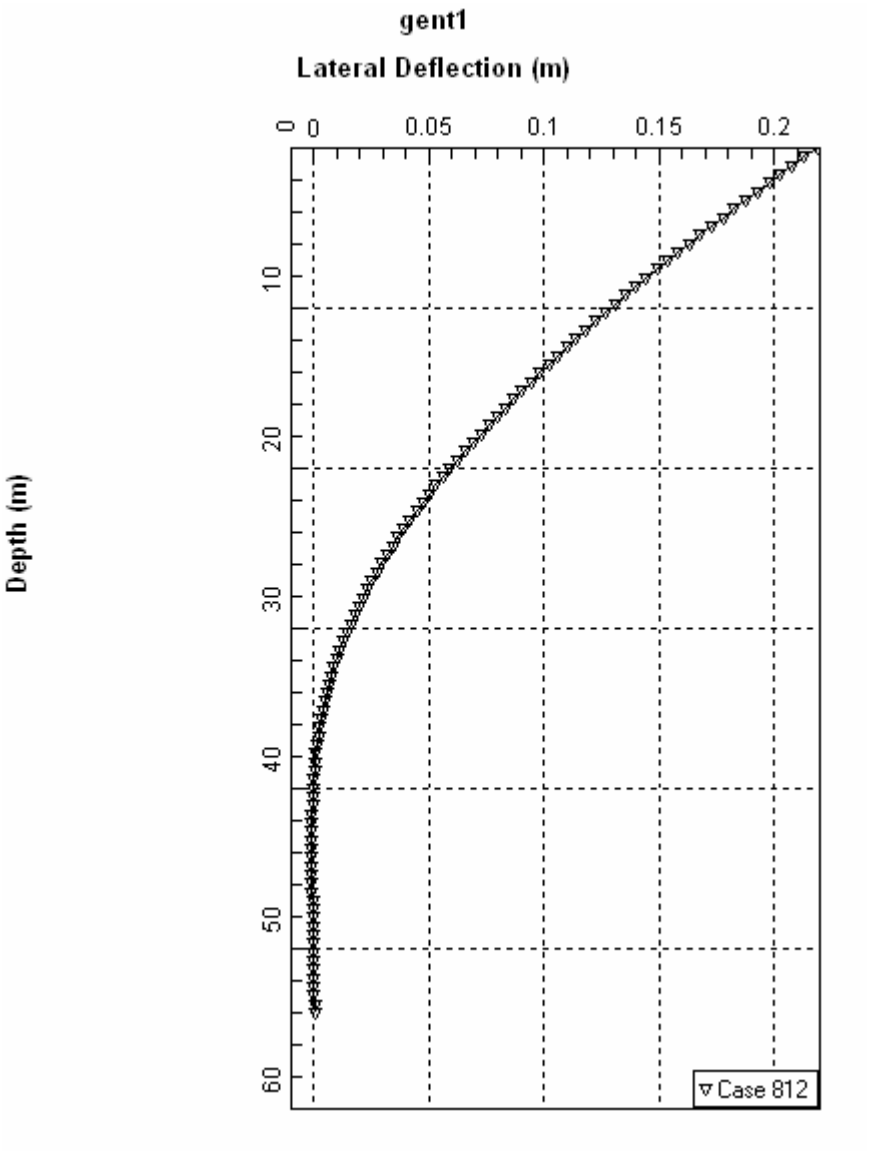
```
================================================================================

                    LPILE Plus for Windows, Version 4.0

               Analysis of Individual Piles and Drilled Shafts
              Subjected to Lateral Loading Using the p-y Method

                   (c) Copyright ENSOFT, Inc., 1985-2001
                             All Rights Reserved

================================================================================


This program is licensed to:

meriggi
ITALPROGETTI

Path to file locations:      C:\TREVI3\
Name of input data file:     gentra1.lpd
Name of output file:         gentra1.lpo
Name of plot output file:    gentra1.lpp
Name of runtime file:        gentra1.lpr


--------------------------------------------------------------------------------
                          Time and Date of Analysis
--------------------------------------------------------------------------------

               Date:  September 12, 2007     Time:  22:10:10


--------------------------------------------------------------------------------
                                 Problem Title
--------------------------------------------------------------------------------

TREVI SPA TORRE EOLICA LESINA-CHIETI  DIMENSIONAMENTO FONDAZIONE S1 H=17.00 M


--------------------------------------------------------------------------------
                                 Program Options
--------------------------------------------------------------------------------

Units Used in Computations - SI Units, meters, kilopascals

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments            =          100
- Deflection tolerance for closure     =   2.5400E-07 m
- Maximum number of iterations allowed =          100
- Maximum allowable deflection         =   2.5400E+00 m

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and
  soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) =  1


--------------------------------------------------------------------------------
                    Pile Structural Properties and Geometry
--------------------------------------------------------------------------------
```

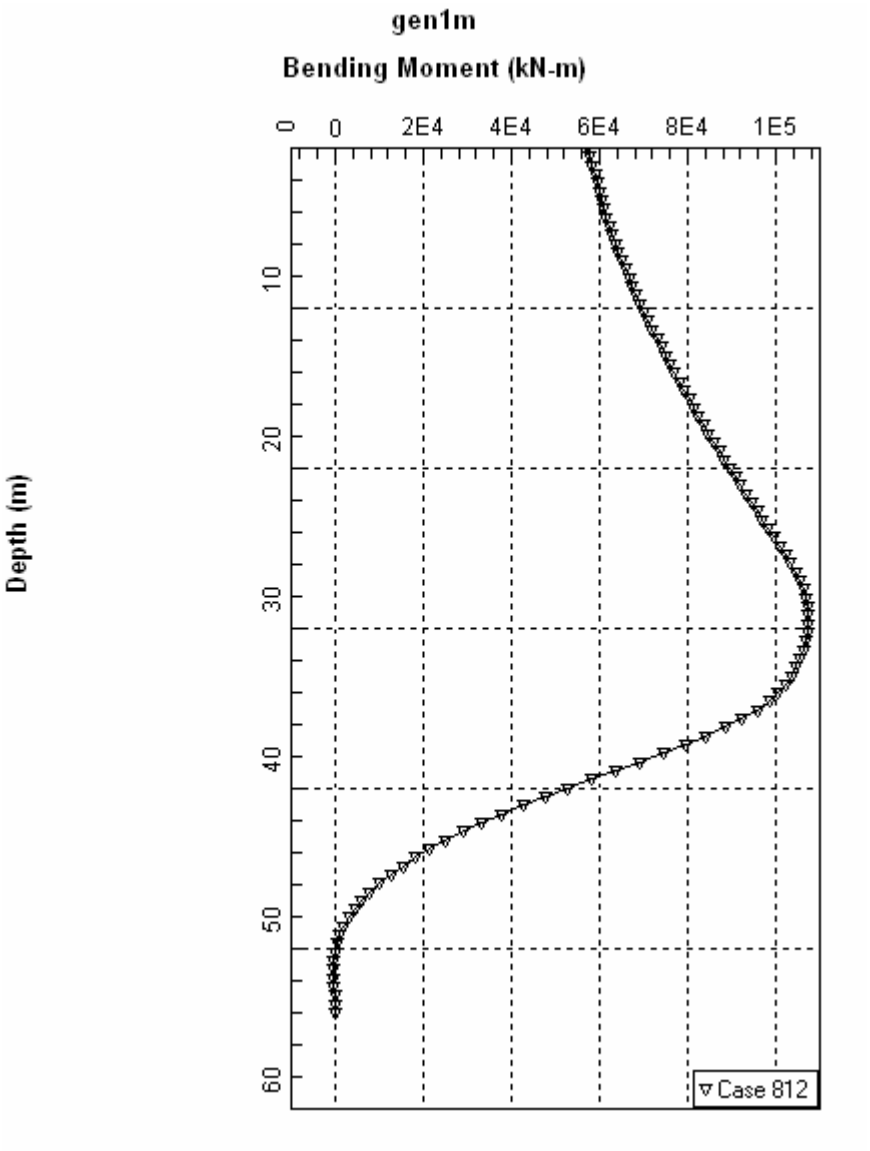
```
Pile Length                                =      54.00 m
Depth of ground surface below top of pile =      24.00 m
Slope angle of ground surface              =        .00 deg.

Structural properties of pile defined using  2 points

Point    Depth         Pile      Moment of       Pile      Modulus of
           X         Diameter     Inertia        Area      Elasticity
           m            m          m**4        Sq. m       kN/Sq. m
-----  ---------   -----------   ----------   ----------   -----------
  1       0.0000    4.20000000       1.6720        .7804  210000000.00
  2      57.5000    4.20000000       1.6720        .7804  210000000.00


---------------------------------------------------------------------------
                      Soil and Rock Layering Information
---------------------------------------------------------------------------

The soil profile is modelled using  2 layers

Layer  1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer    =       24.000 m
Distance from top of pile to bottom of layer =       34.000 m
p-y subgrade modulus k for top of soil layer =     8000.000  kN/ m**3
p-y subgrade modulus k for bottom of layer   =     8000.000  kN/ m**3

Layer  2 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       34.000 m
Distance from top of pile to bottom of layer =      100.000 m
p-y subgrade modulus k for top of soil layer =   270000.000  kN/ m**3
p-y subgrade modulus k for bottom of layer   =   270000.000  kN/ m**3


(Depth of lowest layer extends   46.00 m  below pile tip)


---------------------------------------------------------------------------
                    Effective Unit Weight of Soil vs. Depth
---------------------------------------------------------------------------

Distribution of effective unit weight of soil with depth
is defined using  4 points

Point        Depth X    Eff. Unit Weight
 No.            m           kN/ m**3
-----      ----------   ----------------
  1           24.00        7.00000
  2           34.00        7.00000
  3           34.00        9.00000
  4          100.00        9.00000



---------------------------------------------------------------------------
                           Shear Strength of Soils
---------------------------------------------------------------------------

Distribution of shear strength parameters with depth
defined using  4 points

Point    Depth X     Cohesion c     Angle of Friction     E50 or      RQD
 No.        m          kN/ m**2            Deg.            k_rm        %
-----   --------     ----------     ------------------    ------    ------
  1       24.000         .00000           32.00           ------    ------
  2       34.000         .00000           32.00           ------    ------
  3       34.000      200.00000             .00           .00500        .0
  4      100.000      200.00000             .00           .00500        .0

Notes:

(1)  Cohesion = uniaxial compressive strength for rock materials.
(2)  Values of E50 are reported for clay strata.
(3)  Default values will be generated for E50 when input values are 0.
(4)  RQD and k_rm are reported only for weak rock strata.
```

```
Static loading criteria was used for computation of  p-y curves


Distributed lateral load intensity defined using 16 points

Point      Depth X       Dist. Load
 No.         m             kN/ m
-----     ----------     ----------
  1           .000         .00000
  2          2.830       89.44000
  3          2.830      119.31000
  4          5.830      119.31000
  5          5.830       95.36000
  6          8.830       95.36000
  7          8.830       73.83000
  8         11.830       73.83000
  9         11.830       59.98000
 10         14.830       59.98000
 11         14.830       51.17000
 12         17.830       51.17000
 13         17.830       45.79000
 14         20.830       45.79000
 15         20.830       43.17000
 16         23.830       43.17000



---------------------------------------------------------------------------
              Pile-head Loading and Pile-head Fixity Conditions
---------------------------------------------------------------------------

Number of loads specified =  1

Load Case Number  1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head    =         812.000  kN
Bending moment at pile head =       57498.000  m- kN
Axial load at pile head     =        2564.000  kN

Non-zero moment at pile head for this load case indicates the pile-head
may rotate under the applied pile-head loading, but is not a free-head
(zero moment )condition.



---------------------------------------------------------------------------
             Computed Values of Load Distribution and Deflection
                 for Lateral Loading for Load Case Number  1
---------------------------------------------------------------------------

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head    =         812.000  kN
Specified bending moment at pile head =       57498.000  m- kN
Specified axial load at pile head     =        2564.000  kN

Non-zero moment for this load case indicates the pile-head may rotate under
the applied pile-head loading, but is not a free-head (zero moment )condition.

  Depth    Deflect.    Moment      Shear       Slope       Total     Soil Res
    X         y          M          V           S        Stress        p
    m         m        kN- m        kN         Rad.    kN/ m**2     kN/ m
-------- --------- ----------- ----------- ----------- ----------- -----------
   0.000   .218734  57498.0000    812.0000    -.009847  75501.8822      0.0000
    .540   .213440  57950.0527    816.6079    -.009758  76069.6517      0.0000
  1.080   .208195  58406.9586    830.4316    -.009669  76643.5168      0.0000
  1.620   .202998  58873.6931    853.4711    -.009579  77229.7264      0.0000
  2.160   .197850  59355.2319    885.7264    -.009488  77834.5299      0.0000
  2.700   .192751  59856.5504    927.1975    -.009396  78464.1763      0.0000
  3.240   .187702  60382.6241    982.4506    -.009304  79124.9148      0.0000
  3.780   .182703  60943.3600   1046.8780    -.009210  79829.1884      0.0000
  4.320   .177755  61538.7570   1111.3054    -.009116  80576.9956      0.0000
  4.860   .172857  62168.8137   1175.7328    -.009021  81368.3347      0.0000
  5.400   .168012  62833.5288   1240.1602    -.008925  82203.2042      0.0000
```

5.940	.163218	63532.9009	1298.1211	-.008828	83081.6022	0.0000
6.480	.158478	64259.9447	1349.6155	-.008729	83994.7553	0.0000
7.020	.153791	65014.6587	1401.1099	-.008630	84942.6616	0.0000
7.560	.149157	65797.0412	1452.6043	-.008529	85925.3190	0.0000
8.100	.144579	66607.0905	1504.0987	-.008428	86942.7255	0.0000
8.640	.140056	67444.8050	1555.5931	-.008325	87994.8789	0.0000
9.180	.135588	68310.1829	1601.2744	-.008220	89081.7769	0.0000
9.720	.131178	69196.9441	1641.1426	-.008114	90195.5321	0.0000
10.260	.126825	70105.0868	1681.0108	-.008007	91336.1420	0.0000
10.800	.122530	71034.6091	1720.8790	-.007899	92503.6041	0.0000
11.340	.118294	71985.5089	1760.7472	-.007789	93697.9161	0.0000
11.880	.114118	72957.7843	1796.8759	-.007677	94919.0754	0.0000
12.420	.110002	73947.3945	1829.2651	-.007564	96162.0069	0.0000
12.960	.105948	74954.3374	1861.6543	-.007450	97426.7079	0.0000
13.500	.101956	75978.6109	1894.0435	-.007334	98713.1758	0.0000
14.040	.098028	77020.2127	1926.4327	-.007216	1.000E+05	0.0000
14.580	.094163	78079.1407	1958.8219	-.007097	1.014E+05	0.0000
15.120	.090363	79155.3927	1988.8324	-.006976	1.027E+05	0.0000
15.660	.086629	80246.3972	2016.4642	-.006853	1.041E+05	0.0000
16.200	.082961	81352.1520	2044.0960	-.006729	1.055E+05	0.0000
16.740	.079361	82472.6548	2071.7278	-.006603	1.069E+05	0.0000
17.280	.075830	83607.9032	2099.3596	-.006475	1.083E+05	0.0000
17.820	.072368	84757.8947	2126.9914	-.006346	1.097E+05	0.0000
18.360	.068976	85922.6268	2153.1706	-.006215	1.112E+05	0.0000
18.900	.065656	87100.5284	2177.8972	-.006082	1.127E+05	0.0000
19.440	.062408	88291.5969	2202.6238	-.005947	1.142E+05	0.0000
19.980	.059233	89495.8297	2227.3504	-.005810	1.157E+05	0.0000
20.520	.056133	90713.2243	2252.0770	-.005672	1.172E+05	0.0000
21.060	.053108	91943.7782	2276.0962	-.005531	1.188E+05	0.0000
21.600	.050159	93186.7246	2299.4080	-.005389	1.203E+05	0.0000
22.140	.047288	94442.0609	2322.7198	-.005244	1.219E+05	0.0000
22.680	.044495	95709.7846	2346.0316	-.005098	1.235E+05	0.0000
23.220	.041782	96989.8928	2369.3434	-.004950	1.251E+05	0.0000
23.760	.039149	98282.3828	2392.6552	-.004800	1.267E+05	0.0000
24.300	.036598	99587.2520	2391.2073	-.004648	1.284E+05	-48.5327
24.840	.034130	1.009E+05	2340.3478	-.004494	1.300E+05	-139.8359
25.380	.031745	1.021E+05	2239.4634	-.004337	1.316E+05	-233.8100
25.920	.029445	1.033E+05	2087.8573	-.004180	1.330E+05	-327.6940
26.460	.027231	1.044E+05	1885.6950	-.004020	1.344E+05	-421.0551
27.000	.025104	1.054E+05	1633.7493	-.003859	1.356E+05	-512.0770
27.540	.023064	1.062E+05	1334.0473	-.003696	1.366E+05	-597.9304
28.080	.021112	1.068E+05	989.8956	-.003532	1.374E+05	-676.7056
28.620	.019249	1.072E+05	615.0923	-.003367	1.380E+05	-711.4548
29.160	.017475	1.075E+05	228.2256	-.003202	1.383E+05	-721.3848
29.700	.015791	1.075E+05	-160.9641	-.003037	1.383E+05	-720.0586
30.240	.014195	1.073E+05	-546.7111	-.002872	1.381E+05	-708.6339
30.780	.012689	1.069E+05	-923.8722	-.002707	1.376E+05	-688.2592
31.320	.011272	1.063E+05	-1287.9213	-.002543	1.368E+05	-660.0705
31.860	.009943	1.055E+05	-1634.9409	-.002380	1.358E+05	-625.1874
32.400	.008701	1.046E+05	-1961.6133	-.002219	1.346E+05	-584.7103
32.940	.007546	1.034E+05	-2265.2088	-.002059	1.332E+05	-539.7175
33.480	.006478	1.021E+05	-2543.5734	-.001901	1.316E+05	-491.2625
34.020	.005494	1.007E+05	-3314.2334	-.001745	1.297E+05	-2363.0337
34.560	.004593	98550.5731	-4535.6538	-.001592	1.271E+05	-2160.7457
35.100	.003775	95788.3820	-5647.9315	-.001442	1.236E+05	-1958.8014
35.640	.003036	92454.8003	-6651.1050	-.001297	1.194E+05	-1756.6557
36.180	.002374	88608.7810	-7544.7996	-.001158	1.146E+05	-1553.3244
36.720	.001785	84309.6237	-8327.9053	-.001025	1.092E+05	-1347.0670
37.260	.001267	79617.4820	-8997.9805	-8.991E-04	1.033E+05	-1134.6930
37.800	8.14E-04	74594.2944	-9549.9841	-7.805E-04	96974.5007	-909.7649
38.340	4.24E-04	69305.6605	-9972.8322	-6.698E-04	90332.0778	-656.3394
38.880	9.07E-05	63825.4904	-10232.1132	-5.675E-04	83449.0890	-303.9604
39.420	-1.89E-04	58256.5496	-10195.8365	-4.736E-04	76454.6060	438.3184
39.960	-4.21E-04	52815.2984	-9900.9628	-3.882E-04	69620.4986	653.8066
40.500	-6.08E-04	47564.5847	-9512.1419	-3.110E-04	63025.7027	786.2707
41.040	-7.57E-04	42543.0463	-9063.1047	-2.417E-04	56718.7465	876.8301
41.580	-8.69E-04	37777.1009	-8572.5707	-1.799E-04	50732.8104	939.9626
42.120	-9.51E-04	33285.1682	-8053.3636	-1.253E-04	45091.0288	983.0264
42.660	-.001005	29079.8151	-7515.1188	-7.732E-05	39809.1858	1010.4732
43.200	-.001034	25169.0540	-6965.4620	-3.561E-05	34897.3448	1025.2926
43.740	-.001043	21557.2147	-6410.6315	3.252E-07	30360.9437	1029.6353
44.280	-.001034	18245.5712	-5855.8469	3.093E-05	26201.5828	1025.1226
44.820	-.001010	15232.8145	-5305.5493	5.668E-05	22417.6181	1013.0167
45.360	-9.73E-04	12515.4210	-4763.5685	7.801E-05	19004.6239	994.3195
45.900	-9.26E-04	10087.9444	-4233.2474	9.539E-05	15955.7598	969.8328

```
  46.440 -8.70E-04   7943.2497  -3717.5401   1.093E-04  13262.0642    940.1941
  46.980 -8.08E-04   6072.6986  -3219.0955   1.200E-04  10912.6878    905.8970
  47.520 -7.40E-04   4466.2941  -2740.3325   1.281E-04   8895.0745    867.2993
  48.060 -6.69E-04   3112.7846  -2283.5145   1.340E-04   7195.0925    824.6191
  48.600 -5.95E-04   1999.7274  -1850.8292   1.379E-04   5797.1140    777.9190
  49.140 -5.20E-04   1113.5072  -1444.4821   1.403E-04   4684.0383    727.0705
  49.680 -4.44E-04    439.2983  -1066.8172   1.415E-04   3837.2449    671.6882
  50.220 -3.67E-04    -39.0472   -720.4899   1.418E-04   3334.5372    611.0056
  50.760 -2.91E-04   -339.2234   -408.7407   1.415E-04   3711.5527    543.6210
  51.300 -2.15E-04   -480.8790   -135.8970   1.409E-04   3889.4695    466.9111
  51.840 -1.39E-04   -486.3823     91.5159   1.401E-04   3896.3815    375.3588
  52.380 -6.32E-05   -382.4299    261.2709   1.395E-04   3765.8193    253.3634
  52.920  1.19E-05   -204.5960    299.8742   1.390E-04   3542.4632   -110.3882
  53.460  8.69E-05    -58.9508    189.7966   1.388E-04   3359.5357   -297.3064
  54.000  1.62E-04      0.0000      0.0000   1.388E-04   3285.4946   -405.6440

Output Verification:

Computed forces and moments are within specified convergence limits.


Output Summary for Load Case No.  1:

Pile-head deflection             =      .21873353 m
Computed slope at pile head      =     -.00984713
Maximum bending moment           =      107503.08  kN- m
Maximum shear force              =      -10232.11  kN
Depth of maximum bending moment  =          29.70  m
Depth of maximum shear force     =          38.88  m
Number of iterations             =             14
Number of zero deflection points =              2




--------------------------------------------------------------------------------
                        Summary of Pile-head Response
--------------------------------------------------------------------------------

Definition of symbols for pile-head boundary conditions:

y = pile-head displacment, m
M = pile-head moment,  kN- m
V = pile-head shear force,  kN
S = pile-head slope, radians
R = rotational stiffness of pile-head,  m- kN/rad

 BC    Boundary     Boundary       Axial    Pile Head    Maximum     Maximum
Type  Condition    Condition       Load     Deflection    Moment      Shear

          1            2             kN          m         m- kN        kN
---- ------------ ------------ ----------- ----------- ----------- -----------
  1  V=   812.000 M= 57498.000   2564.0000       .2187   1.075E+05 -10232.1132

The analysis ended normally.
```


gent1
Lateral Deflection (m)
0
0
0.05
0.1
0.15
0.2
10
20
30
40
50
60
Depth (m)
Case 812


gen1m
Bending Moment (kN-m)
0
0
2E4
4E4
6E4
8E4
1E5
10
20
30
40
50
60
Depth (m)
Case 812

Appendice 2 - Terreno stratigrafia 2 – Analisi strutturale (FILES: BRISTRA2/GENTRA2)(ARGILLA/ARGILLA)

```
================================================================================

                    LPILE Plus for Windows, Version 4.0

               Analysis of Individual Piles and Drilled Shafts
              Subjected to Lateral Loading Using the p-y Method

                   (c) Copyright ENSOFT, Inc., 1985-2001
                             All Rights Reserved

================================================================================


This program is licensed to:

meriggi
ITALPROGETTI

Path to file locations:      C:\TREVI3\
Name of input data file:     bristra2.lpd
Name of output file:         bristra2.lpo
Name of plot output file:    bristra2.lpp
Name of runtime file:        bristra2.lpr


--------------------------------------------------------------------------------
                          Time and Date of Analysis
--------------------------------------------------------------------------------

               Date:  September 12, 2007     Time:  21:34:25


--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

TREVI SPA TORRE EOLICA LESINA-CHIETI  DIMENSIONAMENTO FONDAZIONE S2 H=24.00 M


--------------------------------------------------------------------------------
                                  Program Options
--------------------------------------------------------------------------------

Units Used in Computations - SI Units, meters, kilopascals

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments           =          100
- Deflection tolerance for closure    =   2.5400E-07 m
- Maximum number of iterations allowed =          100
- Maximum allowable deflection        =   2.5400E+00 m

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and
  soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) =  1


--------------------------------------------------------------------------------
                    Pile Structural Properties and Geometry
--------------------------------------------------------------------------------
```

```
Pile Length                                 =      67.00 m
Depth of ground surface below top of pile =      37.00 m
Slope angle of ground surface               =        .00 deg.

Structural properties of pile defined using  2 points

Point    Depth         Pile      Moment of       Pile      Modulus of
          X          Diameter     Inertia        Area      Elasticity
           m             m          m**4        Sq. m       kN/Sq. m
-----  ---------   -----------   ----------   ----------   -----------
  1       0.0000    4.20000000       1.6720        .7804  210000000.00
  2      64.5000    4.20000000       1.6720        .7804  210000000.00


---------------------------------------------------------------------------
                      Soil and Rock Layering Information
---------------------------------------------------------------------------

The soil profile is modelled using  2 layers

Layer  1 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer    =       37.000 m
Distance from top of pile to bottom of layer =       47.000 m

Layer  2 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       47.000 m
Distance from top of pile to bottom of layer =      100.000 m
p-y subgrade modulus k for top of soil layer =   270000.000  kN/ m**3
p-y subgrade modulus k for bottom of layer   =   270000.000  kN/ m**3


(Depth of lowest layer extends   33.00 m  below pile tip)


---------------------------------------------------------------------------
                   Effective Unit Weight of Soil vs. Depth
---------------------------------------------------------------------------

Distribution of effective unit weight of soil with depth
is defined using  4 points

Point        Depth X    Eff. Unit Weight
 No.            m           kN/ m**3
-----      ----------   ----------------
  1            37.00        7.00000
  2            47.00        7.00000
  3            47.00        9.00000
  4           100.00        9.00000



---------------------------------------------------------------------------
                            Shear Strength of Soils
---------------------------------------------------------------------------

Distribution of shear strength parameters with depth
defined using  4 points

Point    Depth X     Cohesion c     Angle of Friction     E50 or      RQD
 No.        m          kN/ m**2            Deg.            k_rm        %
-----   --------     ----------     ------------------    ------    ------
  1       37.000        5.00000             .00           .02000        .0
  2       47.000       15.40000             .00           .02000        .0
  3       47.000      200.00000             .00           .00500        .0
  4      100.000      200.00000             .00           .00500        .0

Notes:

(1)  Cohesion = uniaxial compressive strength for rock materials.
(2)  Values of E50 are reported for clay strata.
(3)  Default values will be generated for E50 when input values are 0.
(4)  RQD and k_rm are reported only for weak rock strata.

Static loading criteria was used for computation of  p-y curves
```

Distributed lateral load intensity defined using 16 points

Point No.	Depth X m	Dist. Load kN/ m
1	.000	.00000
2	2.000	3.23000
3	2.000	3.23000
4	7.000	113.60000
5	7.000	67.60000
6	12.000	67.60000
7	12.000	51.20000
8	17.000	51.20000
9	17.000	40.80000
10	22.000	40.80000
11	22.000	33.60000
12	27.000	33.60000
13	27.000	29.40000
14	32.000	29.40000
15	32.000	27.20000
16	37.000	27.20000

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 812.000 kN
Bending moment at pile head = 57498.000 m- kN
Axial load at pile head = 2564.000 kN

Non-zero moment at pile head for this load case indicates the pile-head
may rotate under the applied pile-head loading, but is not a free-head
(zero moment)condition.

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

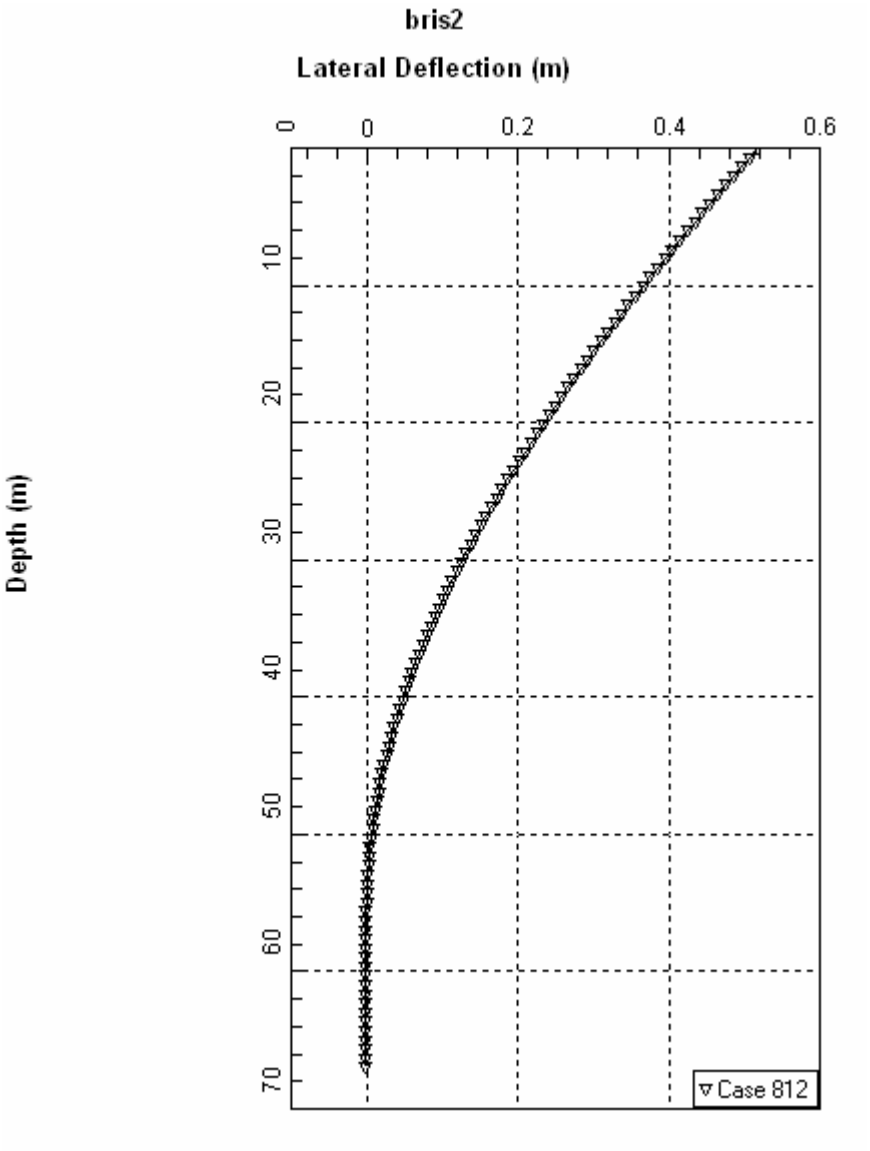
Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 812.000 kN
Specified bending moment at pile head = 57498.000 m- kN
Specified axial load at pile head = 2564.000 kN

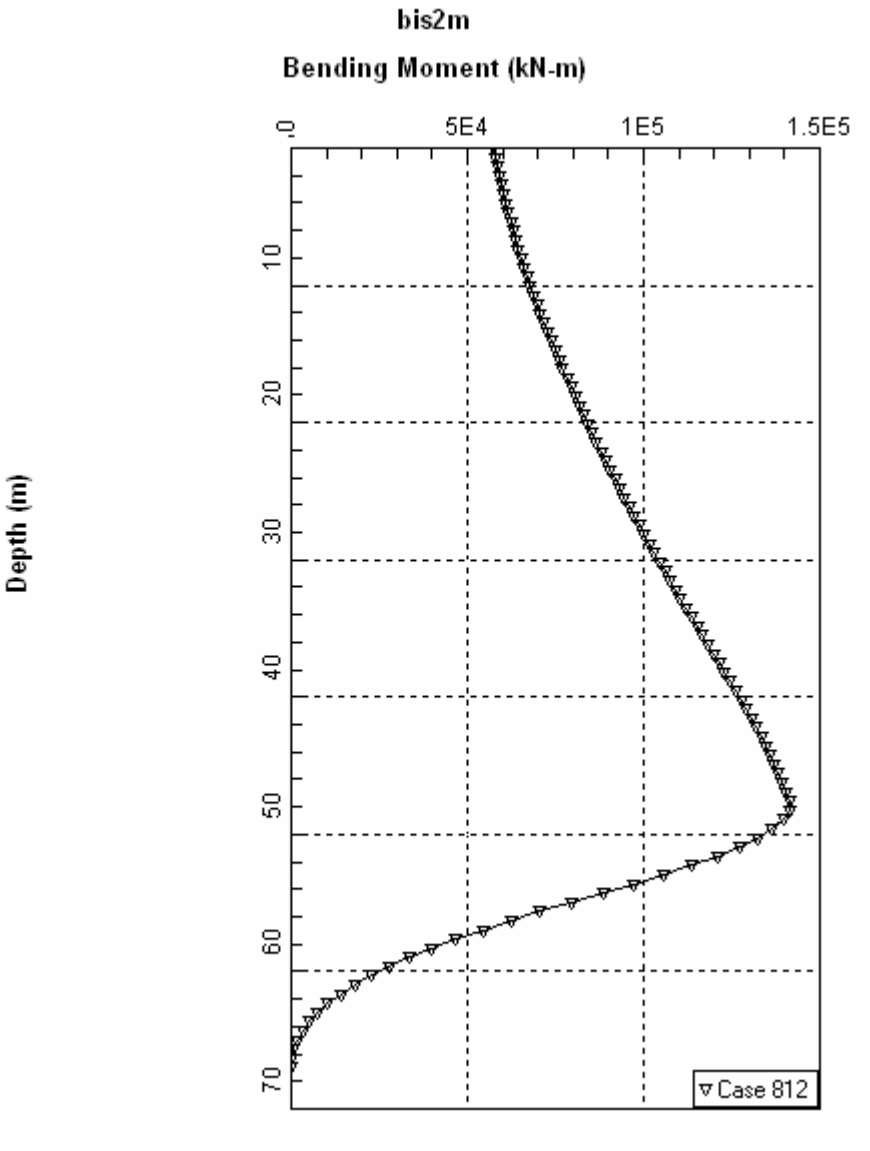
Non-zero moment for this load case indicates the pile-head may rotate under
the applied pile-head loading, but is not a free-head (zero moment)condition.

Depth X m	Deflect. y m	Moment M kN- m	Shear V kN	Slope S Rad.	Total Stress kN/ m**2	Soil Res p kN/ m
0.000	.517597	57498.0000	812.0000	-.015986	75501.8822	0.0000
.670	.506923	58069.4081	812.3625	-.015876	76219.5598	0.0000
1.340	.496324	58641.1115	813.4499	-.015765	76937.6084	0.0000
2.010	.485799	59213.5942	815.3309	-.015652	77656.6356	0.0000
2.680	.475350	59787.4318	822.5974	-.015539	78377.3647	0.0000
3.350	.464977	60369.2615	839.7729	-.015424	79108.1317	0.0000
4.020	.454682	60965.7205	866.8575	-.015308	79857.2727	0.0000
4.690	.444464	61583.4457	903.8511	-.015191	80633.1238	0.0000
5.360	.434325	62229.0743	950.7536	-.015073	81444.0210	0.0000
6.030	.424266	62909.2432	1007.5652	-.014954	82298.3000	0.0000
6.700	.414287	63630.5891	1074.2858	-.014833	83204.2967	0.0000
7.370	.404390	64399.7488	1132.7694	-.014711	84170.3466	0.0000
8.040	.394575	65199.0430	1178.0614	-.014587	85174.2448	0.0000

8.710	.384843	66028.4691	1223.3534	-.014462	86215.9881	0.0000
9.380	.375196	66888.0245	1268.6454	-.014335	87295.5732	0.0000
10.050	.365634	67777.7062	1313.9374	-.014207	88412.9964	0.0000
10.720	.356159	68697.5113	1359.2294	-.014076	89568.2541	0.0000
11.390	.346772	69647.4370	1404.5214	-.013944	90761.3425	0.0000
12.060	.337473	70627.4799	1444.3194	-.013811	91992.2577	0.0000
12.730	.328265	71630.2750	1478.6234	-.013675	93251.7491	0.0000
13.400	.319149	72655.8190	1512.9274	-.013537	94539.8128	0.0000
14.070	.310125	73704.1085	1547.2314	-.013398	95856.4443	0.0000
14.740	.301196	74775.1401	1581.5354	-.013256	97201.6395	0.0000
15.410	.292362	75868.9102	1615.8394	-.013112	98575.3939	0.0000
16.080	.283626	76985.4154	1650.1434	-.012966	99977.7029	0.0000
16.750	.274987	78124.6518	1684.4474	-.012818	1.014E+05	0.0000
17.420	.266449	79286.6158	1715.2674	-.012668	1.029E+05	0.0000
18.090	.258012	80466.6351	1742.6034	-.012516	1.044E+05	0.0000
18.760	.249678	81664.7057	1769.9394	-.012361	1.059E+05	0.0000
19.430	.241448	82880.8237	1797.2754	-.012204	1.074E+05	0.0000
20.100	.233324	84114.9852	1824.6114	-.012045	1.089E+05	0.0000
20.770	.225308	85367.1860	1851.9474	-.011883	1.105E+05	0.0000
21.440	.217401	86637.4221	1879.2834	-.011719	1.121E+05	0.0000
22.110	.209605	87925.6894	1904.2074	-.011552	1.137E+05	0.0000
22.780	.201921	89228.7514	1926.7194	-.011383	1.154E+05	0.0000
23.450	.194351	90546.6040	1949.2314	-.011212	1.170E+05	0.0000
24.120	.186897	91879.2429	1971.7434	-.011038	1.187E+05	0.0000
24.790	.179560	93226.6636	1994.2554	-.010861	1.204E+05	0.0000
25.460	.172343	94588.8617	2016.7674	-.010682	1.221E+05	0.0000
26.130	.165246	95965.8328	2039.2794	-.010500	1.238E+05	0.0000
26.800	.158273	97357.5724	2061.7914	-.010316	1.256E+05	0.0000
27.470	.151423	98764.0758	2082.8964	-.010129	1.273E+05	0.0000
28.140	.144700	1.002E+05	2102.5944	-.009939	1.291E+05	0.0000
28.810	.138105	1.016E+05	2122.2924	-.009746	1.309E+05	0.0000
29.480	.131640	1.031E+05	2141.9904	-.009551	1.327E+05	0.0000
30.150	.125307	1.045E+05	2161.6884	-.009353	1.346E+05	0.0000
30.820	.119107	1.060E+05	2181.3864	-.009152	1.364E+05	0.0000
31.490	.113043	1.075E+05	2201.0844	-.008948	1.383E+05	0.0000
32.160	.107116	1.090E+05	2220.0454	-.008742	1.401E+05	0.0000
32.830	.101329	1.105E+05	2238.2694	-.008533	1.420E+05	0.0000
33.500	.095682	1.120E+05	2256.4934	-.008320	1.440E+05	0.0000
34.170	.090179	1.135E+05	2274.7174	-.008105	1.459E+05	0.0000
34.840	.084821	1.151E+05	2292.9414	-.007887	1.478E+05	0.0000
35.510	.079611	1.166E+05	2311.1654	-.007666	1.498E+05	0.0000
36.180	.074549	1.182E+05	2329.3894	-.007442	1.517E+05	0.0000
36.850	.069638	1.198E+05	2347.6134	-.007215	1.537E+05	0.0000
37.520	.064881	1.214E+05	2346.9257	-.006985	1.557E+05	-29.2528
38.190	.060279	1.229E+05	2324.1663	-.006752	1.577E+05	-38.6857
38.860	.055834	1.245E+05	2295.2115	-.006516	1.597E+05	-47.7465
39.530	.051548	1.260E+05	2260.3189	-.006277	1.616E+05	-56.4107
40.200	.047423	1.276E+05	2219.7626	-.006035	1.635E+05	-64.6529
40.870	.043461	1.290E+05	2173.8344	-.005790	1.654E+05	-72.4463
41.540	.039665	1.305E+05	2122.8443	-.005542	1.672E+05	-79.7628
42.210	.036035	1.319E+05	2067.1218	-.005292	1.690E+05	-86.5731
42.880	.032574	1.333E+05	2007.0164	-.005039	1.707E+05	-92.8460
43.550	.029283	1.346E+05	1942.8992	-.004783	1.724E+05	-98.5486
44.220	.026164	1.359E+05	1875.1640	-.004525	1.740E+05	-103.6459
44.890	.023219	1.371E+05	1804.2289	-.004265	1.755E+05	-108.1008
45.560	.020450	1.383E+05	1730.5373	-.004002	1.770E+05	-111.8739
46.230	.017857	1.395E+05	1654.5604	-.003737	1.785E+05	-114.9230
46.900	.015442	1.406E+05	1576.7982	-.003470	1.798E+05	-117.2028
47.570	.013207	1.416E+05	510.0991	-.003200	1.811E+05	-3066.9738
48.240	.011154	1.413E+05	-1519.0198	-.002931	1.807E+05	-2990.0974
48.910	.009280	1.396E+05	-3479.4410	-.002663	1.786E+05	-2861.9061
49.580	.007586	1.366E+05	-5345.6840	-.002399	1.749E+05	-2708.9685
50.250	.006066	1.324E+05	-7084.9811	-.002142	1.696E+05	-2482.9631
50.920	.004715	1.271E+05	-8650.1204	-.001895	1.629E+05	-2189.0945
51.590	.003526	1.208E+05	-10017.7011	-.001658	1.550E+05	-1893.2358
52.260	.002493	1.137E+05	-11185.1600	-.001435	1.461E+05	-1591.7164
52.930	.001604	1.058E+05	-12146.1530	-.001225	1.362E+05	-1276.9192
53.600	8.51E-04	97424.4321	-12885.4937	-.001031	1.256E+05	-930.0682
54.270	2.22E-04	88584.0092	-13356.3692	-8.537E-04	1.145E+05	-475.5301
54.940	-2.93E-04	79529.8305	-13332.9021	-6.933E-04	1.032E+05	545.5811
55.610	-7.07E-04	70720.3024	-12866.2505	-5.499E-04	92108.8409	847.4087
56.280	-.001030	62290.9442	-12239.6442	-4.230E-04	81521.7284	1023.0577
56.950	-.001273	54320.6325	-11515.8070	-3.118E-04	71511.1694	1137.6505
57.620	-.001448	46860.8340	-10728.3537	-2.152E-04	62141.8052	1212.9565
58.290	-.001562	39945.3780	-9899.9418	-1.324E-04	53456.1249	1259.9147

```
  58.960  -.001625  33595.3669  -9047.3465  -6.224E-05  45480.6324   1285.1458
  59.630  -.001645  27822.1476  -8183.6275  -3.642E-06  38229.5795   1293.1199
  60.300  -.001630  22629.3186  -7319.2618   4.449E-05  31707.4856   1287.0761
  60.970  -.001586  18014.1839  -6462.8174   8.327E-05  25910.9648   1269.4744
  61.640  -.001518  13968.8572  -5621.3935   1.138E-04  20830.1119   1242.2387
  62.310  -.001433  10481.1256  -4800.9335   1.371E-04  16449.5878   1206.8956
  62.980  -.001335   7535.1352  -4006.4647   1.543E-04  12749.4802   1164.6532
  63.650  -.001226   5111.9328  -3242.2973   1.664E-04   9705.9844   1116.4434
  64.320  -.001112   3189.8852  -2512.2053   1.743E-04   7291.9294   1062.9356
  64.990 -9.93E-04   1744.9788  -1819.6056   1.790E-04   5477.1547   1004.5262
  65.660 -8.72E-04    750.9986  -1167.7537   1.814E-04   4228.7345    941.3004
  66.330 -7.50E-04    179.5657   -559.9794   1.823E-04   3511.0257    872.9513
  67.000 -6.28E-04      0.0000      0.0000   1.824E-04   3285.4946    798.6290

Output Verification:

Computed forces and moments are within specified convergence limits.


Output Summary for Load Case No.  1:

Pile-head deflection             =      .51759725 m
Computed slope at pile head      =     -.01598616
Maximum bending moment           =      141595.26  kN- m
Maximum shear force              =      -13356.37  kN
Depth of maximum bending moment  =          47.57  m
Depth of maximum shear force     =          54.27  m
Number of iterations             =             19
Number of zero deflection points =              1




--------------------------------------------------------------------------------
                        Summary of Pile-head Response
--------------------------------------------------------------------------------

Definition of symbols for pile-head boundary conditions:

y = pile-head displacment, m
M = pile-head moment,  kN- m
V = pile-head shear force,  kN
S = pile-head slope, radians
R = rotational stiffness of pile-head,  m- kN/rad

 BC    Boundary     Boundary       Axial    Pile Head    Maximum     Maximum
Type  Condition    Condition       Load     Deflection    Moment      Shear
          1            2             kN          m         m- kN       kN
---- ------------ ------------ ----------- ----------- ----------- -----------
  1  V=   812.000 M= 57498.000   2564.0000       .5176   1.416E+05 -13356.3692

The analysis ended normally.
```


bris2
Lateral Deflection (m)
0
0
0.2
0.4
0.6
10
20
30
40
50
60
70
Depth (m)
Case 812


bis2m
Bending Moment (kN-m)
0
5E4
1E5
1.5E5
Depth (m)
10
20
30
40
50
60
70
Case 812

```
================================================================================

                    LPILE Plus for Windows, Version 4.0

               Analysis of Individual Piles and Drilled Shafts
              Subjected to Lateral Loading Using the p-y Method

                   (c) Copyright ENSOFT, Inc., 1985-2001
                             All Rights Reserved

================================================================================


This program is licensed to:

meriggi
ITALPROGETTI

Path to file locations:      C:\TREVI3\
Name of input data file:     gentra2.lpd
Name of output file:         gentra2.lpo
Name of plot output file:    gentra2.lpp
Name of runtime file:        gentra2.lpr


--------------------------------------------------------------------------------
                          Time and Date of Analysis
--------------------------------------------------------------------------------

               Date:  September 12, 2007     Time:  22:24: 8


--------------------------------------------------------------------------------
                                 Problem Title
--------------------------------------------------------------------------------

TREVI SPA TORRE EOLICA LESINA-CHIETI  DIMENSIONAMENTO FONDAZIONE S1 H=17.00 M


--------------------------------------------------------------------------------
                                 Program Options
--------------------------------------------------------------------------------

Units Used in Computations - SI Units, meters, kilopascals

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments            =          100
- Deflection tolerance for closure     =   2.5400E-07 m
- Maximum number of iterations allowed =          100
- Maximum allowable deflection         =   2.5400E+00 m

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and
  soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) =  1


--------------------------------------------------------------------------------
                    Pile Structural Properties and Geometry
--------------------------------------------------------------------------------
```

```
Pile Length                                 =      54.00 m
Depth of ground surface below top of pile =      24.00 m
Slope angle of ground surface               =        .00 deg.

Structural properties of pile defined using  2 points

Point    Depth         Pile      Moment of       Pile      Modulus of
          X          Diameter     Inertia        Area      Elasticity
           m             m          m**4        Sq. m       kN/Sq. m
-----  ---------   -----------   ----------   ----------   -----------
  1       0.0000    4.20000000       1.6720        .7804  210000000.00
  2      57.5000    4.20000000       1.6720        .7804  210000000.00


---------------------------------------------------------------------------
                      Soil and Rock Layering Information
---------------------------------------------------------------------------

The soil profile is modelled using  2 layers

Layer  1 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer    =       24.000 m
Distance from top of pile to bottom of layer =       34.000 m

Layer  2 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       34.000 m
Distance from top of pile to bottom of layer =      100.000 m
p-y subgrade modulus k for top of soil layer =   270000.000  kN/ m**3
p-y subgrade modulus k for bottom of layer   =   270000.000  kN/ m**3


(Depth of lowest layer extends   46.00 m  below pile tip)


---------------------------------------------------------------------------
                   Effective Unit Weight of Soil vs. Depth
---------------------------------------------------------------------------

Distribution of effective unit weight of soil with depth
is defined using  4 points

Point        Depth X    Eff. Unit Weight
 No.            m           kN/ m**3
-----      ----------   ----------------
  1            24.00        7.00000
  2            34.00        7.00000
  3            34.00        9.00000
  4           100.00        9.00000



---------------------------------------------------------------------------
                           Shear Strength of Soils
---------------------------------------------------------------------------

Distribution of shear strength parameters with depth
defined using  4 points

Point    Depth X     Cohesion c     Angle of Friction     E50 or      RQD
 No.        m          kN/ m**2            Deg.            k_rm        %
-----   --------     ----------     ------------------    ------    ------
  1       24.000        5.00000             .00           .02000        .0
  2       34.000       15.50000             .00           .02000        .0
  3       34.000      200.00000             .00           .00500        .0
  4      100.000      200.00000             .00           .00500        .0

Notes:

(1)  Cohesion = uniaxial compressive strength for rock materials.
(2)  Values of E50 are reported for clay strata.
(3)  Default values will be generated for E50 when input values are 0.
(4)  RQD and k_rm are reported only for weak rock strata.

Static loading criteria was used for computation of  p-y curves
```

Distributed lateral load intensity defined using 16 points

Point No.	Depth X m	Dist. Load kN/ m
1	.000	.00000
2	2.830	89.44000
3	2.830	119.31000
4	5.830	119.31000
5	5.830	95.36000
6	8.830	95.36000
7	8.830	73.83000
8	11.830	73.83000
9	11.830	59.98000
10	14.830	59.98000
11	14.830	51.17000
12	17.830	51.17000
13	17.830	45.79000
14	20.830	45.79000
15	20.830	43.17000
16	23.830	43.17000

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 812.000 kN
Bending moment at pile head = 57498.000 m- kN
Axial load at pile head = 2564.000 kN

Non-zero moment at pile head for this load case indicates the pile-head
may rotate under the applied pile-head loading, but is not a free-head
(zero moment)condition.

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

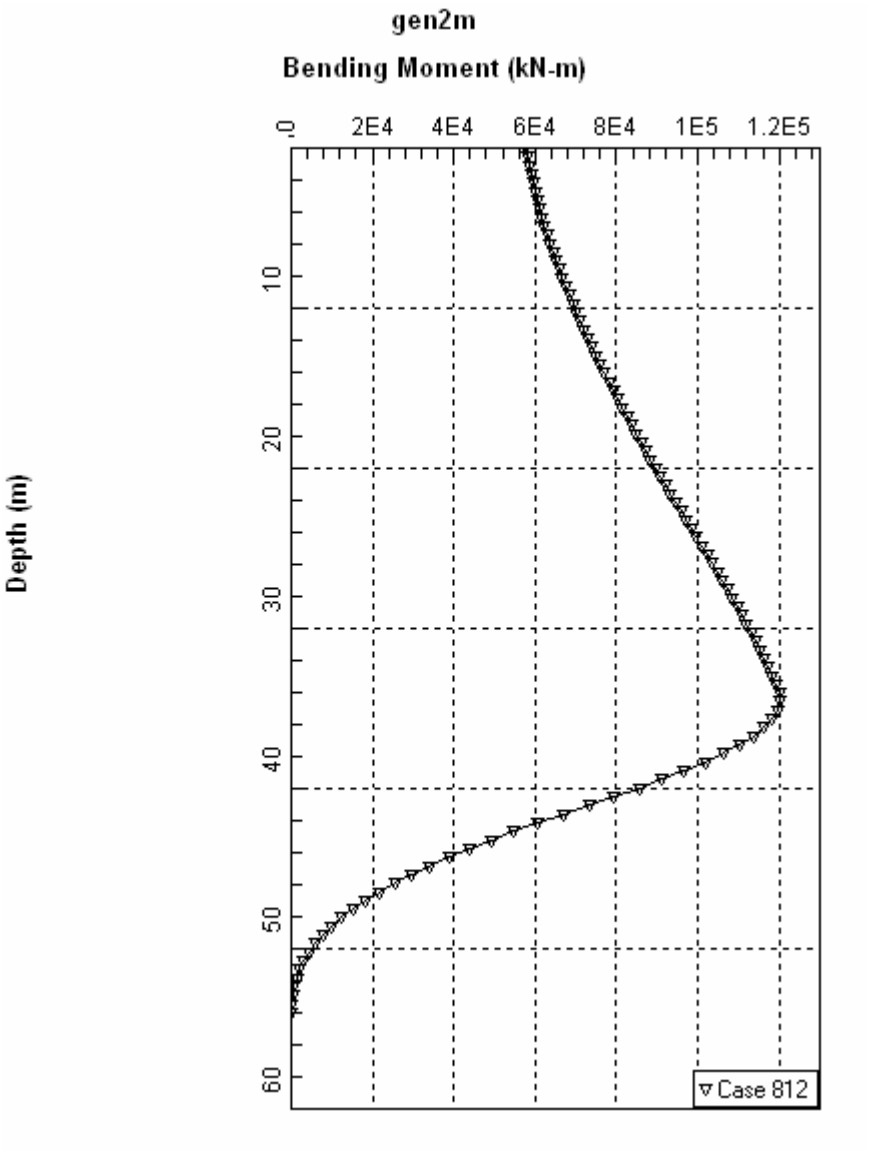
Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 812.000 kN
Specified bending moment at pile head = 57498.000 m- kN
Specified axial load at pile head = 2564.000 kN

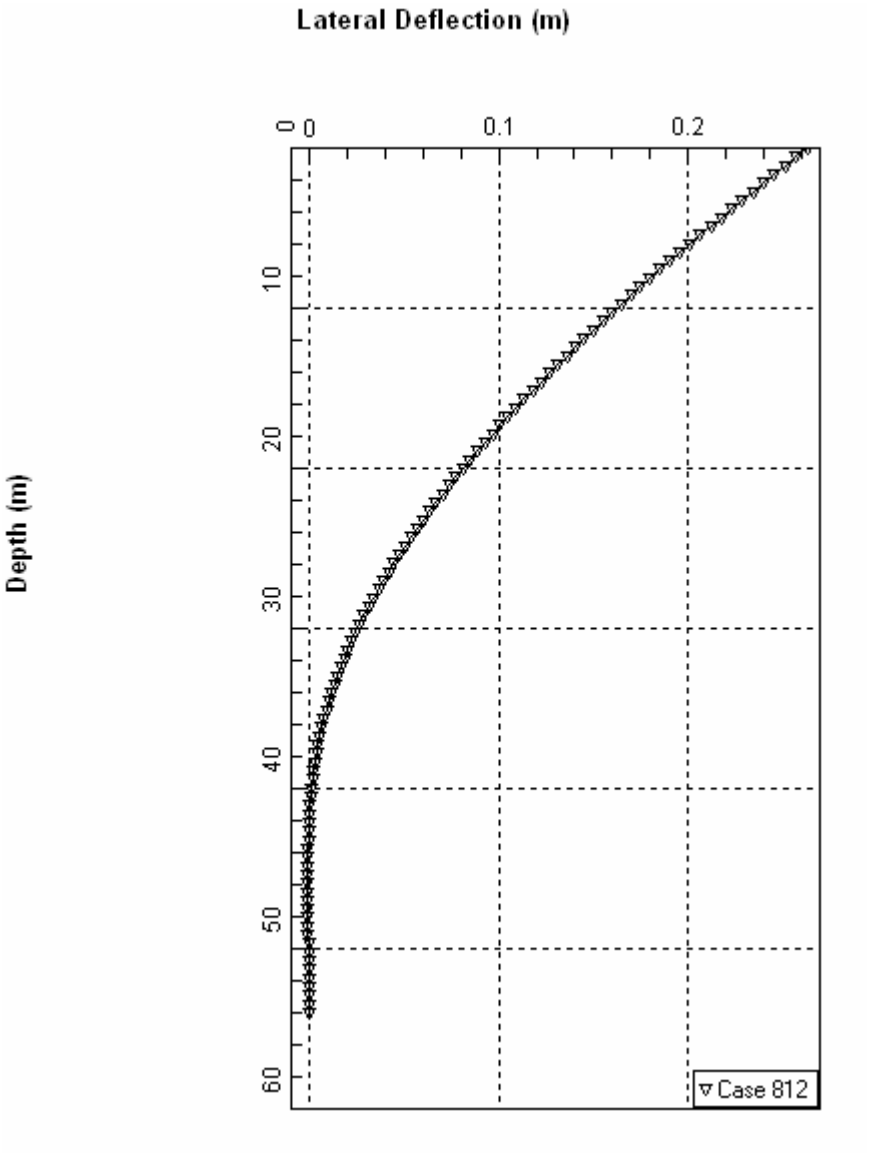
Non-zero moment for this load case indicates the pile-head may rotate under
the applied pile-head loading, but is not a free-head (zero moment)condition.

Depth X m	Deflect. y m	Moment M kN- m	Shear V kN	Slope S Rad.	Total Stress kN/ m**2	Soil Res p kN/ m
0.000	.263705	57498.0000	812.0000	-.011006	75501.8822	0.0000
.540	.257786	57951.6577	816.6079	-.010918	76071.6675	0.0000
1.080	.251915	58410.1685	830.4316	-.010828	76647.5484	0.0000
1.620	.246092	58878.5080	853.4711	-.010738	77235.7738	0.0000
2.160	.240318	59361.6517	885.7264	-.010647	77842.5931	0.0000
2.700	.234593	59864.5751	927.1975	-.010555	78474.2553	0.0000
3.240	.228918	60392.2538	982.4506	-.010463	79137.0095	0.0000
3.780	.223293	60954.5946	1046.8780	-.010369	79843.2988	0.0000
4.320	.217719	61551.5964	1111.3054	-.010275	80593.1216	0.0000
4.860	.212196	62183.2579	1175.7328	-.010180	81386.4764	0.0000
5.400	.206724	62849.5778	1240.1602	-.010084	82223.3615	0.0000
5.940	.201305	63550.5547	1298.1211	-.009987	83103.7751	0.0000
6.480	.195939	64279.2033	1349.6155	-.009888	84018.9437	0.0000

7.020	.190626	65035.5219	1401.1099	-.009789	84968.8655	0.0000
7.560	.185366	65819.5091	1452.6043	-.009688	85953.5383	0.0000
8.100	.180162	66631.1630	1504.0987	-.009587	86972.9601	0.0000
8.640	.175013	67470.4821	1555.5931	-.009483	88027.1288	0.0000
9.180	.169920	68337.4644	1601.2744	-.009379	89116.0421	0.0000
9.720	.164884	69225.8301	1641.1426	-.009273	90231.8123	0.0000
10.260	.159905	70135.5772	1681.0108	-.009166	91374.4373	0.0000
10.800	.154984	71066.7038	1720.8790	-.009057	92543.9145	0.0000
11.340	.150123	72019.2079	1760.7472	-.008947	93740.2413	0.0000
11.880	.145321	72993.0874	1796.8759	-.008836	94963.4154	0.0000
12.420	.140580	73984.3017	1829.2651	-.008723	96208.3616	0.0000
12.960	.135900	74992.8486	1861.6543	-.008608	97475.0772	0.0000
13.500	.131283	76018.7260	1894.0435	-.008492	98763.5596	0.0000
14.040	.126729	77061.9317	1926.4327	-.008375	1.001E+05	0.0000
14.580	.122238	78122.4635	1958.8219	-.008255	1.014E+05	0.0000
15.120	.117813	79200.3191	1988.8324	-.008134	1.028E+05	0.0000
15.660	.113453	80292.9272	2016.4642	-.008012	1.041E+05	0.0000
16.200	.109160	81400.2855	2044.0960	-.007887	1.055E+05	0.0000
16.740	.104935	82522.3917	2071.7278	-.007761	1.069E+05	0.0000
17.280	.100778	83659.2433	2099.3596	-.007633	1.084E+05	0.0000
17.820	.096691	84810.8379	2126.9914	-.007504	1.098E+05	0.0000
18.360	.092674	85977.1732	2153.1706	-.007373	1.113E+05	0.0000
18.900	.088729	87156.6777	2177.8972	-.007239	1.128E+05	0.0000
19.440	.084856	88349.3489	2202.6238	-.007104	1.143E+05	0.0000
19.980	.081056	89555.1845	2227.3504	-.006968	1.158E+05	0.0000
20.520	.077331	90774.1816	2252.0770	-.006829	1.173E+05	0.0000
21.060	.073681	92006.3379	2276.0962	-.006688	1.188E+05	0.0000
21.600	.070107	93250.8866	2299.4080	-.006546	1.204E+05	0.0000
22.140	.066611	94507.8251	2322.7198	-.006402	1.220E+05	0.0000
22.680	.063193	95777.1508	2346.0316	-.006255	1.236E+05	0.0000
23.220	.059855	97058.8609	2369.3434	-.006107	1.252E+05	0.0000
23.760	.056598	98352.9527	2392.6552	-.005957	1.268E+05	0.0000
24.300	.053422	99659.4234	2397.7600	-.005804	1.285E+05	-24.2636
24.840	.050329	1.010E+05	2382.7159	-.005650	1.301E+05	-31.4552
25.380	.047320	1.022E+05	2363.8491	-.005494	1.317E+05	-38.4217
25.920	.044396	1.035E+05	2341.2845	-.005336	1.333E+05	-45.1510
26.460	.041557	1.048E+05	2315.1536	-.005175	1.349E+05	-51.6301
27.000	.038806	1.060E+05	2285.5951	-.005013	1.365E+05	-57.8459
27.540	.036143	1.073E+05	2252.7548	-.004849	1.380E+05	-63.7848
28.080	.033569	1.085E+05	2216.7862	-.004683	1.395E+05	-69.4323
28.620	.031085	1.097E+05	2177.8505	-.004516	1.410E+05	-74.7738
29.160	.028692	1.109E+05	2136.1173	-.004346	1.425E+05	-79.7936
29.700	.026391	1.120E+05	2091.7647	-.004175	1.440E+05	-84.4755
30.240	.024183	1.131E+05	2044.9796	-.004002	1.454E+05	-88.8026
30.780	.022069	1.142E+05	1995.9585	-.003827	1.467E+05	-92.7571
31.320	.020050	1.153E+05	1944.9076	-.003650	1.481E+05	-96.3203
31.860	.018127	1.163E+05	1892.0436	-.003472	1.494E+05	-99.4726
32.400	.016300	1.173E+05	1837.5938	-.003292	1.507E+05	-102.1934
32.940	.014571	1.183E+05	1781.7971	-.003111	1.519E+05	-104.4609
33.480	.012940	1.193E+05	1724.9045	-.002929	1.531E+05	-106.2525
34.020	.011408	1.202E+05	979.8851	-.002744	1.542E+05	-2653.0785
34.560	.009976	1.203E+05	-436.6188	-.002559	1.544E+05	-2593.2324
35.100	.008644	1.197E+05	-1816.7583	-.002375	1.537E+05	-2518.3955
35.640	.007411	1.184E+05	-3152.4730	-.002192	1.520E+05	-2428.6959
36.180	.006277	1.163E+05	-4435.7496	-.002011	1.494E+05	-2324.1806
36.720	.005239	1.136E+05	-5658.5627	-.001834	1.460E+05	-2204.7569
37.260	.004296	1.102E+05	-6812.7741	-.001662	1.417E+05	-2070.1001
37.800	.003444	1.062E+05	-7876.8597	-.001496	1.367E+05	-1870.9576
38.340	.002680	1.017E+05	-8827.6663	-.001336	1.310E+05	-1650.5483
38.880	.002001	96717.2768	-9658.3841	-.001183	1.248E+05	-1426.1844
39.420	.001402	91295.3471	-10365.7997	-.001039	1.180E+05	-1193.8734
39.960	8.79E-04	85525.0896	-10943.3960	-9.028E-04	1.107E+05	-945.3721
40.500	4.27E-04	79478.9794	-11376.5835	-7.759E-04	1.031E+05	-659.0260
41.040	4.13E-05	73240.5281	-11603.5536	-6.585E-04	95274.1961	-181.6040
41.580	-2.84E-04	66948.9650	-11507.5611	-5.507E-04	87372.1133	537.1318
42.120	-5.53E-04	60813.8870	-11160.0355	-4.524E-04	79666.5728	750.0001
42.660	-7.73E-04	54897.3795	-10718.2910	-3.635E-04	72235.5526	886.0904
43.200	-9.46E-04	49239.1391	-10214.2988	-2.834E-04	65128.9110	980.5474
43.740	-.001079	43866.7215	-9666.8587	-2.118E-04	58381.2573	1047.0086
44.280	-.001175	38799.5182	-9089.1424	-1.482E-04	52016.9469	1092.6815
44.820	-.001239	34050.8582	-8491.1731	-9.220E-05	46052.7208	1122.0194
45.360	-.001274	29629.3065	-7880.9541	-4.323E-05	40499.3365	1138.0509
45.900	-.001285	25539.5474	-7265.0783	-8.053E-07	35362.6774	1142.9707
46.440	-.001275	21783.0242	-6649.0974	3.558E-05	30644.5561	1138.4401
46.980	-.001247	18358.4237	-6037.7649	6.645E-05	26343.3234	1125.7543

```
  47.520  -.001203  15262.0541  -5435.2075   9.230E-05  22454.3424   1105.9399
  48.060  -.001147  12488.1440  -4845.0537   1.136E-04  18970.3645   1079.8150
  48.600  -.001081  10029.0814  -4270.5368   1.310E-04  15881.8289   1048.0252
  49.140  -.001006   7875.6016  -3714.5831   1.447E-04  13177.0995   1011.0625
  49.680 -9.24E-04   6016.9309  -3179.8926   1.554E-04  10842.6446    969.2730
  50.220 -8.38E-04   4440.8873  -2669.0191   1.635E-04   8863.1641    922.8510
  50.760 -7.48E-04   3133.9376  -2184.4580   1.693E-04   7221.6603    871.8195
  51.300 -6.55E-04   2081.2039  -1728.7495   1.733E-04   5899.4469    815.9897
  51.840 -5.61E-04   1266.4083  -1304.6131   1.759E-04   4876.0792    754.8857
  52.380 -4.65E-04    671.7347   -915.1415   1.774E-04   4129.1806    687.6021
  52.920 -3.69E-04    277.5644   -564.1100   1.781E-04   3634.1102    612.5143
  53.460 -2.73E-04     62.0027   -256.5468   1.783E-04   3363.3689    526.6086
  54.000 -1.77E-04      0.0000      0.0000   1.784E-04   3285.4946    423.5649

Output Verification:

Computed forces and moments are within specified convergence limits.


Output Summary for Load Case No.  1:

Pile-head deflection             =      .26370544 m
Computed slope at pile head      =     -.01100631
Maximum bending moment           =      120341.21  kN- m
Maximum shear force              =      -11603.55  kN
Depth of maximum bending moment  =          34.56  m
Depth of maximum shear force     =          41.04  m
Number of iterations             =             16
Number of zero deflection points =              1




--------------------------------------------------------------------------------
                        Summary of Pile-head Response
--------------------------------------------------------------------------------

Definition of symbols for pile-head boundary conditions:

y = pile-head displacment, m
M = pile-head moment,  kN- m
V = pile-head shear force,  kN
S = pile-head slope, radians
R = rotational stiffness of pile-head,  m- kN/rad

 BC    Boundary     Boundary       Axial    Pile Head    Maximum     Maximum
Type  Condition    Condition       Load     Deflection    Moment      Shear
          1            2             kN          m         m- kN       kN
---- ------------ ------------ ----------- ----------- ----------- -----------
  1  V=   812.000 M= 57498.000   2564.0000       .2637   1.203E+05 -11603.5536

The analysis ended normally.
```


gen2m
Bending Moment (kN-m)
0
2E4
4E4
6E4
8E4
1E5
1.2E5
Depth (m)
10
20
30
40
50
60
Case 812


Lateral Deflection (m)
Depth (m)
0
0.1
0.2
10
20
30
40
50
60
Case 812

Appendice 3 - Azione onda corrente e vento sul palo

```
LDOPT       NF+Z    1.03    7.85 -30.000  30.800    MN
 CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO IN ALT
OPTIONS      MN         UC   0 0  0 0       PTPTPTPTPT  PTPT
AMOD
AMOD      5 1.333   6 1.333
GRUP
GRUP CAS         450.00 4.500 20.00 8.0035.86 1    1.001.00      0.50  7.849
MEMBER
MEMBER0   2   1 CAS
MEMBER0   4   5 CAS
MEMBER0   5   6 CAS
MEMBER0   6   7 CAS
MEMBER0   7   8 CAS
MEMBER0   8   9 CAS
MEMBER0   9   2 CAS
MEMBER0 101   4 CAS
JOINT
JOINT    1      0.     0.     6.               13.000
JOINT    2      0.     0.     5.
JOINT    4      0.     0.   -25.
JOINT    5      0.     0.   -20.
JOINT    6      0.     0.   -15.
JOINT    7      0.     0.   -10.
JOINT    8      0.     0.    -5.
JOINT    9      0.     0.     0.
JOINT  101      0.     0.   -30.                     111111
***SPJT**    1T   2T   4T   5T   6T   7T   8T   9T
CDM
CDM   450.00 0.750       2.000       0.750       2.000
MGROV
MGROV     27.000  32.000   5.000                  1.400
LOAD
LOADCN   1
WIND
WIND1      40.00             0.0        AP13
CURR
CURR       0.000   0.800   0.000                         CN
CURR      40.000   0.800
WAVE
WAVE1.00STOK  9.10        9.00          0.00      D   0.00 10.00  37MS10 1 3 7
END
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
07-SEP-19:7  TIME 23:50:54   SEA PAGE     1

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALT

                                ******* PROGRAM OPTIONS *******

            ANALYSIS OPTIONS        UNITS (ENGLISH OR METRIC)  ............   METRIC-
KN
                                    VERTICAL COORDINATE  ..................   +Z
                                    ALL MEMBERS  ..........................   NON-
FLOODED
                                    DENSITY OF SEAWATER  ..................     1.03
TONNE/M**3
                                    DENSITY OF CONSTRUCTION MATERIAL  .....     7.85
TONNE/M**3
                                    MUDLINE ELEVATION  ....................   -30.00
M.
                                    WATER DEPTH  ..........................    30.80
M.

            LOAD OPTIONS            GENERATE LOADS IN STRUCTURAL COORD.  ..   YES
                                    GENERATE LOAD COMBINATIONS  ...........    NO
                                    OUTPUT SELECTED LOAD CASES ONLY  ......    NO
                                    GENERATE TIME HISTORY LOADS  ..........    NO
                                    GENERATE BASE TRANSFER FUNCTION .......    NO

                                    GENERATE WIND GUST LOADS ..............   NO

            HYDROSTATIC COLLAPSE    PERFORM HYDROSTATIC COLLAPSE CHECK  ...    NO
            OPTIONS                 HYDROSTATIC COLLAPSE FOR FLOODED GROUPS    NO

            PRINT OPTIONS           INPUT ECHO  ...........................   NO PRINT
                                    OUTPUT ECHO  ..........................   NO PRINT
                                    SACS IV INPUT REPORTS .................   PRINT
                                    SEASTATE INPUT REPORTS ................   PRINT
                                    MEMBER SUMMARY FOR SEASTATE LOADS .....   NO PRINT
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********             DATE
07-SEP-19:7  TIME 23:50:54   SEA PAGE     8

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALT

                     **** WIND DESCRIPTION FOR LOAD CASE    1 ****



                          WIND VELOCITY ************   40.000 M/SEC

                          WIND DIRECTION ***********    0.000 DEGREES

                          WATER DEPTH **************   30.800 M

                          REFERENCE HEIGHT *********   10.000 M

                          VARIATION EXPONENT ******* 1/13

                          WIND VARIATION WITH HEIGHT ACCORDING TO API RULES
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
07-SEP-19:7  TIME 23:50:54   SEA PAGE     9

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALT

                     **** CURRENT DESCRIPTION FOR LOAD CASE    1 ****



                     MUDLINE ELEVATION ***   -30.00 M

                     CREST/TROUGH STRETCHING - CONSTANT

                     ELEVATION        CURRENT       DIRECTION
                       ABOVE          VELOCITY        ANGLE
                      MUDLINE
                        (M)            (M/SEC)      (DEGREES)

                         0.00            0.800           0.000
                        40.00            0.800           0.000
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********            DATE
07-SEP-19:7  TIME 23:50:54   SEA PAGE    10

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALT

                     **** WAVE DESCRIPTION FOR LOAD CASE    1 ****



                          WAVE THEORY ************ STOKES 5TH

                          WAVE HEIGHT ************    9.100 M

                          WATER DEPTH ************   30.800 M

                          WAVE PERIOD ************    9.000 SECS

                          WAVE LENGTH ************  124.448 M

                          ANGLE FROM X TOWARD Y **    0.000 DEGREES

                          MUDLINE ELEVATION ******  -30.000 M

                          WAVE CELERITY **********   13.828 M /SEC

                          MAX. NO. SEG/MEMBER ****       10

                          MIN. NO. SEG/MEMBER ****        1

                          CREST POSITION DETERMINED BY MAXIMUM SHEAR

                          STARTING CREST POSITION     0.000 M

                          NO. STEPS **************       37

                          STEP SIZE **************    3.457 M

                          CREST WATER DEPTH ******    36.12 M

                          TROUGH WATER DEPTH *****    27.02 M
            ****** LOAD CASE GENERATED FOR WAVE CREST POSITION RESULTING IN THE
MAXIMUM SHEAR  AT MUDLINE    ******
```

```
            *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
07-SEP-19:7  TIME 23:50:54   SEA PAGE    22

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALT

                              ****** RESULTS FOR LOAD CASE    1 ******

                                 9.1 M. WAVE AT   0.0 DEG + CURRENT + WIND

                    ****** SUMMATION OF FORCES AND MOMENTS FOR LOAD CASE    1 ******
                           (MOMENTS ABOUT MUDLINE AT ELEVATION  -30.00 M.  )

                           SUM FX        SUM FY        SUM FZ        SUM MX        SUM MY
SUM MZ
                            KN            KN            KN            KN-M          KN-M
KN-M

          MEMBER WIND           5.557         0.000         0.000         0.000
193.378         0.000

   SEASTATE GENERATED        1535.881         0.000         0.000         0.000
31374.720         0.000
          USER INPUT           0.000         0.000         0.000         0.000
0.000         0.000

                    ****** LOAD CASE FACTORS ******

 OVERALL LOAD CASE FACTOR          1.000
 DEAD LOAD FACTOR                  1.000
 WAVE, WIND, AND CURRENT FACTOR    1.000
 USER SUPPLIED LOAD FACTOR         1.000
```

```
               *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
07-SEP-19:7  TIME 23:50:54   SEA PAGE    23

               CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALT

                        ** SEASTATE BASIC LOAD CASE DESCRIPTIONS **

 LOAD  LOAD     ********** DESCRIPTION ***********
 CASE  LABEL

   1      1        9.1 M. WAVE AT   0.0 DEG + CURRENT + WIND
```

```
               ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
07-SEP-19:7  TIME 23:50:54   SEA PAGE    24

               CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALT

                                    ****** SEASTATE BASIC LOAD CASE SUMMARY ******

   LOAD  LOAD             FX          FY          FZ          MX          MY
MZ      DEAD LOAD    BUOYANCY
   CASE  LABEL
                         (KN)        (KN)        (KN)       (KN-M)      (KN-M)
(KN-M)        (KN)        (KN)

     1     1           1535.881       0.000       0.000       0.000    31374.720
0.000         0.000       0.000
```

```
   CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO IN ALT  DATE
07-SEP-19:7  TIME 23:51:10   PST PAGE    7

                                                          SACS-IV SYSTEM   MEMBER FORCES AND
MOMENTS

                                  ******************** KN ********************
******************** KN-M ********************
 MEMBER  MEMBER  GROUP LOAD      FORCE(X)        FORCE(Y)        FORCE(Z)       MOMENT(X)
MOMENT(Y)       MOMENT(Z)
 NUMBER    END    ID   CASE

   2-   1     2   CAS    1          0.0000         -2.4243          0.0000
0.0000          0.0000          1.5007
             1          1          0.0000          0.0000          0.0000
0.0000          0.0000          0.0000

   4-   5     4   CAS    1          0.0000      -1399.3390          0.0000
0.0000          0.0000      24034.2400
             5          1          0.0000      -1252.3980          0.0000
0.0000          0.0000      17398.5000

   5-   6     5   CAS    1          0.0000      -1252.3980          0.0000
0.0000          0.0000      17398.5000
             6          1          0.0000      -1084.0160          0.0000
0.0000          0.0000      11546.0200

   6-   7     6   CAS    1          0.0000      -1084.0160          0.0000
0.0000          0.0000      11546.0200
             7          1          0.0000       -880.5797          0.0000
0.0000          0.0000       6616.7880

   7-   8     7   CAS    1          0.0000       -880.5797          0.0000
0.0000          0.0000       6616.7880
             8          1          0.0000       -624.7559          0.0000
0.0000          0.0000       2827.5570

   8-   9     8   CAS    1          0.0000       -624.7559          0.0000
0.0000          0.0000       2827.5570
             9          1          0.0000       -286.6240          0.0000
0.0000          0.0000        502.7338

   9-   2     9   CAS    1          0.0000       -286.6240          0.0000
0.0000          0.0000        502.7338
             2          1          0.0000         -2.4243          0.0000
0.0000          0.0000          1.5007

 101-   4   101   CAS    1          0.0000      -1535.8790          0.0000
0.0000          0.0000      31374.5200
             4          1          0.0000      -1399.3390          0.0000
0.0000          0.0000      24034.2400
```

```
LDOPT       NF+Z    1.03    7.85 -17.000  17.800    MN
 CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO IN BAS
OPTIONS      MN         UC   0 0  0 0       PTPTPTPTPT  PTPT
AMOD
AMOD      5 1.333   6 1.333
GRUP
GRUP CAS         450.00 4.500 20.00 8.0035.86 1    1.001.00      0.50  7.849
MEMBER
MEMBER0   2   1 CAS
MEMBER0   4   5 CAS
MEMBER0   5   6 CAS
MEMBER0   6   7 CAS
MEMBER0   7   8 CAS
MEMBER0   8   9 CAS
MEMBER0   9   2 CAS
MEMBER0 101   4 CAS
JOINT
JOINT    1      0.     0.     6.               83.000
JOINT    2      0.     0.     4.
JOINT    4      0.     0.   -14.
JOINT    5      0.     0.   -11.
JOINT    6      0.     0.    -8.
JOINT    7      0.     0.    -5.
JOINT    8      0.     0.    -2.
JOINT    9      0.     0.     1.
JOINT  101      0.     0.   -17.                      111111
***SPJT**    1T   2T   4T   5T   6T   7T   8T   9T
CDM
CDM   450.00 0.750       2.000       0.750       2.000
MGROV
MGROV     14.000  19.000   5.000                  1.400
LOAD
LOADCN   1
WIND
WIND1      40.00             0.0        AP13
CURR
CURR       0.000   0.800   0.000                         CN
CURR      40.000   0.800
WAVE
WAVE1.00STOK  9.10        9.00          0.00      D   0.00 10.00  37MS10 1 3 7
END
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
08-SEP-19:7  TIME 16:42:00   SEA PAGE     1

              CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
IN BAS

                                  ******* PROGRAM OPTIONS *******

             ANALYSIS OPTIONS         UNITS (ENGLISH OR METRIC)  ............   METRIC-
KN
                                      VERTICAL COORDINATE  ..................   +Z
                                      ALL MEMBERS  ..........................   NON-
FLOODED
                                      DENSITY OF SEAWATER  ..................     1.03
TONNE/M**3
                                      DENSITY OF CONSTRUCTION MATERIAL  .....     7.85
TONNE/M**3
                                      MUDLINE ELEVATION  ....................   -17.00
M.
                                      WATER DEPTH  ..........................    17.80
M.

             LOAD OPTIONS             GENERATE LOADS IN STRUCTURAL COORD.  ..   YES
                                      GENERATE LOAD COMBINATIONS  ...........    NO
                                      OUTPUT SELECTED LOAD CASES ONLY  ......    NO
                                      GENERATE TIME HISTORY LOADS  ..........    NO
                                      GENERATE BASE TRANSFER FUNCTION .......    NO

                                      GENERATE WIND GUST LOADS ..............   NO

             HYDROSTATIC COLLAPSE     PERFORM HYDROSTATIC COLLAPSE CHECK  ...    NO
             OPTIONS                  HYDROSTATIC COLLAPSE FOR FLOODED GROUPS    NO

             PRINT OPTIONS            INPUT ECHO  ...........................   NO PRINT
                                      OUTPUT ECHO  ..........................   NO PRINT
                                      SACS IV INPUT REPORTS .................   PRINT
                                      SEASTATE INPUT REPORTS ................   PRINT
                                      MEMBER SUMMARY FOR SEASTATE LOADS .....   NO PRINT
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********             DATE
08-SEP-19:7  TIME 16:42:00   SEA PAGE     8

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
IN BAS

                     **** WIND DESCRIPTION FOR LOAD CASE    1 ****



                          WIND VELOCITY ************   40.000 M/SEC

                          WIND DIRECTION ***********    0.000 DEGREES

                          WATER DEPTH **************   17.800 M

                          REFERENCE HEIGHT *********   10.000 M

                          VARIATION EXPONENT ******* 1/13

                          WIND VARIATION WITH HEIGHT ACCORDING TO API RULES
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
08-SEP-19:7  TIME 16:42:00   SEA PAGE     9

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
IN BAS

                     **** CURRENT DESCRIPTION FOR LOAD CASE    1 ****



                          MUDLINE ELEVATION ***   -17.00 M

                          CREST/TROUGH STRETCHING - CONSTANT

                          ELEVATION        CURRENT       DIRECTION
                            ABOVE          VELOCITY        ANGLE
                           MUDLINE
                             (M)            (M/SEC)      (DEGREES)

                              0.00            0.800           0.000
                             40.00            0.800           0.000
```

```
            *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
08-SEP-19:7  TIME 16:42:00   SEA PAGE    10

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
IN BAS

                      **** WAVE DESCRIPTION FOR LOAD CASE    1 ****



                           WAVE THEORY ************ STOKES 5TH

                           WAVE HEIGHT ************    9.100 M

                           WATER DEPTH ************   17.800 M

                           WAVE PERIOD ************    9.000 SECS

                           WAVE LENGTH ************  111.608 M

                           ANGLE FROM X TOWARD Y **    0.000 DEGREES

                           MUDLINE ELEVATION ******  -17.000 M

                           WAVE CELERITY **********   12.401 M /SEC

                           MAX. NO. SEG/MEMBER ****       10

                           MIN. NO. SEG/MEMBER ****        1

                           CREST POSITION DETERMINED BY MAXIMUM SHEAR

                           STARTING CREST POSITION     0.000 M

                           NO. STEPS **************       37

                           STEP SIZE **************    3.100 M

                           CREST WATER DEPTH ******    23.83 M

                           TROUGH WATER DEPTH *****    14.71 M
            ****** LOAD CASE GENERATED FOR WAVE CREST POSITION RESULTING IN THE
MAXIMUM SHEAR  AT MUDLINE    ******
```

```
            *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
08-SEP-19:7  TIME 16:42:00   SEA PAGE    22

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
IN BAS

                              ****** RESULTS FOR LOAD CASE    1 ******

                                 9.1 M. WAVE AT   0.0 DEG + CURRENT + WIND

                    ****** SUMMATION OF FORCES AND MOMENTS FOR LOAD CASE    1 ******
                           (MOMENTS ABOUT MUDLINE AT ELEVATION  -17.00 M.  )

                           SUM FX        SUM FY        SUM FZ        SUM MX        SUM MY
SUM MZ
                            KN            KN            KN            KN-M          KN-M
KN-M

          MEMBER WIND           3.965         0.000         0.000         0.000
90.557         0.000

   SEASTATE GENERATED        1585.436         0.000         0.000         0.000
21177.790         0.000
          USER INPUT           0.000         0.000         0.000         0.000
0.000         0.000

                    ****** LOAD CASE FACTORS ******

 OVERALL LOAD CASE FACTOR          1.000
 DEAD LOAD FACTOR                  1.000
 WAVE, WIND, AND CURRENT FACTOR    1.000
 USER SUPPLIED LOAD FACTOR         1.000
```

```
               ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
08-SEP-19:7  TIME 16:42:00   SEA PAGE    23

               CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
IN BAS

                        ** SEASTATE BASIC LOAD CASE DESCRIPTIONS **

 LOAD  LOAD     ********** DESCRIPTION **********
 CASE  LABEL

   1      1        9.1 M. WAVE AT   0.0 DEG + CURRENT + WIND
```

```
                ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
08-SEP-19:7  TIME 16:42:00   SEA PAGE    24

                CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
IN BAS

                                       ****** SEASTATE BASIC LOAD CASE SUMMARY ******

   LOAD  LOAD              FX           FY           FZ           MX           MY
MZ       DEAD LOAD     BUOYANCY
   CASE  LABEL
                          (KN)         (KN)         (KN)       (KN-M)       (KN-M)
(KN-M)         (KN)         (KN)

     1     1            1585.436        0.000        0.000        0.000    21177.790
0.000          0.000          0.000
```

```
   CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO IN BAS  DATE
08-SEP-19:7  TIME 16:42:16   PST PAGE    7

                                                          SACS-IV SYSTEM   MEMBER FORCES AND
MOMENTS

                                  ******************** KN ********************
****************** KN-M ********************
 MEMBER  MEMBER  GROUP LOAD      FORCE(X)        FORCE(Y)        FORCE(Z)       MOMENT(X)
MOMENT(Y)       MOMENT(Z)
 NUMBER    END    ID   CASE

   2-   1     2   CAS    1          0.0000       -119.4953          0.0000
0.0000          0.0000         55.7568
             1          1          0.0000          0.0000          0.0000
0.0000          0.0000          0.0000

   4-   5     4   CAS    1          0.0000      -1455.9150          0.0000
0.0000          0.0000      16614.7200
             5          1          0.0000      -1318.5320          0.0000
0.0000          0.0000      12450.1700

   5-   6     5   CAS    1          0.0000      -1318.5320          0.0000
0.0000          0.0000      12450.1700
             6          1          0.0000      -1165.0000          0.0000
0.0000          0.0000       8719.6950

   6-   7     6   CAS    1          0.0000      -1165.0000          0.0000
0.0000          0.0000       8719.6950
             7          1          0.0000       -985.0432          0.0000
0.0000          0.0000       5486.6080

   7-   8     7   CAS    1          0.0000       -985.0432          0.0000
0.0000          0.0000       5486.6080
             8          1          0.0000       -763.5399          0.0000
0.0000          0.0000       2849.1630

   8-   9     8   CAS    1          0.0000       -763.5399          0.0000
0.0000          0.0000       2849.1630
             9          1          0.0000       -477.4393          0.0000
0.0000          0.0000        970.6657

   9-   2     9   CAS    1          0.0000       -477.4393          0.0000
0.0000          0.0000        970.6657
             2          1          0.0000       -119.4953          0.0000
0.0000          0.0000         55.7568

 101-   4   101   CAS    1          0.0000      -1585.4340          0.0000
0.0000          0.0000      21177.7700
             4          1          0.0000      -1455.9150          0.0000
0.0000          0.0000      16614.7200
```

AppendicE 4 - Tabulati elaborazioni studio di battitura monopalo D = 420 cm

```
          PRINT OF INPUT DATA COMPUTATION N.  1  -  AK (1)  =  1000000 kN/m

          ..............................


1ST SET OF DATA
DELTAT       ENERGY         W(1)          W(2)           Q             J             JP

 .00005      4675000.        29400.        20000.        .25000        .02000        .00500


2ND SET OF DATA
          PILE SUBDIVISIONS                                    BASIC RESISTANCES
I1 = 5          I2 = 5          I3 = 5          I4 = 5          RPB=      100.     RLB=      100.


3RD SET OF DATA
                     PILE DATA
                  PILE WGTS                         **            PILE   LENGTHS

    97403.    97403.    97403.    97403.               1590.     1590.     1590.     1590.

             PILE SECTIONS                *    TIP WEIGHT  *    EMBEDD.  LENGTH           PILE MODULUS
   7804.00   7804.00   7804.00   7804.00               2002.               2475.           2100000.


4TH SET OF DATA
         CRL= 3008.0000
         CRP=  642.0000


5TH SET OF DATA
          AK(1)           E1           N
      1000000.        1.0000          1


LATERAL RESISTANCE  RL(TON)=  300.800
POINT RESISTANCE    RP(TON)=   64.200
TOTAL RESISTANCE    RU(TON)=  365.000
RP/RU RATIO                 =     .176


COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                           ..................................

                                COMPRESSION          TRACTION
                           ..................................

END OF 1ST STAGE   F( 6)           -347.13             203.27
END OF 2ND STAGE   F(11)           -347.84             263.02
END OF 3RD STAGE   F(16)           -334.48             252.11
AT THE PILE TIP    F(21)           -103.50              57.07


MAXIMUN DISPLACEMENT   DPR(22) IS      2.49058
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .4015



          PRINT OF INPUT DATA COMPUTATION N.  2

          ..............................


4TH SET OF DATA
         CRL= 6016.0000
         CRP= 1284.0000


LATERAL RESISTANCE  RL(TON)=  601.600
POINT RESISTANCE    RP(TON)=  128.400
TOTAL RESISTANCE    RU(TON)=  730.000
RP/RU RATIO                 =     .176


                              MAXIMUM STRESSES (KG/CM2)
                           ..................................

                                COMPRESSION          TRACTION
                           ..................................

END OF 1ST STAGE   F( 6)           -347.13             151.95
END OF 2ND STAGE   F(11)           -351.48             192.43
END OF 3RD STAGE   F(16)           -337.61             189.14
AT THE PILE TIP    F(21)           -101.25              44.96


MAXIMUN DISPLACEMENT   DPR(22) IS      1.35643
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .7372
```

```
          PRINT OF INPUT DATA COMPUTATION N.  3

          ..............................


4TH SET OF DATA
         CRL= 9024.0000
         CRP= 1926.0000


LATERAL RESISTANCE  RL(TON)=  902.400
POINT RESISTANCE    RP(TON)=  192.600
TOTAL RESISTANCE    RU(TON)= 1095.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -347.13              108.11
END OF 2ND STAGE   F(11)           -355.55              193.60
END OF 3RD STAGE   F(16)           -340.61              135.12
AT THE PILE TIP    F(21)            -99.04               36.89


MAXIMUN DISPLACEMENT   DPR(22) IS       .89883
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.1126



          PRINT OF INPUT DATA COMPUTATION N.  4

          ..............................


4TH SET OF DATA
         CRL=12032.0000
         CRP= 2568.0000


LATERAL RESISTANCE  RL(TON)= 1203.200
POINT RESISTANCE    RP(TON)=  256.800
TOTAL RESISTANCE    RU(TON)= 1460.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -347.13               70.99
END OF 2ND STAGE   F(11)           -359.87               84.24
END OF 3RD STAGE   F(16)           -343.46               88.55
AT THE PILE TIP    F(21)           -107.16               29.88


MAXIMUN DISPLACEMENT   DPR(22) IS       .73083
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.3683



          PRINT OF INPUT DATA COMPUTATION N.  5

          ..............................


4TH SET OF DATA
         CRL=15040.0000
         CRP= 3210.0000


LATERAL RESISTANCE  RL(TON)= 1504.000
POINT RESISTANCE    RP(TON)=  321.000
TOTAL RESISTANCE    RU(TON)= 1825.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -347.13               39.76
END OF 2ND STAGE   F(11)           -364.39               12.93
END OF 3RD STAGE   F(16)           -346.14               48.87
AT THE PILE TIP    F(21)           -118.93               11.84


MAXIMUN DISPLACEMENT   DPR(22) IS       .58569
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.7074
```

```
          PRINT OF INPUT DATA COMPUTATION N.  6

          ..............................


4TH SET OF DATA
         CRL=18048.0000
         CRP= 3852.0000


LATERAL RESISTANCE  RL(TON)= 1804.800
POINT RESISTANCE    RP(TON)=  385.200
TOTAL RESISTANCE    RU(TON)= 2190.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -347.13              13.09
END OF 2ND STAGE   F(11)           -369.12                .00
END OF 3RD STAGE   F(16)           -348.62              13.50
AT THE PILE TIP    F(21)           -127.27                .00


MAXIMUN DISPLACEMENT   DPR(22) IS       .45986
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.1746



          PRINT OF INPUT DATA COMPUTATION N.  7

          ..............................


4TH SET OF DATA
         CRL=21056.0000
         CRP= 4494.0000


LATERAL RESISTANCE  RL(TON)= 2105.600
POINT RESISTANCE    RP(TON)=  449.400
TOTAL RESISTANCE    RU(TON)= 2555.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -347.13                .00
END OF 2ND STAGE   F(11)           -374.03                .00
END OF 3RD STAGE   F(16)           -350.88                .00
AT THE PILE TIP    F(21)           -132.59                .00


MAXIMUN DISPLACEMENT   DPR(22) IS       .35061
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.8522



          PRINT OF INPUT DATA COMPUTATION N.  8

          ..............................


4TH SET OF DATA
         CRL=24064.0000
         CRP= 5136.0000


LATERAL RESISTANCE  RL(TON)= 2406.400
POINT RESISTANCE    RP(TON)=  513.600
TOTAL RESISTANCE    RU(TON)= 2920.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -347.13                .00
END OF 2ND STAGE   F(11)           -379.17                .00
END OF 3RD STAGE   F(16)           -352.94                .00
AT THE PILE TIP    F(21)           -135.24                .00


MAXIMUN DISPLACEMENT   DPR(22) IS       .25575
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   3.9101
```

```
          PRINT OF INPUT DATA COMPUTATION N.  1  -  AK (1)  =  2000000 kN/m

          ..............................


1ST SET OF DATA
DELTAT       ENERGY         W(1)          W(2)           Q             J             JP

 .00005      4675000.        29400.        20000.        .25000        .02000        .00500


2ND SET OF DATA
          PILE SUBDIVISIONS                                    BASIC RESISTANCES
I1 = 5          I2 = 5          I3 = 5          I4 = 5          RPB=      100.     RLB=      100.


3RD SET OF DATA
                     PILE DATA
                  PILE WGTS                         **            PILE   LENGTHS

    97403.    97403.    97403.    97403.               1590.     1590.     1590.     1590.

             PILE SECTIONS                *    TIP WEIGHT  *    EMBEDD.  LENGTH           PILE MODULUS
   7804.00   7804.00   7804.00   7804.00               2002.               2475.           2100000.


4TH SET OF DATA
         CRL= 3008.0000
         CRP=  642.0000


5TH SET OF DATA
          AK(1)           E1           N
      2000000.        1.0000          1


LATERAL RESISTANCE  RL(TON)=  300.800
POINT RESISTANCE    RP(TON)=   64.200
TOTAL RESISTANCE    RU(TON)=  365.000
RP/RU RATIO                 =     .176


COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                          ..................................

                               COMPRESSION          TRACTION
                          ..................................

END OF 1ST STAGE   F( 6)           -467.40             346.27
END OF 2ND STAGE   F(11)           -470.49             371.62
END OF 3RD STAGE   F(16)           -474.74             398.96
AT THE PILE TIP    F(21)           -188.92             109.69


MAXIMUN DISPLACEMENT   DPR(22) IS      2.60305
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .3842



          PRINT OF INPUT DATA COMPUTATION N.  2

          ..............................


4TH SET OF DATA
         CRL= 6016.0000
         CRP= 1284.0000


LATERAL RESISTANCE  RL(TON)=  601.600
POINT RESISTANCE    RP(TON)=  128.400
TOTAL RESISTANCE    RU(TON)=  730.000
RP/RU RATIO                 =     .176


COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                          ..................................

                               COMPRESSION          TRACTION
                          ..................................

END OF 1ST STAGE   F( 6)           -467.40             281.44
END OF 2ND STAGE   F(11)           -470.72             280.08
END OF 3RD STAGE   F(16)           -475.66             336.61
AT THE PILE TIP    F(21)           -184.69              98.44


MAXIMUN DISPLACEMENT   DPR(22) IS      1.47254
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .6791
```

```
          PRINT OF INPUT DATA COMPUTATION N.  3

          ..............................


4TH SET OF DATA
         CRL= 9024.0000
         CRP= 1926.0000


LATERAL RESISTANCE  RL(TON)=  902.400
POINT RESISTANCE    RP(TON)=  192.600
TOTAL RESISTANCE    RU(TON)= 1095.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -467.40             221.68
END OF 2ND STAGE   F(11)           -470.97             201.60
END OF 3RD STAGE   F(16)           -476.53             263.04
AT THE PILE TIP    F(21)           -180.50              81.34


MAXIMUN DISPLACEMENT   DPR(22) IS       .99220
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.0079



          PRINT OF INPUT DATA COMPUTATION N.  4

          ..............................


4TH SET OF DATA
         CRL=12032.0000
         CRP= 2568.0000


LATERAL RESISTANCE  RL(TON)= 1203.200
POINT RESISTANCE    RP(TON)=  256.800
TOTAL RESISTANCE    RU(TON)= 1460.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -467.40             170.51
END OF 2ND STAGE   F(11)           -471.21             181.54
END OF 3RD STAGE   F(16)           -477.33             292.02
AT THE PILE TIP    F(21)           -176.37              72.90


MAXIMUN DISPLACEMENT   DPR(22) IS       .79983
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.2503



          PRINT OF INPUT DATA COMPUTATION N.  5

          ..............................


4TH SET OF DATA
         CRL=15040.0000
         CRP= 3210.0000


LATERAL RESISTANCE  RL(TON)= 1504.000
POINT RESISTANCE    RP(TON)=  321.000
TOTAL RESISTANCE    RU(TON)= 1825.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -467.40             127.54
END OF 2ND STAGE   F(11)           -471.46              85.51
END OF 3RD STAGE   F(16)           -478.08             137.19
AT THE PILE TIP    F(21)           -172.30              65.81


MAXIMUN DISPLACEMENT   DPR(22) IS       .67494
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.4816
```

```
          PRINT OF INPUT DATA COMPUTATION N.  6

          ..............................


4TH SET OF DATA
         CRL=18048.0000
         CRP= 3852.0000


LATERAL RESISTANCE  RL(TON)= 1804.800
POINT RESISTANCE    RP(TON)=  385.200
TOTAL RESISTANCE    RU(TON)= 2190.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -467.40              90.94
END OF 2ND STAGE   F(11)           -471.71              31.62
END OF 3RD STAGE   F(16)           -478.74              91.57
AT THE PILE TIP    F(21)           -175.27              58.26


MAXIMUN DISPLACEMENT   DPR(22) IS       .56481
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.7705



          PRINT OF INPUT DATA COMPUTATION N.  7

          ..............................


4TH SET OF DATA
         CRL=21056.0000
         CRP= 4494.0000


LATERAL RESISTANCE  RL(TON)= 2105.600
POINT RESISTANCE    RP(TON)=  449.400
TOTAL RESISTANCE    RU(TON)= 2555.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -467.40                .00
END OF 2ND STAGE   F(11)           -471.95                .00
END OF 3RD STAGE   F(16)           -479.32              50.11
AT THE PILE TIP    F(21)           -182.24              26.87


MAXIMUN DISPLACEMENT   DPR(22) IS       .46745
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.1393



          PRINT OF INPUT DATA COMPUTATION N.  8

          ..............................


4TH SET OF DATA
         CRL=24064.0000
         CRP= 5136.0000


LATERAL RESISTANCE  RL(TON)= 2406.400
POINT RESISTANCE    RP(TON)=  513.600
TOTAL RESISTANCE    RU(TON)= 2920.000
RP/RU RATIO                =     .176


                                MAXIMUM STRESSES (KG/CM2)
                             ..................................

                                   COMPRESSION          TRACTION
                             ..................................

END OF 1ST STAGE   F( 6)           -467.40                .00
END OF 2ND STAGE   F(11)           -472.20                .00
END OF 3RD STAGE   F(16)           -479.83              11.85
AT THE PILE TIP    F(21)           -186.15              12.83


MAXIMUN DISPLACEMENT   DPR(22) IS       .38124
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.6230
```

```
          PRINT OF INPUT DATA COMPUTATION N.  1  -  AK(1) = 5000000 kN/m

          ..............................


1ST SET OF DATA
DELTAT       ENERGY         W(1)          W(2)           Q             J             JP

 .00005      4675000.        29400.        20000.        .25000        .02000        .00500


2ND SET OF DATA
          PILE SUBDIVISIONS                                    BASIC RESISTANCES
I1 = 5          I2 = 5          I3 = 5          I4 = 5          RPB=      100.     RLB=      100.


3RD SET OF DATA
                     PILE DATA
                  PILE WGTS                         **            PILE   LENGTHS

    97403.    97403.    97403.    97403.               1590.     1590.     1590.     1590.

             PILE SECTIONS                *    TIP WEIGHT  *    EMBEDD.  LENGTH           PILE MODULUS
   7804.00   7804.00   7804.00   7804.00               2002.               2475.           2100000.


4TH SET OF DATA
         CRL= 3008.0000
         CRP=  642.0000


5TH SET OF DATA
          AK(1)           E1           N
      5000000.        1.0000          1


LATERAL RESISTANCE  RL(TON)=  300.800
POINT RESISTANCE    RP(TON)=   64.200
TOTAL RESISTANCE    RU(TON)=  365.000
RP/RU RATIO                 =     .176


COMPUTATION STOPPED AT ITERATION NUMBER  1500

                               MAXIMUM STRESSES (KG/CM2)
                          ..................................

                               COMPRESSION          TRACTION
                          ..................................

END OF 1ST STAGE   F( 6)           -701.06             598.64
END OF 2ND STAGE   F(11)           -688.04             595.81
END OF 3RD STAGE   F(16)           -700.81             611.07
AT THE PILE TIP    F(21)           -372.82             264.03


MAXIMUN DISPLACEMENT   DPR(22) IS      2.52991
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .3953



          PRINT OF INPUT DATA COMPUTATION N.  2

          ..............................


4TH SET OF DATA
         CRL= 6016.0000
         CRP= 1284.0000


LATERAL RESISTANCE  RL(TON)=  601.600
POINT RESISTANCE    RP(TON)=  128.400
TOTAL RESISTANCE    RU(TON)=  730.000
RP/RU RATIO                 =     .176


COMPUTATION STOPPED AT ITERATION NUMBER  1500

                               MAXIMUM STRESSES (KG/CM2)
                          ..................................

                               COMPRESSION          TRACTION
                          ..................................

END OF 1ST STAGE   F( 6)           -676.03             514.12
END OF 2ND STAGE   F(11)           -688.04             477.32
END OF 3RD STAGE   F(16)           -694.66             506.82
AT THE PILE TIP    F(21)           -363.88             227.65


MAXIMUN DISPLACEMENT   DPR(22) IS      1.49476
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .6690
```

```
          PRINT OF INPUT DATA COMPUTATION N.  3

          ..............................


4TH SET OF DATA
         CRL= 9024.0000
         CRP= 1926.0000


LATERAL RESISTANCE  RL(TON)=  902.400
POINT RESISTANCE    RP(TON)=  192.600
TOTAL RESISTANCE    RU(TON)= 1095.000
RP/RU RATIO                =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                           ................................

                                 COMPRESSION          TRACTION
                           ................................

END OF 1ST STAGE   F( 6)           -676.03             414.92
END OF 2ND STAGE   F(11)           -688.05             373.99
END OF 3RD STAGE   F(16)           -688.56             461.76
AT THE PILE TIP    F(21)           -354.99             224.60


MAXIMUN DISPLACEMENT   DPR(22) IS      1.07656
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .9289



          PRINT OF INPUT DATA COMPUTATION N.  4

          ..............................


4TH SET OF DATA
         CRL=12032.0000
         CRP= 2568.0000


LATERAL RESISTANCE  RL(TON)= 1203.200
POINT RESISTANCE    RP(TON)=  256.800
TOTAL RESISTANCE    RU(TON)= 1460.000
RP/RU RATIO                =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                           ................................

                                 COMPRESSION          TRACTION
                           ................................

END OF 1ST STAGE   F( 6)           -676.03             351.70
END OF 2ND STAGE   F(11)           -688.05             356.62
END OF 3RD STAGE   F(16)           -682.61             429.70
AT THE PILE TIP    F(21)           -346.16             193.24


MAXIMUN DISPLACEMENT   DPR(22) IS       .81710
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.2238



          PRINT OF INPUT DATA COMPUTATION N.  5

          ..............................


4TH SET OF DATA
         CRL=15040.0000
         CRP= 3210.0000


LATERAL RESISTANCE  RL(TON)= 1504.000
POINT RESISTANCE    RP(TON)=  321.000
TOTAL RESISTANCE    RU(TON)= 1825.000
RP/RU RATIO                =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                           ................................

                                 COMPRESSION          TRACTION
                           ................................

END OF 1ST STAGE   F( 6)           -676.03             293.19
END OF 2ND STAGE   F(11)           -688.05             319.37
END OF 3RD STAGE   F(16)           -676.69             429.04
AT THE PILE TIP    F(21)           -337.43             156.90


MAXIMUN DISPLACEMENT   DPR(22) IS       .71588
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.3969
```

```
          PRINT OF INPUT DATA COMPUTATION N.  6

          ..............................


4TH SET OF DATA
         CRL=18048.0000
         CRP= 3852.0000


LATERAL RESISTANCE  RL(TON)= 1804.800
POINT RESISTANCE    RP(TON)=  385.200
TOTAL RESISTANCE    RU(TON)= 2190.000
RP/RU RATIO               =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                               MAXIMUM STRESSES (KG/CM2)
                            ................................

                                  COMPRESSION          TRACTION
                            ................................

END OF 1ST STAGE   F( 6)           -676.03             310.98
END OF 2ND STAGE   F(11)           -688.06             379.50
END OF 3RD STAGE   F(16)           -670.93             424.76
AT THE PILE TIP    F(21)           -328.81             154.07


MAXIMUN DISPLACEMENT   DPR(22) IS       .62524
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.5994



          PRINT OF INPUT DATA COMPUTATION N.  7

          ..............................


4TH SET OF DATA
         CRL=21056.0000
         CRP= 4494.0000


LATERAL RESISTANCE  RL(TON)= 2105.600
POINT RESISTANCE    RP(TON)=  449.400
TOTAL RESISTANCE    RU(TON)= 2555.000
RP/RU RATIO               =     .176

                               MAXIMUM STRESSES (KG/CM2)
                            ................................

                                  COMPRESSION          TRACTION
                            ................................

END OF 1ST STAGE   F( 6)           -676.03             155.84
END OF 2ND STAGE   F(11)           -688.06              81.39
END OF 3RD STAGE   F(16)           -665.22             137.54
AT THE PILE TIP    F(21)           -320.33             133.36


MAXIMUN DISPLACEMENT   DPR(22) IS       .54376
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.8390



          PRINT OF INPUT DATA COMPUTATION N.  8

          ..............................


4TH SET OF DATA
         CRL=24064.0000
         CRP= 5136.0000


LATERAL RESISTANCE  RL(TON)= 2406.400
POINT RESISTANCE    RP(TON)=  513.600
TOTAL RESISTANCE    RU(TON)= 2920.000
RP/RU RATIO               =     .176

                               MAXIMUM STRESSES (KG/CM2)
                            ................................

                                  COMPRESSION          TRACTION
                            ................................

END OF 1ST STAGE   F( 6)           -676.03              83.16
END OF 2ND STAGE   F(11)           -688.06              37.08
END OF 3RD STAGE   F(16)           -659.66              96.98
AT THE PILE TIP    F(21)           -311.97             127.02


MAXIMUN DISPLACEMENT   DPR(22) IS       .47034
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.1261
```

```
          PRINT OF INPUT DATA COMPUTATION N.  1  -  AK(1)  =  10000000 kN/m

          ..............................


1ST SET OF DATA
DELTAT       ENERGY         W(1)          W(2)           Q             J             JP

 .00005      4675000.        29400.        20000.        .25000        .02000        .00500


2ND SET OF DATA
          PILE SUBDIVISIONS                                    BASIC RESISTANCES
I1 = 5          I2 = 5          I3 = 5          I4 = 5          RPB=      100.     RLB=      100.


3RD SET OF DATA
                     PILE DATA
                  PILE WGTS                         **            PILE   LENGTHS

    97403.    97403.    97403.    97403.               1590.     1590.     1590.     1590.

             PILE SECTIONS                *    TIP WEIGHT  *    EMBEDD.  LENGTH           PILE MODULUS
   7804.00   7804.00   7804.00   7804.00               2002.               2475.           2100000.


4TH SET OF DATA
         CRL= 3008.0000
         CRP=  642.0000


5TH SET OF DATA
          AK(1)           E1           N
     10000000.        1.0000          1


LATERAL RESISTANCE  RL(TON)=  300.800
POINT RESISTANCE    RP(TON)=   64.200
TOTAL RESISTANCE    RU(TON)=  365.000
RP/RU RATIO                 =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                         ..................................

                               COMPRESSION          TRACTION
                         ..................................

END OF 1ST STAGE   F( 6)           -948.56             792.26
END OF 2ND STAGE   F(11)           -969.23             790.85
END OF 3RD STAGE   F(16)           -963.33             794.83
AT THE PILE TIP    F(21)           -544.63             518.37


MAXIMUN DISPLACEMENT   DPR(22) IS      2.38302
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .4196



          PRINT OF INPUT DATA COMPUTATION N.  2

          ..............................


4TH SET OF DATA
         CRL= 6016.0000
         CRP= 1284.0000


LATERAL RESISTANCE  RL(TON)=  601.600
POINT RESISTANCE    RP(TON)=  128.400
TOTAL RESISTANCE    RU(TON)=  730.000
RP/RU RATIO                 =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                         ..................................

                               COMPRESSION          TRACTION
                         ..................................

END OF 1ST STAGE   F( 6)           -948.56             667.36
END OF 2ND STAGE   F(11)           -969.23             651.93
END OF 3RD STAGE   F(16)           -955.35             669.66
AT THE PILE TIP    F(21)           -532.10             441.24


MAXIMUN DISPLACEMENT   DPR(22) IS      1.44588
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .6916
```

```
          PRINT OF INPUT DATA COMPUTATION N.  3

          ..............................


4TH SET OF DATA
         CRL= 9024.0000
         CRP= 1926.0000


LATERAL RESISTANCE  RL(TON)=  902.400
POINT RESISTANCE    RP(TON)=  192.600
TOTAL RESISTANCE    RU(TON)= 1095.000
RP/RU RATIO                =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                           ..................................

                                 COMPRESSION          TRACTION
                           ..................................

END OF 1ST STAGE   F( 6)           -948.56             580.39
END OF 2ND STAGE   F(11)           -969.23             529.83
END OF 3RD STAGE   F(16)           -947.40             558.91
AT THE PILE TIP    F(21)           -519.30             381.40


MAXIMUN DISPLACEMENT   DPR(22) IS      1.07075
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .9339



          PRINT OF INPUT DATA COMPUTATION N.  4

          ..............................


4TH SET OF DATA
         CRL=12032.0000
         CRP= 2568.0000


LATERAL RESISTANCE  RL(TON)= 1203.200
POINT RESISTANCE    RP(TON)=  256.800
TOTAL RESISTANCE    RU(TON)= 1460.000
RP/RU RATIO                =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                              MAXIMUM STRESSES (KG/CM2)
                           ..................................

                                 COMPRESSION          TRACTION
                           ..................................

END OF 1ST STAGE   F( 6)           -948.56             466.35
END OF 2ND STAGE   F(11)           -969.23             504.89
END OF 3RD STAGE   F(16)           -939.48             460.91
AT THE PILE TIP    F(21)           -506.38             345.98


MAXIMUN DISPLACEMENT   DPR(22) IS       .81211
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.2314



          PRINT OF INPUT DATA COMPUTATION N.  5

          ..............................


4TH SET OF DATA
         CRL=15040.0000
         CRP= 3210.0000


LATERAL RESISTANCE  RL(TON)= 1504.000
POINT RESISTANCE    RP(TON)=  321.000
TOTAL RESISTANCE    RU(TON)= 1825.000
RP/RU RATIO                =     .176


                              MAXIMUM STRESSES (KG/CM2)
                           ..................................

                                 COMPRESSION          TRACTION
                           ..................................

END OF 1ST STAGE   F( 6)           -948.56             379.23
END OF 2ND STAGE   F(11)           -969.24             327.14
END OF 3RD STAGE   F(16)           -931.59             372.96
AT THE PILE TIP    F(21)           -493.47             289.65


MAXIMUN DISPLACEMENT   DPR(22) IS       .69142
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.4463
```

```
          PRINT OF INPUT DATA COMPUTATION N.  6

          ..............................


4TH SET OF DATA
         CRL=18048.0000
         CRP= 3852.0000


LATERAL RESISTANCE  RL(TON)= 1804.800
POINT RESISTANCE    RP(TON)=  385.200
TOTAL RESISTANCE    RU(TON)= 2190.000
RP/RU RATIO               =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                               MAXIMUM STRESSES (KG/CM2)
                            ................................

                                  COMPRESSION          TRACTION
                            ................................

END OF 1ST STAGE   F( 6)           -948.56             357.18
END OF 2ND STAGE   F(11)           -969.24             418.49
END OF 3RD STAGE   F(16)           -923.75             387.92
AT THE PILE TIP    F(21)           -480.53             305.45


MAXIMUN DISPLACEMENT   DPR(22) IS       .61443
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.6275



          PRINT OF INPUT DATA COMPUTATION N.  7

          ..............................


4TH SET OF DATA
         CRL=21056.0000
         CRP= 4494.0000


LATERAL RESISTANCE  RL(TON)= 2105.600
POINT RESISTANCE    RP(TON)=  449.400
TOTAL RESISTANCE    RU(TON)= 2555.000
RP/RU RATIO               =     .176

COMPUTATION STOPPED AT ITERATION NUMBER  1500

                               MAXIMUM STRESSES (KG/CM2)
                            ................................

                                  COMPRESSION          TRACTION
                            ................................

END OF 1ST STAGE   F( 6)           -948.56             404.91
END OF 2ND STAGE   F(11)           -969.24             469.59
END OF 3RD STAGE   F(16)           -916.07             397.62
AT THE PILE TIP    F(21)           -467.56             299.22


MAXIMUN DISPLACEMENT   DPR(22) IS       .54489
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.8352



          PRINT OF INPUT DATA COMPUTATION N.  8

          ..............................


4TH SET OF DATA
         CRL=24064.0000
         CRP= 5136.0000


LATERAL RESISTANCE  RL(TON)= 2406.400
POINT RESISTANCE    RP(TON)=  513.600
TOTAL RESISTANCE    RU(TON)= 2920.000
RP/RU RATIO               =     .176


                               MAXIMUM STRESSES (KG/CM2)
                            ................................

                                  COMPRESSION          TRACTION
                            ................................

END OF 1ST STAGE   F( 6)           -948.56             205.90
END OF 2ND STAGE   F(11)           -969.24             133.03
END OF 3RD STAGE   F(16)           -908.52             170.53
AT THE PILE TIP    F(21)           -454.67             208.06


MAXIMUN DISPLACEMENT   DPR(22) IS       .48188
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.0752
```