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Redatto da:	**Verificato da:**	**Approvato da:**
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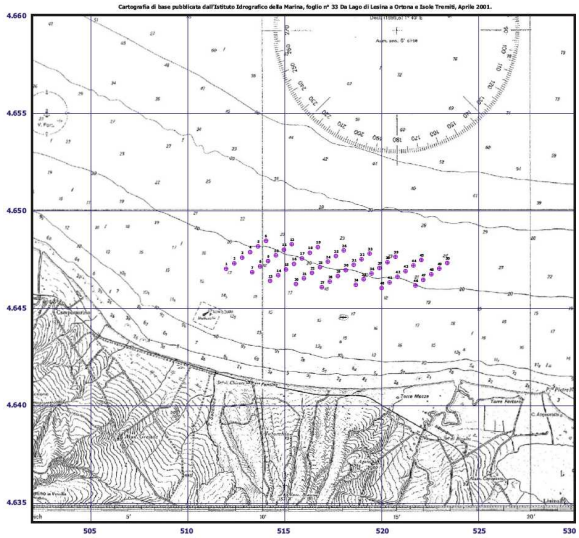
Via Larga, 201 – 47023 CESENA (FC)

Opera: *"CENTRALE EOLICA OFF-SHORE CHIEUTI"***.**

Capitaneria di Porto di Manfredonia (FG)

Oggetto: dimensionamento della fondazioni degli aerogeneratori.



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Revisioni

Versione	Data	Totale Pagine	Modifiche
00	03/09/2007	107	Versione Originale

Indice della Relazione.

1 Introduzione

Nella seguente relazione viene riportato il dimensionamento della struttura di fondazione delle Torri Eoliche previste nella Centrale Eolica Off-Shore Chieuti.

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 2 dalla Del. Giunta Regionale n° 153 del 02/03/2004 con un accelerazion e di riferimento su suolo rigido pari a 0.25 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"
- API-RP-2A – Recommended Practice for planning, Designino and Constructing Fixed Offshore Platforme – 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.
  Lymon C. 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 della "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.

Stratigrafia 1 (riferita al fondale)

da 0.00 a – 10.00 m (soft clay)

C_u = 5 ÷ 15.5 kPa

γ' = 7 kN/m^3

da – 10.00 a – 20.00 m (stiff clay)

C_u = 150 kPa

γ' = 9 kN/m^3

K = 270.000 kN/m^3

> – 20.00 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

da – 10.00 a – 20.00 m s.l.m.m. (stiff clay)

C_u = 150 kPa

γ' = 9 kN/m^3

K = 270.000 kN/m^3

> – 20.00 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 L = 54.0 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 –47/-54 m (base), avendo individuato il fondale a -17.0/-24.0 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".

- 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 S = 9) 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 o 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} = 7.20 x 1.85 = 13.32 m (*)
T = 10.50 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.)

I calcoli sono riportati nell'Appendice 3 ed i risultati per i due fondali -24.00 e -17.00 sono rispettivamente

H = 2681 kN

applicati a 20.47 m dal fondale

H = 3278 kN

applicati a 17.65 m dal fondale

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

8 Analisi strutturale.

L'analisi strutturale è stata eseguita con il programma LPILE Plus ver.4 per le due tipologie stratigrafiche.

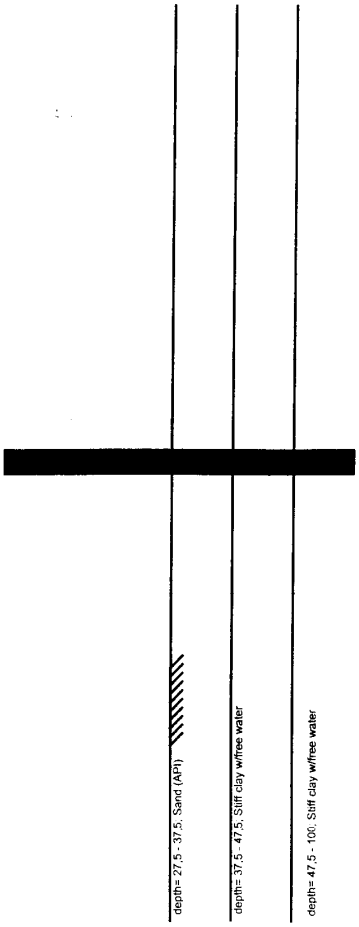
Di seguito sono riportati files di input ed output

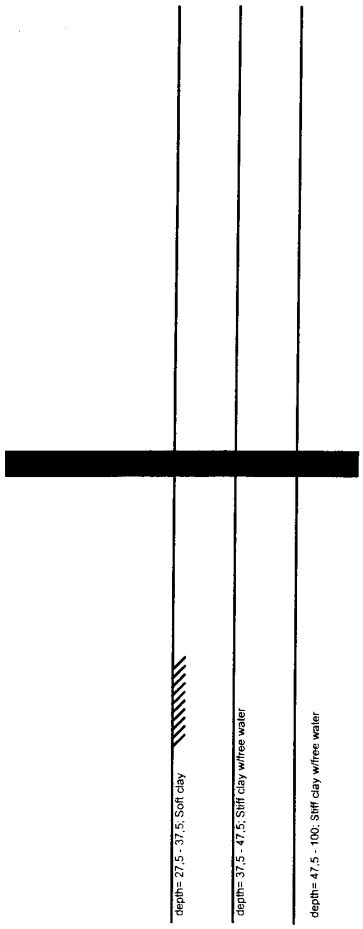
TRESTRA 1 per stratigrafia 1 (Appendice 1)

TRESTRA 2 per stratigrafia 2 (Appendice 2)

relativi a un palo D_e = 4200 mm t = 60 m e di lunghezza complessiva di 57.50 / 64.50 m compreso il tratto di transizione di cui 30.00 m infissi nel terreno.

Nelle pagina seguente sono riportati i due modelli utilizzati uno per ciascuna stratigrafia.


depth= 27.5 - 37.5; Sand (API)
depth= 37.5 - 47.5; Stiff clay w/free water
depth= 47.5 - 100; Stiff clay w/free water


depth= 27.5 - 37.5; Soft clay
depth= 37.5 - 47.5; Stiff clay w/free water
depth= 47.5 - 100; Stiff clay w/free water

9 Risultati.

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

NOME FILE	CESTRA 1	LESTRA 1	CESTRA 2	LESTRA 2
deformazione in sommità	47 cm	57 cm	37 cm	47 cm
deformazione al fondale	10 cm	9.50 cm	6.5 cm	6.0 cm
sollecitazione massima	227 N/mm^2	220 N/mm^2	197 N/mm^2	197 N/mm^2
deformazione alla punta del palo	3 mm	2 mm	~ 0.0	0.00
rotazione in sommità	1.6 %	1.7 %	1.4 %	1.5 %

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.

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	=	54+1.5+2 = 57.5 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 (*)
  $P_{l\_stat} = \pi \times 4.2 \times (10 \times 23 + 10 \times 98 + 10 \times 120) = 31799\ kN$
- portata laterale dinamica
  $P_{l\_dyn} = \pi \times 4.2 \times (10 \times 18 + 10 \times 39 + 10 \times 48) = 13854\ kN$
- portata di base stat./din. $P_b = 1.0355 \times 3100 = 3210\ kN$

(*) 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	2770	642	37	36	38	40
0.4	5540	1284	69	64	64	66
0.6	8310	1926	108	95	88	90
0.8	11080	2568	131	121	118	118
1.0	13850	3210	161	142	136	141
1.2	16620	3852	200	167	154	158
1.4	19390	4494	255	199	176	177
1.6	22160	5136	336	240	201	199

Dai risultati riassunti nella precedente tabelle si evince che 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.

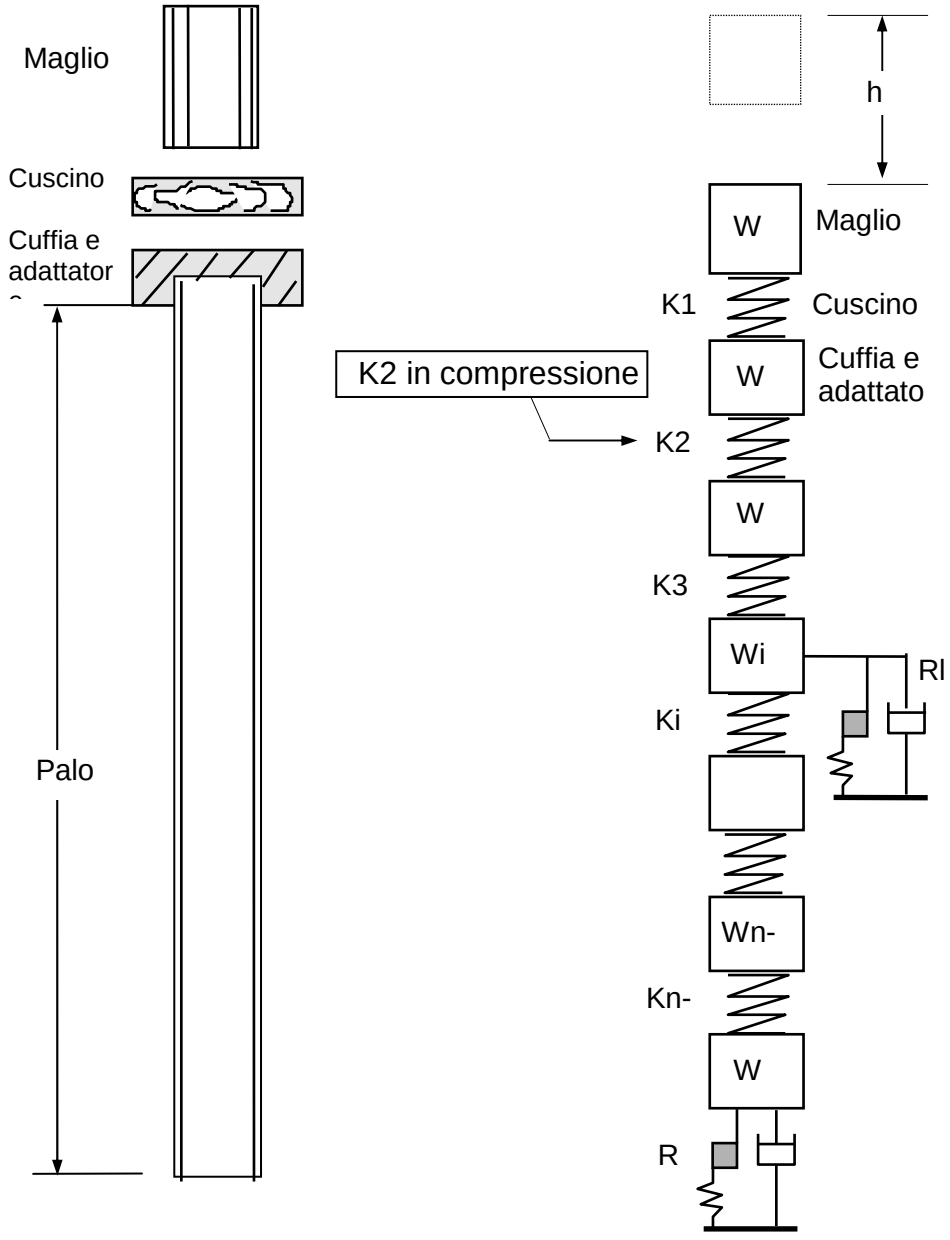


Figura 1

12 Lista degli allegati e delle tavole.

Allegati

Allegato A ***Centrale eolica Off-Shore Chieuti***
Relazione Geologica e Geotecnica Preliminare
Autore: Studio Geologico Italiano Srl: Dott. Mazza
Rif. **SEO-PR002-07 – RT - AA**
Versione: 00

Allegato B ***Centrale eolica Off-Shore Chieuti***
Individuazione Caratteristiche moto ondoso al largo di Manfredonia – Caratteristiche onda di progetto
Autore: Ing.Girolamo Mauro Gentile
Rif. **SEO-PR002-07 – RT - AD**
Versione: 00

Allegato C ***Centrale eolica Off-Shore Chieuti***
Documentazione tecnica Illustrativa aerogeneratori Vestas V90 3.0 MW.
Rif. **SEO-PR002-07 – RT - AE**
Autore: Trevi Finanziaria Industriale: Ing.Fabio Pallotti - Vestas Wind Systems AS
Versione: 00

Tavole:

Tavola I **Fondazione ed elemento di transizione degli aerogeneratori**
NºTavola: TEE00002-006-0-L

Rev. 00
Formato A0

Appendici.

APPENDICE 1 - TERRENO STRATIGRAFIA 1 – ANALISI STRUTTURALE (FILE: TRESTRA1)

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

                    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:

E. MERIGGI
ITALPROGETTI

Path to file locations:      G:\TREVI2\
Name of input data file:     Cestra1.lpd
Name of output file:         Cestra1.lpo
Name of plot output file:    Cestra1.lpp
Name of runtime file:        Cestra1.lpr


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

               Date:  August 21, 2007     Time:  18:47:44


--------------------------------------------------------------------------------
                                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                                =      57.50 m
Depth of ground surface below top of pile =      27.50 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  3 layers

Layer  1 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer    =       27.500 m
Distance from top of pile to bottom of layer =       37.500 m

Layer  2 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       37.500 m
Distance from top of pile to bottom of layer =       47.500 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

Layer  3 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       47.500 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   42.50 m  below pile tip)


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

Distribution of effective unit weight of soil with depth
is defined using  6 points

Point        Depth X    Eff. Unit Weight
 No.            m           kN/ m**3
-----      ----------   ----------------
  1           27.50        7.00000
  2           37.50        7.00000
  3           37.50        9.00000
  4           47.50        9.00000
  5           47.50        9.00000
  6          100.00        9.00000



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

Distribution of shear strength parameters with depth
defined using  6 points

Point    Depth X     Cohesion c     Angle of Friction     E50 or      RQD
 No.        m          kN/ m**2            Deg.            k_rm        %
-----   --------     ----------     ------------------    ------    ------
  1       27.500        5.00000             .00           .02000        .0
  2       37.500       15.50000             .00           .02000        .0
  3       37.500      150.00000             .00           .00500        .0
  4       47.500      150.00000             .00           .00500        .0
  5       47.500      200.00000             .00           .00500        .0
  6      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

---

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 = 4090.000 kN
Bending moment at pile head = 25210.000 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 = 4090.000 kN
Specified bending moment at pile head = 25210.000 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.

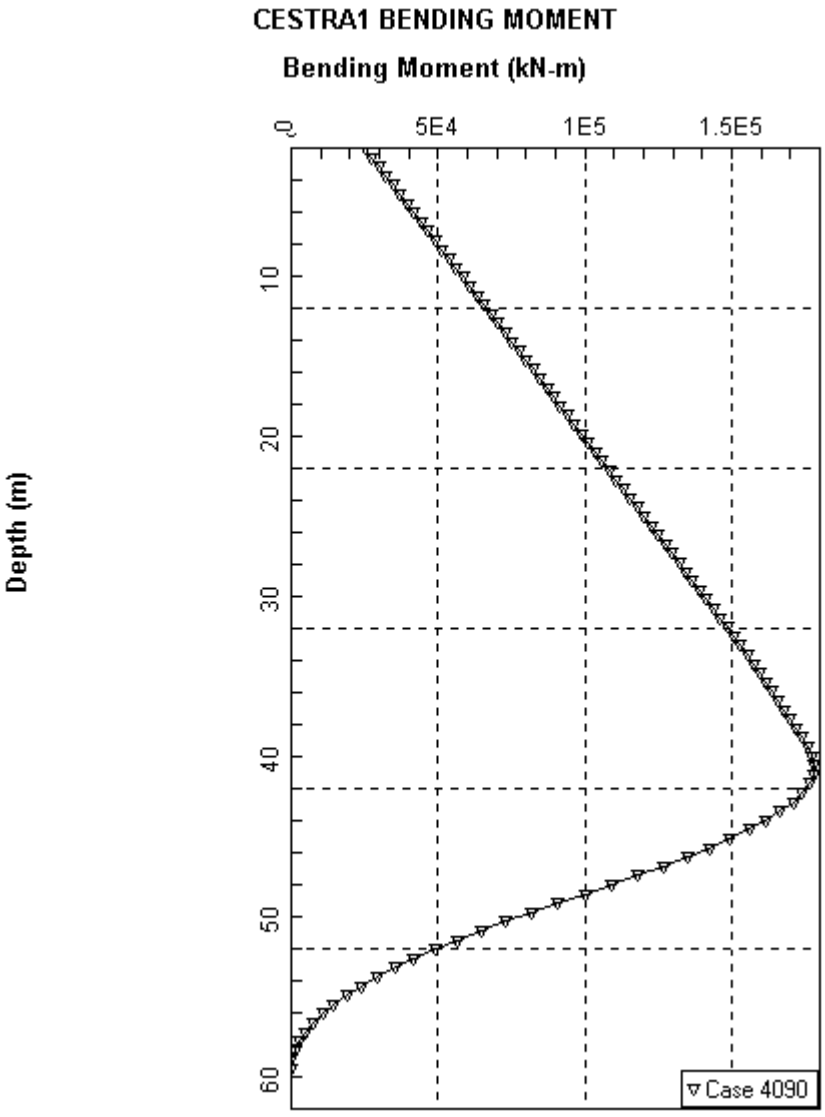
Depth X m	Deflect. y m	Moment M kN- m	Shear V kN	Slope S Rad.	Total Stress kN/ m**2	Soil Res p kN/ m
0.000	.473488	25210.0000	4090.0000	-.016008	34948.7721	0.0000
.575	.464295	27585.3196	4090.0000	-.015964	37932.1281	0.0000
1.150	.455129	29960.5727	4090.0000	-.015917	40915.4005	0.0000
1.725	.445990	32335.7534	4090.0000	-.015866	43898.5820	0.0000
2.300	.436883	34710.8560	4090.0000	-.015811	46881.6655	0.0000
2.875	.427807	37085.8749	4090.0000	-.015753	49864.6437	0.0000
3.450	.418767	39460.8042	4090.0000	-.015690	52847.5094	0.0000
4.025	.409764	41835.6382	4090.0000	-.015623	55830.2555	0.0000
4.600	.400800	44210.3712	4090.0000	-.015553	58812.8748	0.0000
5.175	.391878	46584.9975	4090.0000	-.015479	61795.3599	0.0000
5.750	.383000	48959.5113	4090.0000	-.015400	64777.7038	0.0000
6.325	.374168	51333.9069	4090.0000	-.015318	67759.8993	0.0000
6.900	.365384	53708.1786	4090.0000	-.015232	70741.9391	0.0000
7.475	.356651	56082.3206	4090.0000	-.015142	73723.8160	0.0000
8.050	.347970	58456.3272	4090.0000	-.015049	76705.5228	0.0000
8.625	.339345	60830.1927	4090.0000	-.014951	79687.0524	0.0000
9.200	.330777	63203.9113	4090.0000	-.014849	82668.3976	0.0000
9.775	.322268	65577.4773	4090.0000	-.014744	85649.5510	0.0000
10.350	.313821	67950.8850	4090.0000	-.014635	88630.5056	0.0000
10.925	.305439	70324.1286	4090.0000	-.014521	91611.2542	0.0000
11.500	.297122	72697.2024	4090.0000	-.014404	94591.7895	0.0000
12.075	.288874	75070.1008	4090.0000	-.014283	97572.1044	0.0000
12.650	.280696	77442.8178	4090.0000	-.014158	1.006E+05	0.0000
13.225	.272592	79815.3479	4090.0000	-.014030	1.035E+05	0.0000
13.800	.264562	82187.6853	4090.0000	-.013897	1.065E+05	0.0000
14.375	.256610	84559.8243	4090.0000	-.013760	1.095E+05	0.0000
14.950	.248738	86931.7591	4090.0000	-.013620	1.125E+05	0.0000
15.525	.240947	89303.4841	4090.0000	-.013476	1.154E+05	0.0000
16.100	.233241	91674.9934	4090.0000	-.013327	1.184E+05	0.0000

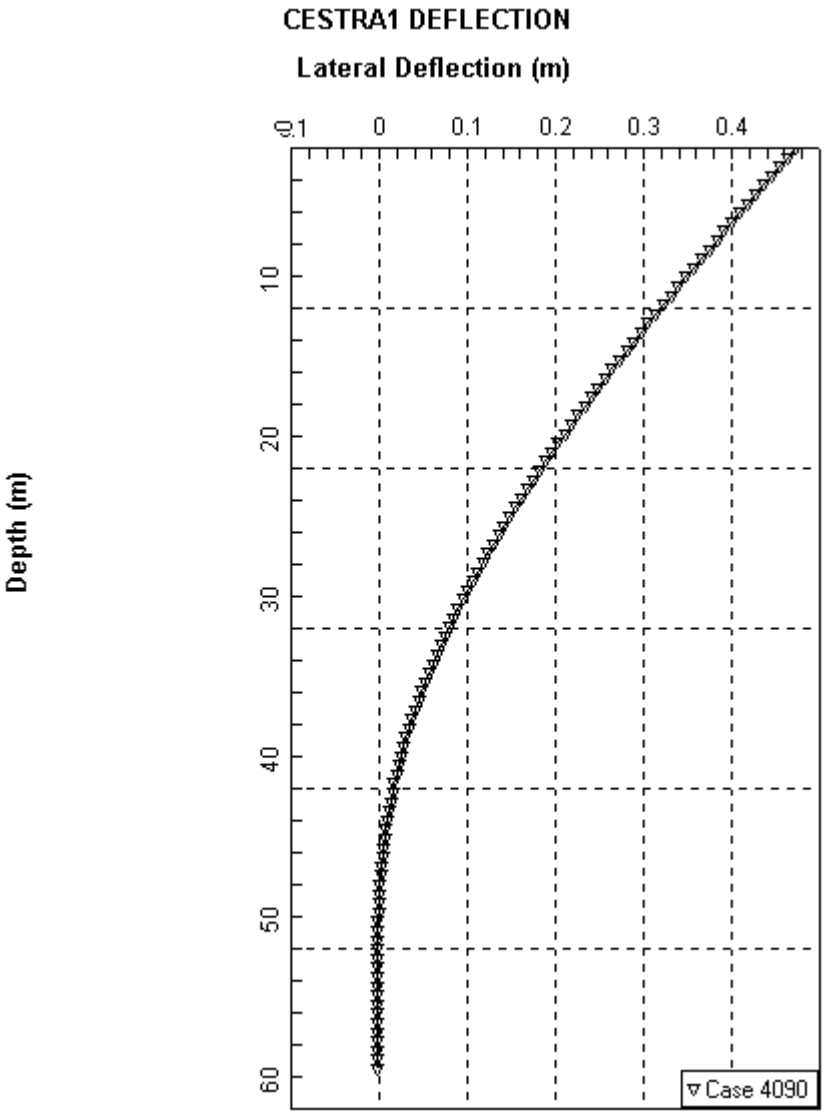
16.675	.225621	94046.2814	4090.0000	-.013175	1.214E+05	0.0000
17.250	.218089	96417.3423	4090.0000	-.013019	1.244E+05	0.0000
17.825	.210648	98788.1705	4090.0000	-.012860	1.274E+05	0.0000
18.400	.203301	1.012E+05	4090.0000	-.012696	1.303E+05	0.0000
18.975	.196048	1.035E+05	4090.0000	-.012528	1.333E+05	0.0000
19.550	.188893	1.059E+05	4090.0000	-.012357	1.363E+05	0.0000
20.125	.181838	1.083E+05	4090.0000	-.012181	1.393E+05	0.0000
20.700	.174885	1.106E+05	4090.0000	-.012002	1.422E+05	0.0000
21.275	.168035	1.130E+05	4090.0000	-.011819	1.452E+05	0.0000
21.850	.161293	1.154E+05	4090.0000	-.011632	1.482E+05	0.0000
22.425	.154658	1.177E+05	4090.0000	-.011441	1.512E+05	0.0000
23.000	.148135	1.201E+05	4090.0000	-.011246	1.541E+05	0.0000
23.575	.141725	1.225E+05	4090.0000	-.011048	1.571E+05	0.0000
24.150	.135430	1.249E+05	4090.0000	-.010845	1.601E+05	0.0000
24.725	.129253	1.272E+05	4090.0000	-.010639	1.631E+05	0.0000
25.300	.123196	1.296E+05	4090.0000	-.010429	1.660E+05	0.0000
25.875	.117260	1.320E+05	4090.0000	-.010214	1.690E+05	0.0000
26.450	.111449	1.343E+05	4090.0000	-.009996	1.720E+05	0.0000
27.025	.105764	1.367E+05	4090.0000	-.009775	1.750E+05	0.0000
27.600	.100208	1.391E+05	4082.4155	-.009549	1.779E+05	-26.3807
28.175	.094783	1.414E+05	4064.4989	-.009319	1.809E+05	-35.9382
28.750	.089491	1.438E+05	4041.1604	-.009086	1.838E+05	-45.2391
29.325	.084335	1.461E+05	4012.5521	-.008848	1.868E+05	-54.2680
29.900	.079316	1.484E+05	3978.8349	-.008607	1.897E+05	-63.0092
30.475	.074437	1.507E+05	3940.1789	-.008362	1.925E+05	-71.4464
31.050	.069699	1.529E+05	3896.7638	-.008114	1.954E+05	-79.5626
31.625	.065106	1.552E+05	3848.7791	-.007861	1.982E+05	-87.3406
32.200	.060659	1.574E+05	3796.4246	-.007605	2.010E+05	-94.7622
32.775	.056360	1.596E+05	3739.9104	-.007346	2.037E+05	-101.8089
33.350	.052211	1.617E+05	3679.4577	-.007083	2.064E+05	-108.4613
33.925	.048214	1.638E+05	3615.2990	-.006816	2.091E+05	-114.6996
34.500	.044372	1.659E+05	3547.6782	-.006546	2.117E+05	-120.5030
35.075	.040686	1.679E+05	3476.8517	-.006273	2.142E+05	-125.8502
35.650	.037158	1.699E+05	3403.0880	-.005996	2.167E+05	-130.7190
36.225	.033791	1.719E+05	3326.6690	-.005716	2.191E+05	-135.0865
36.800	.030585	1.738E+05	3247.8894	-.005433	2.215E+05	-138.9294
37.375	.027542	1.756E+05	3167.0579	-.005147	2.238E+05	-142.2236
37.950	.024665	1.774E+05	2212.3853	-.004858	2.261E+05	-3178.3767
38.525	.021955	1.782E+05	376.3196	-.004567	2.271E+05	-3207.9388
39.100	.019413	1.779E+05	-1450.0178	-.004276	2.267E+05	-3144.5389
39.675	.017038	1.765E+05	-3219.6648	-.003985	2.250E+05	-3010.7552
40.250	.014830	1.742E+05	-4908.6073	-.003698	2.220E+05	-2863.8272
40.825	.012785	1.709E+05	-6508.2152	-.003416	2.179E+05	-2700.0264
41.400	.010901	1.667E+05	-8002.2241	-.003139	2.127E+05	-2496.5263
41.975	.009175	1.617E+05	-9378.4364	-.002870	2.064E+05	-2290.2991
42.550	.007600	1.559E+05	-10636.2050	-.002610	1.991E+05	-2084.5481
43.125	.006173	1.495E+05	-11775.6111	-.002360	1.910E+05	-1878.6036
43.700	.004886	1.424E+05	-12796.2240	-.002121	1.821E+05	-1671.3545
44.275	.003733	1.348E+05	-13696.7594	-.001894	1.725E+05	-1460.9427
44.850	.002707	1.266E+05	-14474.4639	-.001680	1.623E+05	-1244.1166
45.425	.001801	1.181E+05	-15123.8538	-.001480	1.516E+05	-1014.6306
46.000	.001005	1.093E+05	-15633.5129	-.001294	1.405E+05	-758.0968
46.575	3.13E-04	1.001E+05	-15973.0214	-.001122	1.291E+05	-422.8023
47.150	-2.86E-04	90885.1928	-15978.4052	-9.660E-04	1.174E+05	404.0760
47.725	-7.98E-04	81765.7231	-15603.2667	-8.247E-04	1.060E+05	900.7536
48.300	-.001234	72943.8677	-15022.3273	-6.980E-04	94901.5964	1119.9051
48.875	-.001601	64492.1048	-14333.6140	-5.854E-04	84286.3439	1275.6195
49.450	-.001907	56461.9379	-13566.5871	-4.864E-04	74200.6080	1392.3000
50.025	-.002160	48891.9638	-12740.2811	-4.001E-04	64692.8654	1481.8081
50.600	-.002367	41811.7945	-11868.2916	-3.259E-04	55800.3083	1551.1989
51.175	-.002535	35244.3894	-10960.8272	-2.628E-04	47551.7732	1605.1990
51.750	-.002670	29207.6181	-10025.7529	-2.100E-04	39969.7039	1647.2335
52.325	-.002777	23715.3928	-9069.1956	-1.667E-04	33071.5741	1679.9222
52.900	-.002861	18778.5346	-8095.9313	-1.319E-04	26870.9746	1705.3451
53.475	-.002928	14405.4607	-7109.6514	-1.047E-04	21378.4776	1725.1935
54.050	-.002982	10602.7442	-6113.1608	-8.423E-05	16602.3384	1740.8608
54.625	-.003025	7375.5741	-5108.5329	-6.951E-05	12549.0746	1753.4972
55.200	-.003062	4728.1363	-4097.2399	-5.960E-05	9223.9433	1764.0435
55.775	-.003094	2663.9240	-3080.2676	-5.355E-05	6631.3321	1773.2517
56.350	-.003123	1185.9865	-2058.2198	-5.040E-05	4775.0710	1781.6969
56.925	-.003152	297.1197	-1031.4187	-4.918E-05	3658.6713	1789.7853
57.500	-.003180	0.0000	0.0000	-4.894E-05	3285.4946	1797.7581

Output Verification:

Computed forces and moments are within specified convergence limits.

```
Output Summary for Load Case No.  1:

Pile-head deflection             =      .47348790 m
Computed slope at pile head      =     -.01600765
Maximum bending moment           =      178168.99  kN- m
Maximum shear force              =      -15978.41  kN
Depth of maximum bending moment  =          38.52  m
Depth of maximum shear force     =          47.15  m
Number of iterations             =             23
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=  4090.000 M= 25210.000   2564.0000       .4735   1.782E+05 -15978.4052

The analysis ended normally.
```


CESTRA1 BENDING MOMENT
Bending Moment (kN-m)
0
5E4
1E5
1.5E5
10
20
30
40
50
60
Depth (m)
Case 4090


CESTRA1 DEFLECTION
Lateral Deflection (m)
-0.1
0
0.1
0.2
0.3
0.4
Depth (m)
10
20
30
40
50
60
Case 4090

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

                     LPILE Plus for Windows, Version 4.0

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

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                             All Rights Reserved

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


This program is licensed to:

E. MERIGGI
ITALPROGETTI

Path to file locations:      G:\TREVI2\
Name of input data file:     Lestra1.lpd
Name of output file:         Lestra1.lpo
Name of plot output file:    Lestra1.lpp
Name of runtime file:        Lestra1.lpr


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

               Date:  August 21, 2007     Time:  18:48: 5


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

TREVI SPA TORRE EOLICA LESINA-CHIETI  DIMENSIONAMENTO FONDAZIONE S1 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                                 =      64.50 m
Depth of ground surface below top of pile =      34.50 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  3 layers

Layer  1 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer    =       34.500 m
Distance from top of pile to bottom of layer =       44.500 m

Layer  2 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       44.500 m
Distance from top of pile to bottom of layer =       54.500 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

Layer  3 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       54.500 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   35.50 m  below pile tip)


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

Distribution of effective unit weight of soil with depth
is defined using  6 points

Point        Depth X    Eff. Unit Weight
 No.            m           kN/ m**3
-----      ----------   ----------------
  1           34.50        7.00000
  2           44.50        7.00000
  3           44.50        9.00000
  4           54.50        9.00000
  5           54.50        9.00000
  6          100.00        9.00000



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

Distribution of shear strength parameters with depth
defined using  6 points

Point    Depth X     Cohesion c     Angle of Friction     E50 or      RQD
 No.        m          kN/ m**2            Deg.            k_rm        %
-----   --------     ----------     ------------------    ------    ------
  1       34.500        5.00000             .00           .02000        .0
  2       44.500       15.50000             .00           .02000        .0
  3       44.500      150.00000             .00           .00500        .0
  4       54.500      150.00000             .00           .00500        .0
  5       54.500      200.00000             .00           .00500        .0
  6      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

---
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 = 3493.000 kN
Bending moment at pile head = 19884.000 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 = 3493.000 kN
Specified bending moment at pile head = 19884.000 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.

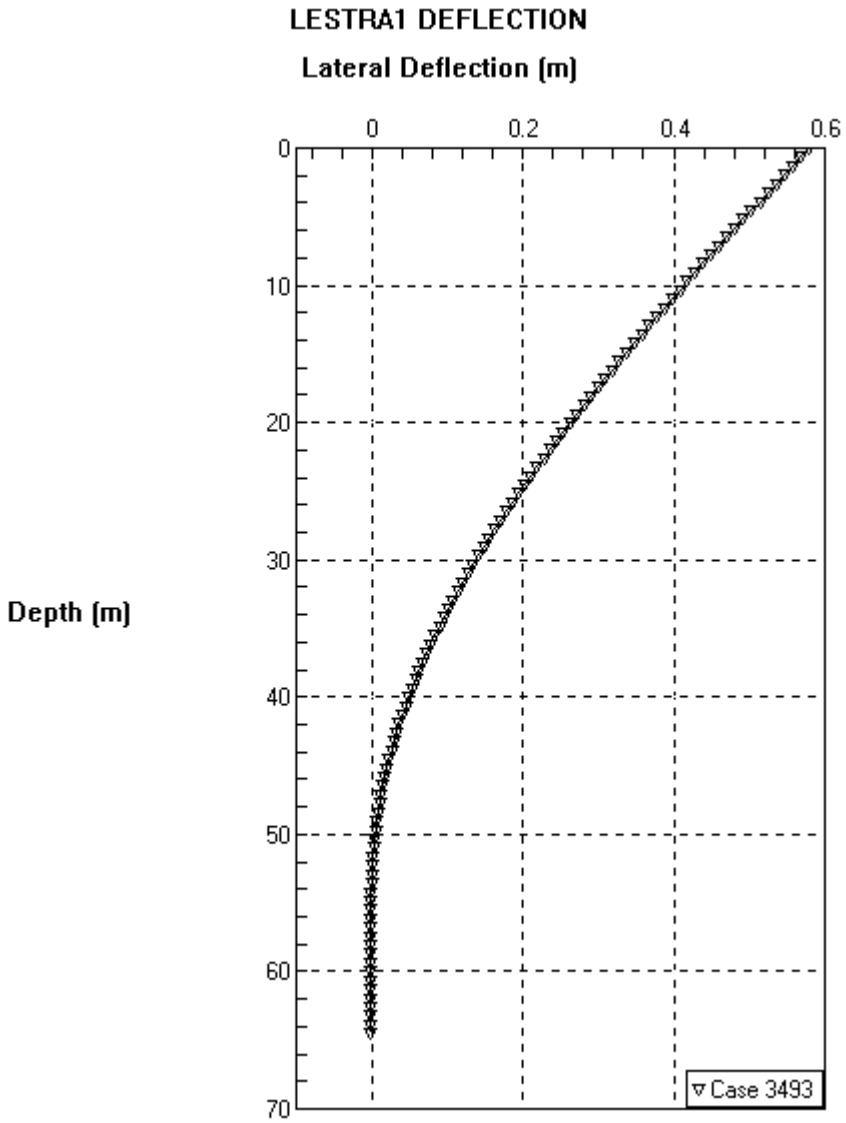
Depth X m	Deflect. y m	Moment M kN- m	Shear V kN	Slope S Rad.	Total Stress kN/ m**2	Soil Res p kN/ m
0.000	.579497	19884.0000	3493.0000	-.017083	28259.4181	0.0000
.645	.568490	22165.2066	3493.0000	-.017045	31124.5699	0.0000
1.290	.557509	24446.3458	3493.0000	-.017002	33989.6371	0.0000
1.935	.546558	26727.4108	3493.0000	-.016955	36854.6111	0.0000
2.580	.535638	29008.3946	3493.0000	-.016904	39719.4830	0.0000
3.225	.524752	31289.2902	3493.0000	-.016848	42584.2443	0.0000
3.870	.513904	33570.0908	3493.0000	-.016789	45448.8862	0.0000
4.515	.503095	35850.7894	3493.0000	-.016725	48313.4000	0.0000
5.160	.492329	38131.3791	3493.0000	-.016657	51177.7770	0.0000
5.805	.481608	40411.8530	3493.0000	-.016585	54042.0085	0.0000
6.450	.470934	42692.2041	3493.0000	-.016508	56906.0859	0.0000
7.095	.460312	44972.4255	3493.0000	-.016428	59770.0003	0.0000
7.740	.449743	47252.5102	3493.0000	-.016343	62633.7431	0.0000
8.385	.439229	49532.4515	3493.0000	-.016254	65497.3057	0.0000
9.030	.428775	51812.2422	3493.0000	-.016161	68360.6792	0.0000
9.675	.418381	54091.8755	3493.0000	-.016064	71223.8550	0.0000
10.320	.408052	56371.3445	3493.0000	-.015962	74086.8245	0.0000
10.965	.397790	58650.6423	3493.0000	-.015857	76949.5788	0.0000
11.610	.387597	60929.7619	3493.0000	-.015747	79812.1094	0.0000
12.255	.377476	63208.6963	3493.0000	-.015633	82674.4075	0.0000
12.900	.367430	65487.4388	3493.0000	-.015515	85536.4644	0.0000
13.545	.357462	67765.9823	3493.0000	-.015392	88398.2714	0.0000
14.190	.347574	70044.3199	3493.0000	-.015266	91259.8198	0.0000
14.835	.337769	72322.4447	3493.0000	-.015135	94121.1010	0.0000
15.480	.328050	74600.3499	3493.0000	-.015000	96982.1063	0.0000
16.125	.318419	76878.0283	3493.0000	-.014861	99842.8269	0.0000
16.770	.308879	79155.4733	3493.0000	-.014718	1.027E+05	0.0000
17.415	.299433	81432.6777	3493.0000	-.014570	1.056E+05	0.0000
18.060	.290084	83709.6348	3493.0000	-.014418	1.084E+05	0.0000
18.705	.280834	85986.3376	3493.0000	-.014263	1.113E+05	0.0000

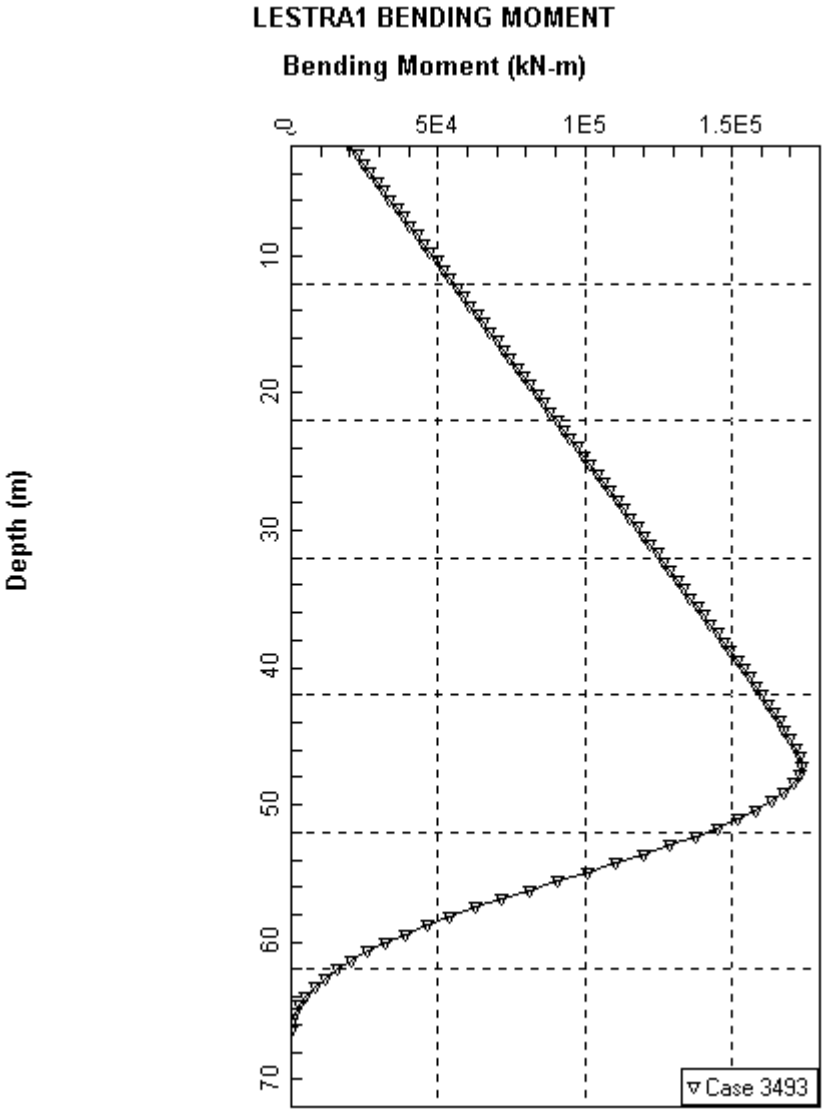
19.350	.271685	88262.7791	3493.0000	-.014103	1.141E+05	0.0000
19.995	.262641	90538.9526	3493.0000	-.013938	1.170E+05	0.0000
20.640	.253705	92814.8509	3493.0000	-.013770	1.199E+05	0.0000
21.285	.244878	95090.4673	3493.0000	-.013597	1.227E+05	0.0000
21.930	.236164	97365.7948	3493.0000	-.013421	1.256E+05	0.0000
22.575	.227566	99640.8265	3493.0000	-.013240	1.284E+05	0.0000
23.220	.219085	1.019E+05	3493.0000	-.013054	1.313E+05	0.0000
23.865	.210725	1.042E+05	3493.0000	-.012865	1.341E+05	0.0000
24.510	.202489	1.065E+05	3493.0000	-.012672	1.370E+05	0.0000
25.155	.194379	1.087E+05	3493.0000	-.012474	1.399E+05	0.0000
25.800	.186398	1.110E+05	3493.0000	-.012272	1.427E+05	0.0000
26.445	.178548	1.133E+05	3493.0000	-.012066	1.456E+05	0.0000
27.090	.170832	1.156E+05	3493.0000	-.011856	1.484E+05	0.0000
27.735	.163254	1.178E+05	3493.0000	-.011642	1.513E+05	0.0000
28.380	.155815	1.201E+05	3493.0000	-.011423	1.541E+05	0.0000
29.025	.148518	1.224E+05	3493.0000	-.011200	1.570E+05	0.0000
29.670	.141366	1.246E+05	3493.0000	-.010973	1.598E+05	0.0000
30.315	.134362	1.269E+05	3493.0000	-.010742	1.627E+05	0.0000
30.960	.127509	1.292E+05	3493.0000	-.010507	1.655E+05	0.0000
31.605	.120808	1.315E+05	3493.0000	-.010268	1.684E+05	0.0000
32.250	.114263	1.337E+05	3493.0000	-.010024	1.712E+05	0.0000
32.895	.107877	1.360E+05	3493.0000	-.009776	1.741E+05	0.0000
33.540	.101651	1.383E+05	3493.0000	-.009525	1.769E+05	0.0000
34.185	.095590	1.405E+05	3493.0000	-.009269	1.798E+05	0.0000
34.830	.089695	1.428E+05	3483.5340	-.009008	1.826E+05	-29.3519
35.475	.083969	1.451E+05	3461.2974	-.008744	1.855E+05	-39.5988
36.120	.078415	1.473E+05	3432.5621	-.008475	1.883E+05	-49.5029
36.765	.073036	1.495E+05	3397.5564	-.008203	1.911E+05	-59.0419
37.410	.067834	1.517E+05	3356.5232	-.007926	1.938E+05	-68.1929
38.055	.062811	1.539E+05	3309.7204	-.007645	1.965E+05	-76.9321
38.700	.057971	1.560E+05	3257.4216	-.007361	1.992E+05	-85.2346
39.345	.053316	1.581E+05	3199.9168	-.007072	2.018E+05	-93.0748
39.990	.048848	1.602E+05	3137.5129	-.006780	2.044E+05	-100.4258
40.635	.044570	1.622E+05	3070.5343	-.006484	2.070E+05	-107.2597
41.280	.040484	1.641E+05	2999.3240	-.006184	2.094E+05	-113.5473
41.925	.036592	1.661E+05	2924.2442	-.005881	2.118E+05	-119.2583
42.570	.032897	1.679E+05	2845.6769	-.005574	2.142E+05	-124.3612
43.215	.029401	1.697E+05	2764.0249	-.005264	2.165E+05	-128.8233
43.860	.026107	1.715E+05	2679.7125	-.004951	2.187E+05	-132.6107
44.505	.023015	1.732E+05	1702.2608	-.004634	2.208E+05	-2898.2472
45.150	.020129	1.737E+05	-177.1587	-.004315	2.215E+05	-2929.4104
45.795	.017448	1.730E+05	-2067.6137	-.003997	2.206E+05	-2932.4655
46.440	.014973	1.711E+05	-3939.6033	-.003681	2.181E+05	-2872.1535
47.085	.012700	1.679E+05	-5733.8245	-.003370	2.142E+05	-2691.3228
47.730	.010626	1.637E+05	-7396.6697	-.003065	2.089E+05	-2464.7864
48.375	.008746	1.584E+05	-8912.7225	-.002769	2.022E+05	-2236.1528
49.020	.007054	1.522E+05	-10281.5281	-.002484	1.944E+05	-2008.2054
49.665	.005542	1.451E+05	-11503.2329	-.002211	1.856E+05	-1780.0267
50.310	.004202	1.374E+05	-12577.1587	-.001951	1.758E+05	-1549.9756
50.955	.003025	1.289E+05	-13501.1352	-.001707	1.652E+05	-1315.0676
51.600	.002000	1.199E+05	-14270.1413	-.001478	1.539E+05	-1069.4477
52.245	.001118	1.105E+05	-14872.8948	-.001266	1.421E+05	-799.5552
52.890	3.67E-04	1.008E+05	-15278.4440	-.001072	1.298E+05	-457.9619
53.535	-2.65E-04	90819.0315	-15300.5812	-8.963E-04	1.174E+05	389.3194
54.180	-7.89E-04	81032.4844	-14958.3627	-7.385E-04	1.051E+05	671.8234
54.825	-.001218	71525.1863	-14382.9055	-5.984E-04	93119.7597	1112.5399
55.470	-.001561	62480.5154	-13617.8434	-4.753E-04	81759.8262	1259.7457
56.115	-.001831	53959.7404	-12771.6342	-3.683E-04	71057.8958	1364.1588
56.760	-.002037	46006.3256	-11867.7056	-2.765E-04	61068.5591	1438.7205
57.405	-.002188	38651.3148	-10922.8255	-1.988E-04	51830.8062	1491.1402
58.050	-.002293	31916.5381	-9949.6014	-1.340E-04	43372.0557	1526.6089
58.695	-.002360	25816.7720	-8957.7454	-8.092E-05	35710.8661	1548.9137
59.340	-.002397	20361.3142	-7954.8064	-3.851E-05	28858.9156	1560.9746
59.985	-.002410	15555.1991	-6946.6380	-5.520E-06	22822.5269	1565.1291
60.630	-.002404	11400.1695	-5937.7220	1.924E-05	17603.8893	1563.2926
61.275	-.002385	7895.4741	-4931.4110	3.696E-05	13202.0590	1557.0514
61.920	-.002357	5038.5271	-3930.1233	4.884E-05	9613.7882	1547.7165
62.565	-.002322	2825.4535	-2935.5114	5.606E-05	6834.2101	1536.3514
63.210	-.002284	1251.5319	-1948.6173	5.981E-05	4857.3947	1523.7855
63.855	-.002245	311.5393	-970.0227	6.124E-05	3676.7821	1510.6163
64.500	-.002205	0.0000	0.0000	6.153E-05	3285.4946	1497.2060

Output Verification:

Computed forces and moments are within specified convergence limits.

```
Output Summary for Load Case No.  1:

Pile-head deflection             =      .57949689 m
Computed slope at pile head      =     -.01708316
Maximum bending moment           =      173719.54  kN- m
Maximum shear force              =      -15300.58  kN
Depth of maximum bending moment  =          45.15  m
Depth of maximum shear force     =          53.54  m
Number of iterations             =             22
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=  3493.000 M= 19884.000   2564.0000       .5795   1.737E+05 -15300.5812

The analysis ended normally.
```


LESTRA1 DEFLECTION
Lateral Deflection (m)
0
0.2
0.4
0.6
Depth (m)
0
10
20
30
40
50
60
70
Case 3493


LESTRA1 BENDING MOMENT
Bending Moment (kN-m)
0
5E4
1E5
1.5E5
10
20
30
40
50
60
70
Depth (m)
Case 3493

APPENDICE 2 - TERRENO STRATIGRAFIA 2 – ANALISI STRUTTURALE (FILE: TRESTRA2)

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

                    LPILE Plus for Windows, Version 4.0

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

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                             All Rights Reserved

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


This program is licensed to:

E. MERIGGI
ITALPROGETTI

Path to file locations:      G:\TREVI2\
Name of input data file:     Cestra2.lpd
Name of output file:         Cestra2.lpo
Name of plot output file:    Cestra2.lpp
Name of runtime file:        Cestra2.lpr


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

               Date:  August 21, 2007     Time:  18:47:54


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

TREVI SPA TORRE EOLICA LESINA-CHIETI  DIMENSIONAMENTO FONDAZIONE S2 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                                =      57.50 m
```

```
Depth of ground surface below top of pile =      27.50 m
Slope angle of ground surface             =        .00 deg.

Structural properties of pile defined using  2 points
```

Point	Depth X m	Pile Diameter m	Moment of Inertia m**4	Pile Area Sq. m	Modulus of Elasticity 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  3 layers

Layer  1 is sand, p-y criteria by API RP-2A, 1987
Distance from top of pile to top of layer    =       27.500 m
Distance from top of pile to bottom of layer =       37.500 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    =       37.500 m
Distance from top of pile to bottom of layer =       47.500 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

Layer  3 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       47.500 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   42.50 m  below pile tip)


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

Distribution of effective unit weight of soil with depth
is defined using  6 points
```

Point No.	Depth X m	Eff. Unit Weight kN/ m**3
1	27.50	7.00000
2	37.50	7.00000
3	37.50	9.00000
4	47.50	9.00000
5	47.50	9.00000
6	100.00	9.00000

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

Distribution of shear strength parameters with depth
defined using  6 points
```

Point No.	Depth X m	Cohesion c kN/ m**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	27.500	.00000	32.00	------	------
2	37.500	.00000	32.00	------	------
3	37.500	150.00000	.00	.00500	.0
4	47.500	150.00000	.00	.00500	.0
5	47.500	200.00000	.00	.00500	.0
6	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

---

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 = 4090.000 kN
Bending moment at pile head = 25210.000 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 = 4090.000 kN
Specified bending moment at pile head = 25210.000 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.

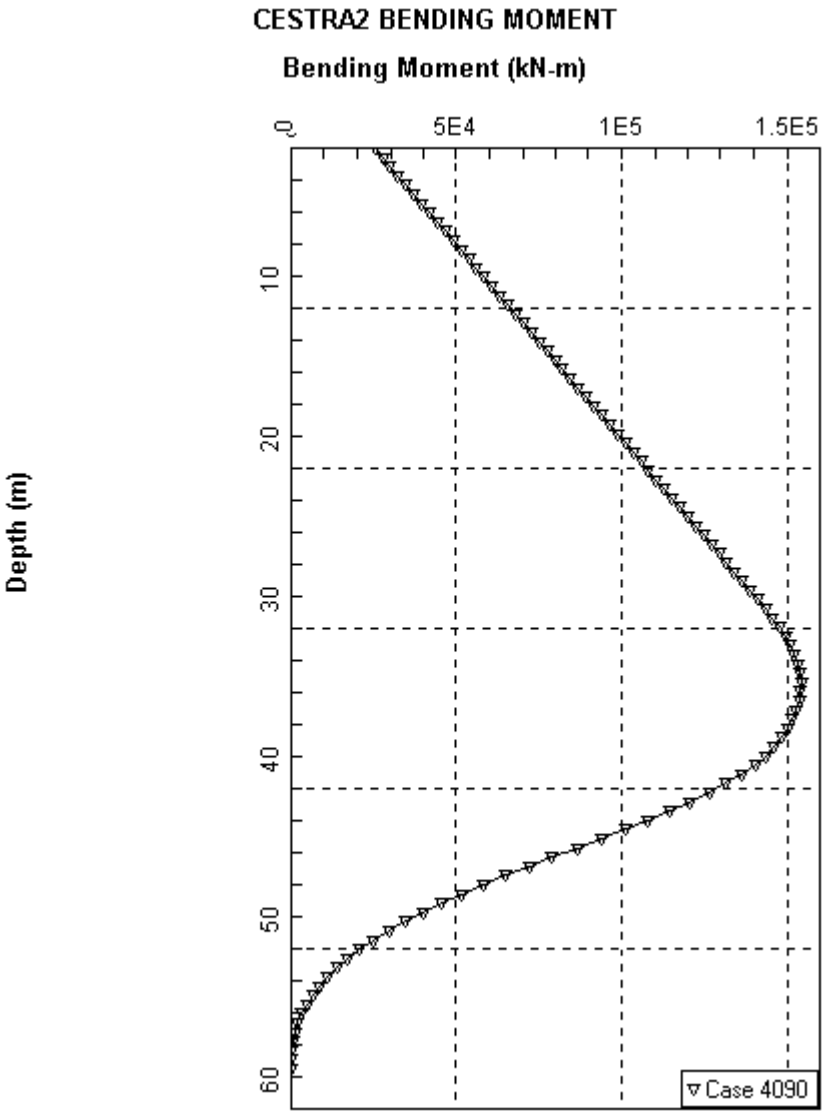
Depth X m	Deflect. y m	Moment M kN- m	Shear V kN	Slope S Rad.	Total Stress kN/ m**2	Soil Res p kN/ m
0.000	.368195	25210.0000	4090.0000	-.013607	34948.7721	0.0000
.575	.360383	27581.7798	4090.0000	-.013563	37927.6822	0.0000
1.150	.352597	29953.4930	4090.0000	-.013516	40906.5086	0.0000
1.725	.344839	32325.1339	4090.0000	-.013465	43885.2442	0.0000
2.300	.337112	34696.6968	4090.0000	-.013410	46863.8817	0.0000
2.875	.329417	37068.1759	4090.0000	-.013352	49842.4141	0.0000
3.450	.321757	39439.5655	4090.0000	-.013289	52820.8340	0.0000
4.025	.314135	41810.8599	4090.0000	-.013222	55799.1344	0.0000
4.600	.306551	44182.0533	4090.0000	-.013152	58777.3080	0.0000
5.175	.299010	46553.1400	4090.0000	-.013078	61755.3475	0.0000
5.750	.291512	48924.1144	4090.0000	-.013000	64733.2460	0.0000
6.325	.284060	51294.9706	4090.0000	-.012918	67710.9960	0.0000
6.900	.276657	53665.7030	4090.0000	-.012832	70688.5906	0.0000
7.475	.269304	56036.3059	4090.0000	-.012742	73666.0223	0.0000
8.050	.262004	58406.7734	4090.0000	-.012648	76643.2842	0.0000
8.625	.254759	60777.1000	4090.0000	-.012550	79620.3690	0.0000
9.200	.247571	63147.2797	4090.0000	-.012449	82597.2694	0.0000
9.775	.240442	65517.3071	4090.0000	-.012344	85573.9784	0.0000
10.350	.233376	67887.1762	4090.0000	-.012234	88550.4887	0.0000
10.925	.226373	70256.8815	4090.0000	-.012121	91526.7931	0.0000
11.500	.219436	72626.4171	4090.0000	-.012004	94502.8845	0.0000
12.075	.212568	74995.7774	4090.0000	-.011883	97478.7557	0.0000
12.650	.205770	77364.9566	4090.0000	-.011759	1.005E+05	0.0000
13.225	.199045	79733.9490	4090.0000	-.011630	1.034E+05	0.0000
13.800	.192396	82102.7490	4090.0000	-.011498	1.064E+05	0.0000
14.375	.185823	84471.3507	4090.0000	-.011361	1.094E+05	0.0000
14.950	.179330	86839.7484	4090.0000	-.011221	1.124E+05	0.0000
15.525	.172919	89207.9365	4090.0000	-.011077	1.153E+05	0.0000
16.100	.166592	91575.9093	4090.0000	-.010929	1.183E+05	0.0000

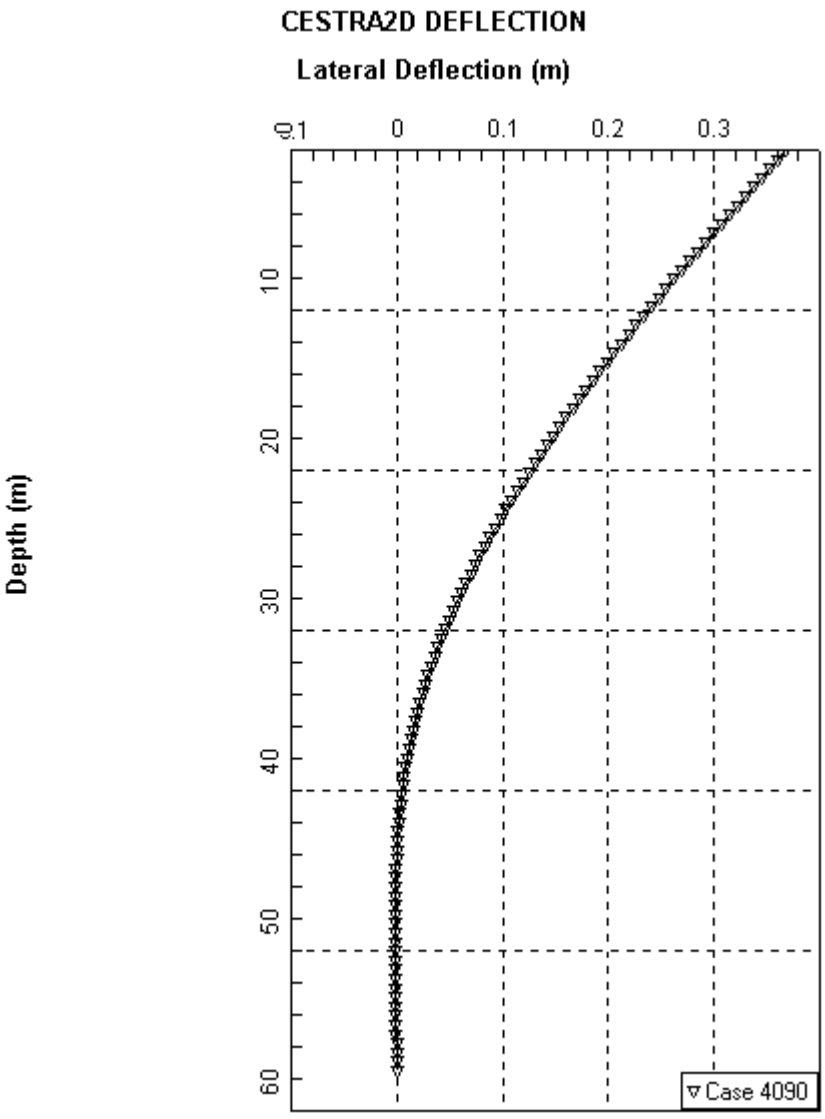
16.675	.160351	93943.6609	4090.0000	-.010777	1.213E+05	0.0000
17.250	.154199	96311.1857	4090.0000	-.010621	1.243E+05	0.0000
17.825	.148137	98678.4780	4090.0000	-.010461	1.272E+05	0.0000
18.400	.142168	1.010E+05	4090.0000	-.010298	1.302E+05	0.0000
18.975	.136295	1.034E+05	4090.0000	-.010130	1.332E+05	0.0000
19.550	.130518	1.058E+05	4090.0000	-.009959	1.361E+05	0.0000
20.125	.124842	1.081E+05	4090.0000	-.009784	1.391E+05	0.0000
20.700	.119267	1.105E+05	4090.0000	-.009605	1.421E+05	0.0000
21.275	.113796	1.129E+05	4090.0000	-.009422	1.451E+05	0.0000
21.850	.108431	1.152E+05	4090.0000	-.009235	1.480E+05	0.0000
22.425	.103175	1.176E+05	4090.0000	-.009045	1.510E+05	0.0000
23.000	.098030	1.200E+05	4090.0000	-.008850	1.540E+05	0.0000
23.575	.092998	1.223E+05	4090.0000	-.008652	1.569E+05	0.0000
24.150	.088081	1.247E+05	4090.0000	-.008449	1.599E+05	0.0000
24.725	.083281	1.271E+05	4090.0000	-.008243	1.629E+05	0.0000
25.300	.078601	1.294E+05	4090.0000	-.008033	1.658E+05	0.0000
25.875	.074043	1.318E+05	4090.0000	-.007819	1.688E+05	0.0000
26.450	.069609	1.342E+05	4090.0000	-.007602	1.718E+05	0.0000
27.025	.065301	1.365E+05	4090.0000	-.007380	1.748E+05	0.0000
27.600	.061122	1.389E+05	4082.7956	-.007154	1.777E+05	-25.0586
28.175	.057074	1.412E+05	4025.2977	-.006925	1.807E+05	-174.9343
28.750	.053158	1.435E+05	3880.3428	-.006692	1.836E+05	-329.2568
29.325	.049378	1.457E+05	3647.3959	-.006455	1.863E+05	-480.9930
29.900	.045735	1.477E+05	3329.6974	-.006215	1.888E+05	-624.0456
30.475	.042231	1.496E+05	2933.6449	-.005971	1.911E+05	-753.5283
31.050	.038868	1.511E+05	2468.0733	-.005725	1.931E+05	-865.8513
31.625	.035647	1.524E+05	1943.5244	-.005477	1.947E+05	-958.6666
32.200	.032570	1.534E+05	1371.5732	-.005226	1.959E+05	-1030.7289
32.775	.029637	1.540E+05	764.2451	-.004974	1.967E+05	-1081.7166
33.350	.026850	1.543E+05	133.5381	-.004722	1.971E+05	-1112.0469
33.925	.024207	1.542E+05	-508.9522	-.004469	1.969E+05	-1122.7021
34.500	.021710	1.537E+05	-1152.3142	-.004217	1.963E+05	-1115.0787
35.075	.019357	1.529E+05	-1786.5219	-.003966	1.953E+05	-1090.8612
35.650	.017148	1.517E+05	-2402.5718	-.003717	1.938E+05	-1051.9210
36.225	.015083	1.501E+05	-2992.5670	-.003470	1.918E+05	-1000.2364
36.800	.013158	1.482E+05	-3549.7617	-.003226	1.895E+05	-937.8321
37.375	.011373	1.460E+05	-4068.5740	-.002985	1.867E+05	-866.7326
37.950	.009726	1.436E+05	-4995.7109	-.002747	1.836E+05	-2358.0913
38.525	.008214	1.403E+05	-6296.6845	-.002515	1.795E+05	-2167.0341
39.100	.006834	1.363E+05	-7487.9840	-.002289	1.745E+05	-1976.6166
39.675	.005582	1.317E+05	-8569.8641	-.002069	1.687E+05	-1786.4444
40.250	.004454	1.265E+05	-9542.2664	-.001858	1.621E+05	-1595.8244
40.825	.003446	1.207E+05	-10404.5933	-.001655	1.549E+05	-1403.5737
41.400	.002551	1.145E+05	-11155.3155	-.001463	1.471E+05	-1207.6339
41.975	.001764	1.079E+05	-11791.2142	-.001280	1.388E+05	-1004.1877
42.550	.001078	1.010E+05	-12305.6558	-.001109	1.301E+05	-785.1745
43.125	4.88E-04	93760.6566	-12683.2414	-9.500E-04	1.210E+05	-528.1665
43.700	-1.43E-05	86381.7676	-12809.2082	-8.025E-04	1.118E+05	90.0210
44.275	-4.35E-04	79032.4333	-12639.9623	-6.670E-04	1.025E+05	498.6605
44.850	-7.81E-04	71847.7778	-12304.4506	-5.435E-04	93524.9285	668.3368
45.425	-.001060	64883.9177	-11888.4953	-4.315E-04	84778.4535	778.4643
46.000	-.001278	58177.2807	-11418.9779	-3.308E-04	76355.0458	854.6395
46.575	-.001440	51753.0685	-10912.3732	-2.408E-04	68286.3581	907.4640
47.150	-.001555	45628.7615	-10380.4467	-1.610E-04	60594.3458	942.7151
47.725	-.001626	39816.0296	-9739.8683	-9.107E-05	53293.6658	1285.3834
48.300	-.001659	34428.1815	-8996.9709	-3.028E-05	46526.6316	1298.6078
48.875	-.001660	29469.6024	-8250.1362	2.204E-05	40298.7512	1299.0780
49.450	-.001634	24940.4598	-7506.1642	6.659E-05	34610.2348	1288.6507
50.025	-.001584	20837.3171	-6770.9068	1.041E-04	29456.7661	1268.7664
50.600	-.001514	17153.6100	-6049.4774	1.352E-04	24830.1005	1240.5534
51.175	-.001428	13880.0195	-5346.4124	1.606E-04	20718.5335	1204.8901
51.750	-.001330	11004.7623	-4665.8054	1.810E-04	17107.2654	1162.4386
52.325	-.001220	8513.8097	-4011.4275	1.970E-04	13978.6767	1113.6582
52.900	-.001103	6391.0398	-3386.8458	2.092E-04	11312.5183	1058.8000
53.475	-9.80E-04	4618.3203	-2795.5504	2.182E-04	9086.0166	997.8796
54.050	-8.52E-04	3175.5136	-2241.1073	2.246E-04	7273.8789	930.6180
54.625	-7.22E-04	2040.3848	-1727.3604	2.288E-04	5848.1789	856.3276
55.200	-5.89E-04	1188.3744	-1258.7313	2.315E-04	4778.0701	773.6868
55.775	-4.55E-04	592.1613	-840.7228	2.329E-04	4029.2379	680.2559
56.350	-3.21E-04	220.8564	-480.9119	2.336E-04	3562.8860	571.2603
56.925	-1.87E-04	38.4238	-191.4495	2.338E-04	3333.7542	435.5653
57.500	-5.23E-05	0.0000	0.0000	2.338E-04	3285.4946	230.3461

Output Verification:

Computed forces and moments are within specified convergence limits.

```
Output Summary for Load Case No.  1:

Pile-head deflection             =      .36819473 m
Computed slope at pile head      =     -.01360662
Maximum bending moment           =      154280.43  kN- m
Maximum shear force              =      -12809.21  kN
Depth of maximum bending moment  =          33.35  m
Depth of maximum shear force     =          43.70  m
Number of iterations             =             15
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=  4090.000 M= 25210.000   2564.0000       .3682   1.543E+05 -12809.2082

The analysis ended normally.
```


CESTRA2 BENDING MOMENT
Bending Moment (kN-m)
0
5E4
1E5
1.5E5
10
20
30
40
50
60
Depth (m)
Case 4090


CESTRA2D DEFLECTION
Lateral Deflection (m)
-0.1
0
0.1
0.2
0.3
Depth (m)
10
20
30
40
50
60
Case 4090

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

                     LPILE Plus for Windows, Version 4.0

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

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                             All Rights Reserved

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


This program is licensed to:

E. MERIGGI
ITALPROGETTI

Path to file locations:      G:\TREVI2\
Name of input data file:     Lestra2.lpd
Name of output file:         Lestra2.lpo
Name of plot output file:    Lestra2.lpp
Name of runtime file:        Lestra2.lpr


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

               Date:  August 21, 2007     Time:  18:48:17


--------------------------------------------------------------------------------
                                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
--------------------------------------------------------------------------------
```
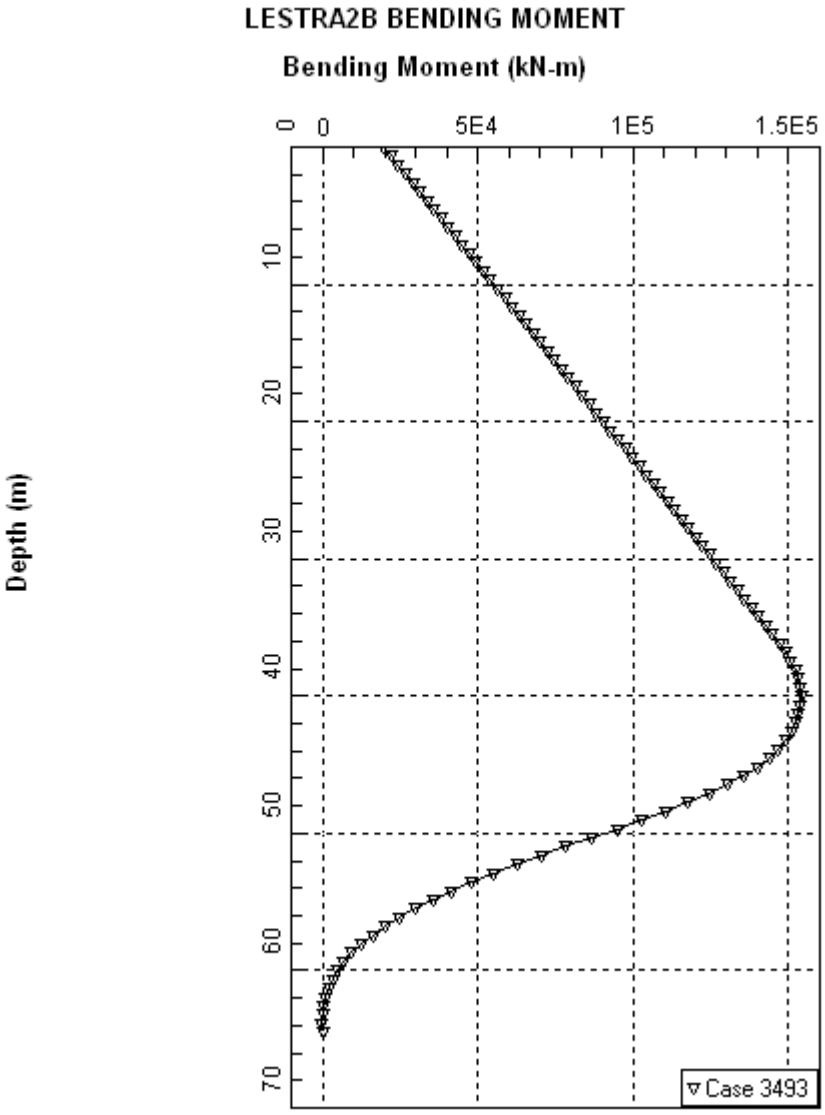

```
Pile Length                                 =      64.50 m
Depth of ground surface below top of pile =      34.50 m
Slope angle of ground surface               =        .00 deg.

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  3 layers

Layer  1 is sand, p-y criteria by API RP-2A, 1987
Distance from top of pile to top of layer    =       34.500 m
Distance from top of pile to bottom of layer =       44.500 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    =       44.500 m
Distance from top of pile to bottom of layer =       54.500 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

Layer  3 is stiff clay with water-induced erosion
Distance from top of pile to top of layer    =       54.500 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   35.50 m  below pile tip)


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

Distribution of effective unit weight of soil with depth
is defined using  6 points

Point        Depth X    Eff. Unit Weight
 No.            m           kN/ m**3
-----      ----------   ----------------
  1           34.50         7.00000
  2           44.50         7.00000
  3           44.50         9.00000
  4           54.50         9.00000
  5           54.50         9.00000
  6          100.00         9.00000



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

Distribution of shear strength parameters with depth
defined using  6 points

Point    Depth X     Cohesion c     Angle of Friction     E50 or      RQD
 No.        m          kN/ m**2            Deg.            k_rm         %
-----   --------     ----------     ------------------    ------    ------
  1       34.500         .00000           32.00           ------    ------
  2       44.500         .00000           32.00           ------    ------
  3       44.500      150.00000             .00           .00500        .0
  4       54.500      150.00000             .00           .00500        .0
  5       54.500      200.00000             .00           .00500        .0
  6      100.000      200.00000             .00           .00500        .0
```

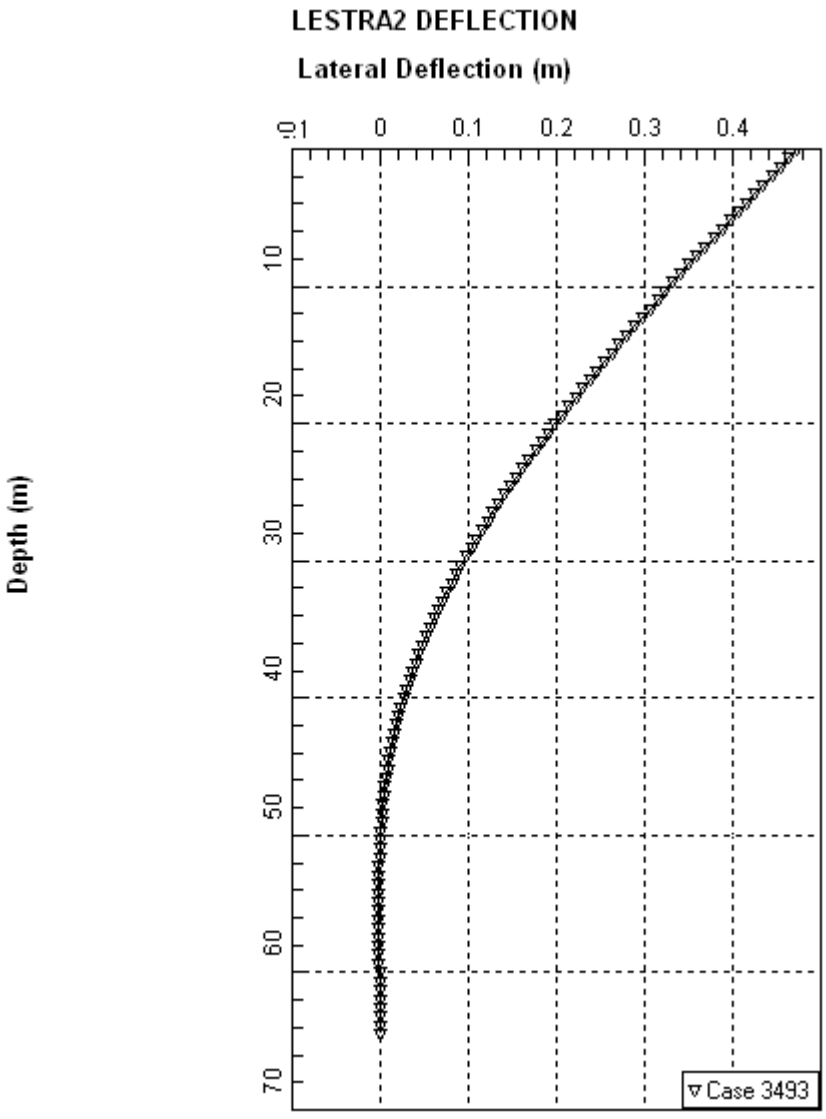
```
Notes:

(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



--------------------------------------------------------------------------------
             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    =        3493.000  kN
Bending moment at pile head =       19884.000  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    =        3493.000  kN
Specified bending moment at pile head =       19884.000  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   .473421  19884.0000   3493.0000    -.014979  28259.4181      0.0000
    .645   .463772  22161.7264   3493.0000    -.014940  31120.1989      0.0000
   1.290   .454148  24439.3856   3493.0000    -.014897  33980.8952      0.0000
   1.935   .444554  26716.9704   3493.0000    -.014850  36841.4982      0.0000
   2.580   .434991  28994.4742   3493.0000    -.014799  39701.9992      0.0000
   3.225   .425463  31271.8898   3493.0000    -.014744  42562.3897      0.0000
   3.870   .415972  33549.2104   3493.0000    -.014684  45422.6608      0.0000
   4.515   .406520  35826.4291   3493.0000    -.014621  48282.8039      0.0000
   5.160   .397111  38103.5390   3493.0000    -.014553  51142.8103      0.0000
   5.805   .387747  40380.5331   3493.0000    -.014481  54002.6713      0.0000
   6.450   .378431  42657.4045   3493.0000    -.014404  56862.3783      0.0000
   7.095   .369166  44934.1464   3493.0000    -.014324  59721.9225      0.0000
   7.740   .359953  47210.7517   3493.0000    -.014239  62581.2952      0.0000
   8.385   .350797  49487.2136   3493.0000    -.014150  65440.4878      0.0000
   9.030   .341699  51763.5252   3493.0000    -.014057  68299.4916      0.0000
   9.675   .332663  54039.6795   3493.0000    -.013960  71158.2978      0.0000
  10.320   .323690  56315.6696   3493.0000    -.013859  74016.8979      0.0000
  10.965   .314785  58591.4887   3493.0000    -.013753  76875.2830      0.0000
  11.610   .305949  60867.1298   3493.0000    -.013644  79733.4447      0.0000
  12.255   .297185  63142.5859   3493.0000    -.013530  82591.3740      0.0000
  12.900   .288495  65417.8502   3493.0000    -.013412  85449.0625      0.0000
  13.545   .279883  67692.9158   3493.0000    -.013289  88306.5013      0.0000
  14.190   .271352  69967.7758   3493.0000    -.013163  91163.6819      0.0000
  14.835   .262903  72242.4231   3493.0000    -.013032  94020.5954      0.0000
  15.480   .254540  74516.8510   3493.0000    -.012898  96877.2334      0.0000
  16.125   .246265  76791.0526   3493.0000    -.012759  99733.5870      0.0000
  16.770   .238082  79065.0208   3493.0000    -.012615   1.026E+05      0.0000
  17.415   .229991  81338.7489   3493.0000    -.012468   1.054E+05      0.0000
```

18.060	.221998	83612.2298	3493.0000	-.012317	1.083E+05	0.0000
18.705	.214103	85885.4567	3493.0000	-.012161	1.112E+05	0.0000
19.350	.206310	88158.4228	3493.0000	-.012001	1.140E+05	0.0000
19.995	.198622	90431.1210	3493.0000	-.011837	1.169E+05	0.0000
20.640	.191040	92703.5444	3493.0000	-.011669	1.197E+05	0.0000
21.285	.183569	94975.6863	3493.0000	-.011496	1.226E+05	0.0000
21.930	.176210	97247.5396	3493.0000	-.011320	1.254E+05	0.0000
22.575	.168966	99519.0974	3493.0000	-.011139	1.283E+05	0.0000
23.220	.161841	1.018E+05	3493.0000	-.010954	1.311E+05	0.0000
23.865	.154835	1.041E+05	3493.0000	-.010765	1.340E+05	0.0000
24.510	.147953	1.063E+05	3493.0000	-.010572	1.368E+05	0.0000
25.155	.141198	1.086E+05	3493.0000	-.010375	1.397E+05	0.0000
25.800	.134570	1.109E+05	3493.0000	-.010173	1.425E+05	0.0000
26.445	.128074	1.131E+05	3493.0000	-.009967	1.454E+05	0.0000
27.090	.121713	1.154E+05	3493.0000	-.009757	1.482E+05	0.0000
27.735	.115488	1.177E+05	3493.0000	-.009543	1.511E+05	0.0000
28.380	.109402	1.199E+05	3493.0000	-.009325	1.539E+05	0.0000
29.025	.103458	1.222E+05	3493.0000	-.009102	1.568E+05	0.0000
29.670	.097660	1.245E+05	3493.0000	-.008876	1.596E+05	0.0000
30.315	.092009	1.268E+05	3493.0000	-.008645	1.625E+05	0.0000
30.960	.086508	1.290E+05	3493.0000	-.008410	1.653E+05	0.0000
31.605	.081159	1.313E+05	3493.0000	-.008171	1.682E+05	0.0000
32.250	.075967	1.336E+05	3493.0000	-.007928	1.710E+05	0.0000
32.895	.070932	1.358E+05	3493.0000	-.007680	1.739E+05	0.0000
33.540	.066059	1.381E+05	3493.0000	-.007429	1.767E+05	0.0000
34.185	.061349	1.403E+05	3493.0000	-.007173	1.796E+05	0.0000
34.830	.056806	1.426E+05	3466.1838	-.006913	1.824E+05	-83.1511
35.475	.052431	1.448E+05	3358.2024	-.006649	1.852E+05	-251.6751
36.120	.048228	1.470E+05	3141.7767	-.006381	1.879E+05	-419.4121
36.765	.044199	1.489E+05	2820.3500	-.006109	1.903E+05	-577.2601
37.410	.040347	1.506E+05	2402.5914	-.005834	1.925E+05	-718.1152
38.055	.036673	1.520E+05	1901.0577	-.005556	1.942E+05	-837.0283
38.700	.033179	1.531E+05	1330.8480	-.005276	1.956E+05	-931.0636
39.345	.029867	1.538E+05	708.4031	-.004994	1.964E+05	-998.9983
39.990	.026737	1.540E+05	50.5136	-.004711	1.967E+05	-1040.9691
40.635	.023789	1.539E+05	-626.4459	-.004429	1.965E+05	-1058.1303
41.280	.021024	1.532E+05	-1307.0783	-.004147	1.957E+05	-1052.3577
41.925	.018440	1.522E+05	-1977.3510	-.003866	1.944E+05	-1026.0072
42.570	.016037	1.507E+05	-2624.8453	-.003588	1.926E+05	-981.7272
43.215	.013812	1.488E+05	-3238.8999	-.003313	1.902E+05	-922.3181
43.860	.011763	1.465E+05	-3810.6756	-.003042	1.873E+05	-850.6297
44.505	.009888	1.439E+05	-4851.8033	-.002775	1.840E+05	-2377.6733
45.150	.008183	1.403E+05	-6316.1886	-.002514	1.795E+05	-2163.0562
45.795	.006645	1.358E+05	-7642.3862	-.002260	1.738E+05	-1949.1845
46.440	.005268	1.304E+05	-8830.6814	-.002016	1.671E+05	-1735.4516
47.085	.004045	1.244E+05	-9880.7996	-.001782	1.595E+05	-1520.7290
47.730	.002969	1.177E+05	-10791.4378	-.001559	1.511E+05	-1302.9555
48.375	.002033	1.105E+05	-11559.3570	-.001350	1.420E+05	-1078.1891
49.020	.001228	1.028E+05	-12177.3033	-.001154	1.324E+05	-837.9234
49.665	5.44E-04	94753.1385	-12627.4884	-9.726E-04	1.223E+05	-557.9994
50.310	-2.68E-05	86493.8022	-12767.6779	-8.061E-04	1.119E+05	123.3030
50.955	-4.96E-04	78285.5003	-12556.2964	-6.548E-04	1.016E+05	532.1437
51.600	-8.71E-04	70298.3456	-12157.0672	-5.183E-04	91578.8713	705.7763
52.245	-.001164	62604.5979	-11666.3760	-3.962E-04	81915.6715	815.7468
52.890	-.001383	55250.0311	-11116.5887	-2.880E-04	72678.4763	889.0201
53.535	-.001536	48265.1510	-10527.7188	-1.929E-04	63905.6006	936.9332
54.180	-.001631	41669.9120	-9914.1096	-1.103E-04	55622.1066	965.7308
54.825	-.001678	35476.3145	-9181.5246	-3.945E-05	47843.0667	1305.8506
55.470	-.001682	29825.8757	-8338.6953	2.053E-05	40746.2237	1307.5736
56.115	-.001651	24719.3297	-7499.2024	7.063E-05	34332.4996	1295.5050
56.760	-.001591	20151.6710	-6671.2879	1.118E-04	28595.6078	1271.6717
57.405	-.001507	16112.9984	-5862.0423	1.452E-04	23523.1122	1237.6172
58.050	-.001404	12589.1564	-5077.6832	1.715E-04	19097.2341	1194.5039
58.695	-.001286	9562.2197	-4323.7856	1.919E-04	15295.4596	1143.1631
59.340	-.001156	7010.8384	-3605.4908	2.071E-04	12090.9735	1084.1074
59.985	-.001019	4910.4516	-2927.7214	2.180E-04	9452.9279	1017.5033
60.630	-8.75E-04	3233.3567	-2295.4292	2.255E-04	7346.5288	943.0926
61.275	-7.28E-04	1948.6021	-1713.9242	2.303E-04	5732.9015	860.0236
61.920	-5.78E-04	1021.6328	-1189.3728	2.330E-04	4568.6459	766.4925
62.565	-4.27E-04	413.5405	-729.6833	2.343E-04	3804.8936	658.9012
63.210	-2.76E-04	79.5663	-346.4475	2.348E-04	3385.4284	529.4269
63.855	-1.24E-04	-34.1533	-61.0773	2.348E-04	3328.3905	355.4421
64.500	2.70E-05	0.0000	0.0000	2.348E-04	3285.4946	-166.0552

Output Verification:

```
Computed forces and moments are within specified convergence limits.


Output Summary for Load Case No.  1:

Pile-head deflection             =      .47342123 m
Computed slope at pile head      =     -.01497881
Maximum bending moment           =      154027.03  kN- m
Maximum shear force              =      -12767.68  kN
Depth of maximum bending moment  =          39.99  m
Depth of maximum shear force     =          50.31  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=  3493.000 M= 19884.000   2564.0000       .4734   1.540E+05 -12767.6779

The analysis ended normally.
```


LESTRA2B BENDING MOMENT
Bending Moment (kN-m)
0
5E4
1E5
1.5E5
Depth (m)
0
10
20
30
40
50
60
70
Case 3493


LESTRA2 DEFLECTION
Lateral Deflection (m)
Depth (m)
-0.1
0
0.1
0.2
0.3
0.4
10
20
30
40
50
60
70
Case 3493

APPENDICE 3 - AZIONE ONDA CORRENTE E VENTO SUL PALO

```
LDOPT       NF+Z    1.03    7.85 -24.000  24.800    MN
 CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO1SAC.INP AZIONE SUL MONOPALO IN ALTI FONDALI
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 101   3 CAS
JOINT
JOINT    3      0.     0.    20.
JOINT  101      0.     0.   -24.                       111111
CDM
CDM   450.00 0.750       2.000       0.750       2.000
MGROV
MGROV     21.000  25.000   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 13.32       10.50          0.00      D   0.00 10.00  37MS10 1 3 0
END
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
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             CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI FONDALI

                                ******* 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  ....................   -24.00
M.
                                    WATER DEPTH  ..........................    24.80
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
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            CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

                                  ****** SACS IV JOINT DESCRIPTION ******

                    JOINT  ********** METERS ************ OR ********* CENTIMETERS
*********
                                *   X   * *   Y   * *   Z   *      *   X   * *   Y   * *
Z   *

                       3      0.000     0.000    20.000            0.0       0.0
2000.0
                     101      0.000     0.000   -24.000            0.0       0.0   -
2400.0
```

```
               *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
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               CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

                                    ****** SEASTATE DRAG AND INERTIA COEFFICIENTS TABLE
******

           MEMBER      *************** CLEAN CYLINDERS ***************
************** FOULED CYLINDERS ***************
          DIAMETER     * DRAG COEFFICIENTS *    * INERTIA COEFFICIENTS *    * DRAG
COEFFICIENTS *    * INERTIA COEFFICIENTS *
            (CM)         NORMAL      AXIAL          NORMAL       AXIAL          NORMAL
AXIAL          NORMAL       AXIAL

           450.00         0.7500     0.0000         2.0000      0.0000         0.7500
0.0000         2.0000      0.0000
```

```
               *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
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               CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

                                     ****** SEASTATE INITIAL GROUP DESCRIPTION ******

   GROUP SECTION ***** AREAS ***** ** DIAMETERS **  * SECTION * * MATL. * * JOINT *
FLOOD  ** DRAG AND INERTIA COEFFICIENTS **
   LABEL  LABEL   CONST.   DISPL.     Y       Z     TYPE LENGTH  DENSITY    THICK
CDY   CDZ   CMY   CMZ   CDT   CMT
                    (CM**2)          (CM)                 (TONNE/M**3)  (M.)

    CAS           6298.11 159043.1  450.00  450.00   TUB           7.849     0.000   NO
0.75  0.75  2.00  2.00  0.00  0.00
```

```
               *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
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               CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

                                          ****** SACS IV MEMBER DESCRIPTION ******

             * MEMBER *  Z-REF  GROUP   CHORD  FLOOD  --------------- MEMBER END OFFSETS
(CM) ---------------  OFFSET
                         JOINT  LABEL   ANGLE         ----- STARTING JOINT -----   -----
- ENDING JOINT ------  SYSTEM
                                                          X        Y        Z          X
Y        Z

              101-   3           CAS     0.00
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
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            CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI
                            ****** SEASTATE GLOBAL MARINE GROWTH ZONE DESCRIPTION
******

                                          MUDLINE ELEVATION =    -24.00(M)

                                        *****  M A R I N E   G R O W T H  *****
                          ZONE
                         ABOVE MUDLINE
ROUGHNESS
                         FROM       TO    THICKNESS    DENSITY       CD         CM
HEIGHT       TYPE
                              (M)           (CM)       TON/CUM
(CM)

                         21.00    25.00      5.000        1.40      0.000      0.000
0.000     CONSTANT
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
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            CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

                                      ******   SEASTATE  PARAMETERS   ******

                                          JOINTS ...................    2

                                          MEMBERS ..................    1

                                          SECTION PROPERTIES .......    0

                                          GROUPS ...................    1

                                          PLATES ...................    0

                                          PLATE GROUPS .............    0

                                          PLATE STIFFENERS .........    0

                                          BASIC LOAD CONDITIONS ....    1

                                          COMBINED LOAD CONDITIONS .    0

                                          SEASTATE VERSION  II.E.003/1000
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********             DATE
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            CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

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



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

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

                          WATER DEPTH **************   24.800 M

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

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

                          WIND VARIATION WITH HEIGHT ACCORDING TO API RULES
```

```
           ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
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           CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

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



                    MUDLINE ELEVATION ***   -24.00 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
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            CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

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



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

                          WAVE HEIGHT ************   13.320 M

                          WATER DEPTH ************   24.800 M

                          WAVE PERIOD ************   10.500 SECS

                          WAVE LENGTH ************  154.599 M

                          ANGLE FROM X TOWARD Y **    0.000 DEGREES

                          MUDLINE ELEVATION ******  -24.000 M

                          WAVE CELERITY **********   14.724 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 **************    4.294 M

                          CREST WATER DEPTH ******    33.68 M

                          TROUGH WATER DEPTH *****    20.36 M
```

********** EDI/SACS IV SEASTATE PROGRAM ********** DATE
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CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO IN ALTI

HORIZONTAL VELOCITY

THETA	120.000	130.000	140.000	150.000	160.000	170.000	180.000
SURFACE	21.460	21.156	20.916	20.710	20.532	20.404	20.356
HEIGHT	*	*	*	*	*	*	*
33.68	0.000	0.000	0.000	0.000	0.000	0.000	0.000
33.38	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32.91	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32.28	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31.48	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30.53	0.000	0.000	0.000	0.000	0.000	0.000	0.000
29.41	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28.12	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.68	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25.07	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23.29	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21.36	-2.129	0.000	0.000	0.000	0.000	0.000	0.000
19.26	-1.990	-2.234	-2.420	-2.559	-2.656	-2.714	-2.733
17.00	-1.860	-2.112	-2.308	-2.453	-2.555	-2.616	-2.636
14.57	-1.741	-2.000	-2.202	-2.354	-2.460	-2.523	-2.544
11.98	-1.636	-1.900	-2.108	-2.265	-2.374	-2.439	-2.461
9.23	-1.549	-1.815	-2.027	-2.188	-2.301	-2.368	-2.390
6.32	-1.483	-1.751	-1.965	-2.128	-2.243	-2.311	-2.334
3.24	-1.440	-1.709	-1.925	-2.090	-2.206	-2.275	-2.297
0.00	-1.424	-1.693	-1.909	-2.075	-2.192	-2.261	-2.284

********** EDI/SACS IV SEASTATE PROGRAM ********** DATE
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CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO IN ALTI

HORIZONTAL ACCELERATION

THETA	120.000	130.000	140.000	150.000	160.000	170.000	180.000
SURFACE	21.460	21.156	20.916	20.710	20.532	20.404	20.356
HEIGHT	*	*	*	*	*	*	*
33.68	0.000	0.000	0.000	0.000	0.000	0.000	0.000
33.38	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32.91	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32.28	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31.48	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30.53	0.000	0.000	0.000	0.000	0.000	0.000	0.000
29.41	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28.12	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.68	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25.07	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23.29	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21.36	0.939	0.000	0.000	0.000	0.000	0.000	0.000
19.26	0.994	0.780	0.601	0.442	0.294	0.147	0.000
17.00	1.036	0.825	0.638	0.469	0.310	0.155	0.000
14.57	1.067	0.860	0.670	0.493	0.325	0.162	0.000
11.98	1.087	0.886	0.695	0.513	0.339	0.169	0.000
9.23	1.099	0.905	0.714	0.529	0.350	0.174	0.000
6.32	1.106	0.917	0.728	0.541	0.358	0.178	0.000
3.24	1.109	0.924	0.736	0.548	0.363	0.181	0.000
0.00	1.110	0.926	0.739	0.551	0.365	0.182	0.000

```
                              ********** EDI/SACS IV SEASTATE PROGRAM **********
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               CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

                                VERTICAL VELOCITY

     THETA   120.000   130.000   140.000   150.000   160.000   170.000   180.000

   SURFACE    21.460    21.156    20.916    20.710    20.532    20.404    20.356

    HEIGHT * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     33.68     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     33.38     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     32.91     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     32.28     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     31.48     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     30.53     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     29.41     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     28.12     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     26.68     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     25.07     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     23.29     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     21.36     1.441     0.000     0.000     0.000     0.000     0.000     0.000
     19.26     1.308     1.053     0.817     0.599     0.393     0.195     0.000
     17.00     1.160     0.938     0.730     0.536     0.352     0.174     0.000
     14.57     0.998     0.810     0.632     0.464     0.305     0.151     0.000
     11.98     0.823     0.670     0.524     0.386     0.253     0.126     0.000
      9.23     0.634     0.518     0.406     0.299     0.197     0.098     0.000
      6.32     0.434     0.355     0.279     0.206     0.135     0.067     0.000
      3.24     0.222     0.182     0.143     0.106     0.070     0.035     0.000
      0.00     0.000     0.000     0.000     0.000     0.000     0.000     0.000
```

********** EDI/SACS IV SEASTATE PROGRAM ********** DATE
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CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO IN ALTI

VERTICAL ACCELERATION

THETA	120.000	130.000	140.000	150.000	160.000	170.000	180.000
SURFACE	21.460	21.156	20.916	20.710	20.532	20.404	20.356
HEIGHT	*	*	*	*	*	*	*
33.68	0.000	0.000	0.000	0.000	0.000	0.000	0.000
33.38	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32.91	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32.28	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31.48	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30.53	0.000	0.000	0.000	0.000	0.000	0.000	0.000
29.41	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28.12	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.68	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25.07	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23.29	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21.36	1.270	0.000	0.000	0.000	0.000	0.000	0.000
19.26	1.120	1.022	0.933	0.865	0.821	0.798	0.791
17.00	0.964	0.894	0.825	0.769	0.731	0.709	0.703
14.57	0.806	0.757	0.706	0.662	0.631	0.613	0.607
11.98	0.648	0.615	0.579	0.546	0.521	0.506	0.501
9.23	0.488	0.469	0.444	0.421	0.403	0.392	0.388
6.32	0.328	0.317	0.303	0.288	0.276	0.269	0.266
3.24	0.166	0.162	0.155	0.148	0.142	0.138	0.137
0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000

********** EDI/SACS IV SEASTATE PROGRAM **********
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CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO IN ALTI

***** SHEAR AND MOMENT AT MUDLINE VERSUS WAVE POSITION *****

13.3 M. WAVE AT 0.0 DEG + CURRENT + WIND

STEP NO.	CREST POSITION	SHEAR KN	SHEAR DIRECTION	MOMENT KN-M	MOMENT DIRECTION
1	0.00	1799.382	0.000	39984.290	90.000
2	4.29	919.412	0.000	20455.310	90.000
3	8.59	14.995	180.000	67.693	90.000
4	12.88	769.109	180.000	14613.330	-90.000
5	17.18	1259.430	180.000	22182.810	-90.000
6	21.47	1516.124	180.000	24522.920	-90.000
7	25.77	1599.520	180.000	23829.740	-90.000
8	30.06	1583.226	180.000	21764.650	-90.000
9	34.36	1457.070	180.000	18676.760	-90.000
10	38.65	1305.801	180.000	15670.940	-90.000
11	42.94	1097.426	180.000	12499.660	-90.000
12	47.24	926.030	180.000	10111.910	-90.000
13	51.53	777.629	180.000	8231.291	-90.000
14	55.83	648.388	180.000	6728.846	-90.000
15	60.12	532.467	180.000	5471.795	-90.000
16	64.42	423.722	180.000	4345.084	-90.000
17	68.71	317.206	180.000	3268.493	-90.000
18	73.01	210.030	180.000	2203.075	-90.000
19	77.30	100.259	180.000	1124.515	-90.000
20	81.59	13.827	0.000	7.925	-90.000
21	85.89	133.944	0.000	1174.737	90.000
22	90.18	261.760	0.000	2452.666	90.000
23	94.48	399.132	0.000	3862.347	90.000
24	98.77	549.054	0.000	5472.200	90.000
25	103.07	714.203	0.000	7368.633	90.000
26	107.36	895.367	0.000	9640.690	90.000
27	111.66	1088.921	0.000	12341.390	90.000
28	115.95	1313.979	0.000	15721.960	90.000
29	120.24	1507.722	0.000	19155.020	90.000
30	124.54	1739.394	0.000	23573.140	90.000
31	128.83	1954.632	0.000	28562.470	90.000
32	133.13	2196.055	0.000	34749.380	90.000
33	137.42	2427.759	0.000	41879.280	90.000
34	141.72	2605.132	0.000	49044.270	90.000
35	146.01	2640.008	0.000	53770.450	90.000
36	150.30	2401.503	0.000	51851.680	90.000
37	154.60	1799.372	0.000	39984.070	90.000
38	158.89	919.404	0.000	20455.120	90.000

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
09-AUG-19:7  TIME 09:49:07   SEA PAGE    21

            CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

                        ****** SEASTATE LOADS FOR WAVE PASSING THROUGH STRUCTURE
******

                                    13.3 M. WAVE AT   0.0 DEG + CURRENT + WIND

                          LOAD            CREST
MUDLINE
                        CONDITION        POSITION            LOAD
ELEVATION


                        MAXIMUM MOMENT      146.01      53770.450 KN-M         -
24.000 M.
                        ABOUT MUDLINE

                        MAXIMUM SHEAR       146.01       2640.008 KN           -
24.000 M.
                        AT MUDLINE

                        MINIMUM MOMENT       21.47     -24522.920 KN-M         -
24.000 M.
                        ABOUT MUDLINE

                        MINIMUM SHEAR        25.77      -1599.520 KN           -
24.000 M.
                        AT MUDLINE

                        MAXIMUM FORCE       158.89          0.000 KN           -
24.000 M.
                        UPWARD

                        MAXIMUM FORCE       158.89          0.000 KN           -
24.000 M.
                        DOWNWARD



            ****** LOAD CASE GENERATED FOR WAVE CREST POSITION RESULTING IN THE
MAXIMUM SHEAR  AT MUDLINE    ******
```

```
            *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
09-AUG-19:7  TIME 09:49:07   SEA PAGE    22

            CAMPO EOLICO SOTTOSTAZIONE ELETRICA FILE LO1SAC.INP AZIONE SUL MONOPALO
IN ALTI

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

                                13.3 M. WAVE AT   0.0 DEG + CURRENT + WIND

                    ****** SUMMATION OF FORCES AND MOMENTS FOR LOAD CASE    1 ******
                           (MOMENTS ABOUT MUDLINE AT ELEVATION  -24.00 M.  )

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

          MEMBER WIND          26.856         0.000         0.000         0.000
1026.985         0.000

   SEASTATE GENERATED        2681.698         0.000         0.000         0.000
54884.660         0.000
          USER INPUT           0.000         0.000         0.000         0.000
0.000         0.000
```

```
LDOPT       NF+Z    1.03    7.85 -17.000  17.800    MN
 CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO IN BASSI
FONDALI
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 101   3 CAS
JOINT
JOINT    3      0.     0.    20.
JOINT  101      0.     0.   -17.                       111111
CDM
CDM   450.00 0.750       2.000       0.750       2.000
MGROV
MGROV     14.000  18.000   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 13.32       10.50          0.00      D   0.00 10.00  37MS10 1 3 0
END
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
09-AUG-19:7  TIME 09:54:28   SEA PAGE     1

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                                ******* 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
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            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                                  ****** SACS IV JOINT DESCRIPTION ******

                  JOINT  ********** METERS ********** OR ********* CENTIMETERS
*********
                         *   X   * *   Y   * *   Z   *      *   X   * *   Y   * *
Z   *

                     3      0.000     0.000    20.000           0.0       0.0
2000.0
                   101      0.000     0.000   -17.000           0.0       0.0   -
1700.0
```

```
               *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
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               CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                                    ****** SEASTATE DRAG AND INERTIA COEFFICIENTS TABLE
******

           MEMBER      *************** CLEAN CYLINDERS ***************
************** FOULED CYLINDERS ***************
          DIAMETER     * DRAG COEFFICIENTS *    * INERTIA COEFFICIENTS *    * DRAG
COEFFICIENTS *    * INERTIA COEFFICIENTS *
            (CM)         NORMAL      AXIAL          NORMAL       AXIAL          NORMAL
AXIAL          NORMAL       AXIAL

           450.00         0.7500     0.0000         2.0000      0.0000         0.7500
0.0000         2.0000      0.0000
```

```
               *********** EDI/SACS IV SEASTATE PROGRAM ***********              DATE
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               CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                                     ****** SEASTATE INITIAL GROUP DESCRIPTION ******

   GROUP SECTION ***** AREAS ***** ** DIAMETERS **  * SECTION * * MATL. * * JOINT *
FLOOD  ** DRAG AND INERTIA COEFFICIENTS **
   LABEL  LABEL   CONST.   DISPL.     Y       Z     TYPE LENGTH  DENSITY    THICK
CDY   CDZ   CMY   CMZ   CDT   CMT
                    (CM**2)           (CM)                 (TONNE/M**3)  (M.)

    CAS           6298.11 159043.1  450.00  450.00   TUB           7.849     0.000   NO
0.75  0.75  2.00  2.00  0.00  0.00
```

```
               ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
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               CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                                          ****** SACS IV MEMBER DESCRIPTION ******

             * MEMBER *  Z-REF  GROUP   CHORD  FLOOD  --------------- MEMBER END OFFSETS
(CM) ---------------  OFFSET
                         JOINT  LABEL   ANGLE         ----- STARTING JOINT -----   -----
- ENDING JOINT ------  SYSTEM
                                                          X        Y        Z          X
Y        Z

              101-   3           CAS     0.00
```

```
               ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
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              CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS
                                ****** SEASTATE GLOBAL MARINE GROWTH ZONE DESCRIPTION
******

                                                MUDLINE ELEVATION =    -17.00(M)

                                              *****  M A R I N E   G R O W T H  *****
                                   ZONE
                                  ABOVE MUDLINE
ROUGHNESS
                                  FROM       TO    THICKNESS    DENSITY       CD         CM
HEIGHT       TYPE
                                       (M)           (CM)       TON/CUM
(CM)

                                  14.00    18.00      5.000        1.40      0.000      0.000
0.000     CONSTANT
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
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            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                                    ******   SEASTATE  PARAMETERS   ******

                                        JOINTS ...................    2

                                        MEMBERS ..................    1

                                        SECTION PROPERTIES .......    0

                                        GROUPS ...................    1

                                        PLATES ...................    0

                                        PLATE GROUPS .............    0

                                        PLATE STIFFENERS .........    0

                                        BASIC LOAD CONDITIONS ....    1

                                        COMBINED LOAD CONDITIONS .    0

                                        SEASTATE VERSION  II.E.003/1000
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
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            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                     **** 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
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            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                     **** 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
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CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO INBASS

HORIZONTAL VELOCITY

THETA	120.000	130.000	140.000	150.000	160.000	170.000	180.000
SURFACE	14.748	14.714	14.755	14.732	14.602	14.441	14.369
HEIGHT	*	*	*	*	*	*	*
27.69	0.000	0.000	0.000	0.000	0.000	0.000	0.000
27.39	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.95	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.39	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25.70	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.89	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23.94	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22.87	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21.67	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.88	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.29	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.58	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.74	-2.019	-2.168	-2.281	-2.355	-2.391	-2.404	-2.406
11.77	-1.947	-2.106	-2.226	-2.307	-2.353	-2.374	-2.380
9.67	-1.881	-2.050	-2.177	-2.264	-2.318	-2.345	-2.354
7.45	-1.823	-2.001	-2.134	-2.228	-2.288	-2.320	-2.330
5.09	-1.777	-1.963	-2.102	-2.200	-2.264	-2.300	-2.311
2.61	-1.747	-1.938	-2.080	-2.182	-2.249	-2.287	-2.299
0.00	-1.736	-1.928	-2.072	-2.175	-2.243	-2.282	-2.294

********** EDI/SACS IV SEASTATE PROGRAM ********** DATE
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CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO INBASS

HORIZONTAL ACCELERATION

THETA	120.000	130.000	140.000	150.000	160.000	170.000	180.000
SURFACE	14.748	14.714	14.755	14.732	14.602	14.441	14.369
HEIGHT	*	*	*	*	*	*	*
27.69	0.000	0.000	0.000	0.000	0.000	0.000	0.000
27.39	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.95	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.39	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25.70	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.89	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23.94	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22.87	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21.67	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.88	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.29	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.58	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.74	0.623	0.503	0.359	0.207	0.086	0.021	0.000
11.77	0.678	0.534	0.387	0.242	0.124	0.047	0.000
9.67	0.730	0.567	0.414	0.273	0.154	0.066	0.000
7.45	0.774	0.598	0.439	0.298	0.177	0.081	0.000
5.09	0.809	0.623	0.460	0.317	0.194	0.091	0.000
2.61	0.831	0.640	0.474	0.329	0.204	0.097	0.000
0.00	0.840	0.646	0.479	0.333	0.208	0.099	0.000

********** EDI/SACS IV SEASTATE PROGRAM ********** DATE
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CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO INBASS

VERTICAL VELOCITY

THETA	120.000	130.000	140.000	150.000	160.000	170.000	180.000
SURFACE	14.748	14.714	14.755	14.732	14.602	14.441	14.369
HEIGHT	*	*	*	*	*	*	*
27.69	0.000	0.000	0.000	0.000	0.000	0.000	0.000
27.39	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.95	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26.39	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25.70	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.89	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23.94	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22.87	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21.67	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.88	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.29	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.58	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.74	0.648	0.497	0.361	0.240	0.140	0.062	0.000
11.77	0.568	0.434	0.316	0.213	0.127	0.058	0.000
9.67	0.477	0.363	0.265	0.181	0.110	0.051	0.000
7.45	0.373	0.284	0.208	0.143	0.087	0.041	0.000
5.09	0.258	0.197	0.144	0.099	0.061	0.029	0.000
2.61	0.134	0.102	0.075	0.052	0.032	0.015	0.000
0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000

```
                                ********** EDI/SACS IV SEASTATE PROGRAM **********
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               CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                                VERTICAL ACCELERATION

     THETA   120.000   130.000   140.000   150.000   160.000   170.000   180.000

   SURFACE    14.748    14.714    14.755    14.732    14.602    14.441    14.369

    HEIGHT * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     27.69     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     27.39     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     26.95     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     26.39     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     25.70     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     24.89     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     23.94     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     22.87     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     21.67     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     20.34     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     18.88     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     17.29     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     15.58     0.000     0.000     0.000     0.000     0.000     0.000     0.000
     13.74     0.665     0.576     0.518     0.448     0.355     0.271     0.236
     11.77     0.592     0.504     0.443     0.381     0.309     0.247     0.223
      9.67     0.500     0.422     0.365     0.312     0.258     0.214     0.196
      7.45     0.393     0.330     0.283     0.241     0.201     0.171     0.159
      5.09     0.272     0.228     0.194     0.165     0.139     0.120     0.113
      2.61     0.141     0.118     0.100     0.085     0.072     0.062     0.059
      0.00     0.000     0.000     0.000     0.000     0.000     0.000     0.000
```

********** EDI/SACS IV SEASTATE PROGRAM **********
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CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO INBASS

***** SHEAR AND MOMENT AT MUDLINE VERSUS WAVE POSITION *****

13.3 M. WAVE AT 0.0 DEG + CURRENT + WIND

STEP NO.	CREST POSITION	SHEAR KN	SHEAR DIRECTION	MOMENT KN-M	MOMENT DIRECTION
1	0.00	2498.721	0.000	46282.150	90.000
2	4.26	997.701	0.000	17883.670	90.000
3	8.51	410.282	180.000	6855.221	-90.000
4	12.77	1195.785	180.000	16973.110	-90.000
5	17.03	1475.516	180.000	17840.510	-90.000
6	21.29	1525.110	180.000	16058.350	-90.000
7	25.54	1419.203	180.000	13557.600	-90.000
8	29.80	1229.656	180.000	10877.200	-90.000
9	34.06	998.344	180.000	8223.288	-90.000
10	38.31	772.810	180.000	5941.592	-90.000
11	42.57	598.995	180.000	4367.694	-90.000
12	46.83	477.164	180.000	3383.291	-90.000
13	51.08	380.323	180.000	2689.719	-90.000
14	55.34	315.814	180.000	2256.471	-90.000
15	59.60	250.201	180.000	1791.904	-90.000
16	63.86	183.510	180.000	1289.521	-90.000
17	68.11	126.550	180.000	861.828	-90.000
18	72.37	86.950	180.000	592.112	-90.000
19	76.63	60.398	180.000	445.272	-90.000
20	80.88	33.481	180.000	302.563	-90.000
21	85.14	8.306	0.000	32.578	-90.000
22	89.40	71.736	0.000	428.685	90.000
23	93.66	150.794	0.000	1017.365	90.000
24	97.91	233.786	0.000	1610.842	90.000
25	102.17	318.104	0.000	2187.844	90.000
26	106.43	439.267	0.000	3052.969	90.000
27	110.68	579.836	0.000	4174.452	90.000
28	114.94	767.215	0.000	5868.441	90.000
29	119.20	1004.268	0.000	8244.989	90.000
30	123.46	1273.720	0.000	11158.100	90.000
31	127.71	1569.473	0.000	14736.180	90.000
32	131.97	1901.517	0.000	19517.250	90.000
33	136.23	2278.222	0.000	26566.540	90.000
34	140.48	2765.450	0.000	37512.590	90.000
35	144.74	3230.857	0.000	50945.510	90.000
36	149.00	3285.237	0.000	57983.070	90.000
37	153.25	2498.725	0.000	46282.220	90.000
38	157.51	997.706	0.000	17883.770	90.000

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
09-AUG-19:7  TIME 09:54:28   SEA PAGE    21

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

                        ****** SEASTATE LOADS FOR WAVE PASSING THROUGH STRUCTURE
******

                                    13.3 M. WAVE AT   0.0 DEG + CURRENT + WIND

                          LOAD            CREST
MUDLINE
                         CONDITION        POSITION            LOAD
ELEVATION


                        MAXIMUM MOMENT      149.00      57983.070 KN-M        -
17.000 M.
                        ABOUT MUDLINE

                        MAXIMUM SHEAR       149.00       3285.237 KN          -
17.000 M.
                        AT MUDLINE

                        MINIMUM MOMENT       17.03     -17840.510 KN-M        -
17.000 M.
                        ABOUT MUDLINE

                        MINIMUM SHEAR        21.29      -1525.110 KN          -
17.000 M.
                        AT MUDLINE

                        MAXIMUM FORCE       157.51          0.000 KN          -
17.000 M.
                        UPWARD

                        MAXIMUM FORCE       157.51          0.000 KN          -
17.000 M.
                        DOWNWARD




            ****** LOAD CASE GENERATED FOR WAVE CREST POSITION RESULTING IN THE
MAXIMUM SHEAR  AT MUDLINE    ******
```

```
            ********** EDI/SACS IV SEASTATE PROGRAM **********              DATE
09-AUG-19:7  TIME 09:54:28   SEA PAGE    22

            CAMPO EOLICO SOTTOSTAZIONE ELETTRICA FILE LO2SAC.INP AZIONE SUL MONOPALO
INBASS

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

                                13.3 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          23.154         0.000         0.000         0.000
742.857         0.000

   SEASTATE GENERATED        3278.361         0.000         0.000         0.000
57879.260         0.000
          USER INPUT           0.000         0.000         0.000         0.000
0.000         0.000
```

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

    88827.    88827.    88827.    88827.               1450.     1450.     1450.     1450.

              PILE SECTIONS                *    TIP WEIGHT  *    EMBEDD.  LENGTH           PILE MODULUS
   7804.00   7804.00   7804.00   7804.00               2002.               2430.            2100000.


4TH SET OF DATA
         CRL= 2770.0000
         CRP=  642.0000


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

LATERAL RESISTANCE  RL(TON)=  277.000
POINT RESISTANCE    RP(TON)=   64.200
TOTAL RESISTANCE    RU(TON)=  341.200
RP/RU RATIO                 =     .188

COMPUTATION STOPPED AT ITERATION NUMBER  1500

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

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

END OF 1ST STAGE   F( 6)           -346.60             193.25
END OF 2ND STAGE   F(11)           -350.70             268.42
END OF 3RD STAGE   F(16)           -326.18             243.64
AT THE PILE TIP    F(21)            -95.76              50.91

MAXIMUN DISPLACEMENT   DPR(22) IS      2.72186
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .3674
```

```
          PRINT OF INPUT DATA COMPUTATION N.  2

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


4TH SET OF DATA
         CRL= 5540.0000
         CRP= 1284.0000


LATERAL RESISTANCE  RL(TON)=  554.000
POINT RESISTANCE    RP(TON)=  128.400
TOTAL RESISTANCE    RU(TON)=  682.400
RP/RU RATIO                 =     .188

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

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

END OF 1ST STAGE   F( 6)            -346.60             146.34
END OF 2ND STAGE   F(11)            -354.54             198.83
END OF 3RD STAGE   F(16)            -328.61             184.21
AT THE PILE TIP    F(21)             -94.11              40.03


MAXIMUN DISPLACEMENT   DPR(22) IS      1.45633
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .6867



          PRINT OF INPUT DATA COMPUTATION N.  3

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


4TH SET OF DATA
         CRL= 8310.0000
         CRP= 1926.0000


LATERAL RESISTANCE  RL(TON)=  831.000
POINT RESISTANCE    RP(TON)=  192.600
TOTAL RESISTANCE    RU(TON)= 1023.600
RP/RU RATIO                 =     .188

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

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

END OF 1ST STAGE   F( 6)            -346.60             113.19
END OF 2ND STAGE   F(11)            -358.57             152.31
END OF 3RD STAGE   F(16)            -330.95             133.40
AT THE PILE TIP    F(21)             -96.41              32.64


MAXIMUN DISPLACEMENT   DPR(22) IS       .92655
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.0793
```

```
          PRINT OF INPUT DATA COMPUTATION N.  4

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


4TH SET OF DATA
         CRL=11080.0000
         CRP= 2568.0000


LATERAL RESISTANCE  RL(TON)= 1108.000
POINT RESISTANCE    RP(TON)=  256.800
TOTAL RESISTANCE    RU(TON)= 1364.800
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -346.60              71.39
END OF 2ND STAGE   F(11)           -362.81              91.30
END OF 3RD STAGE   F(16)           -333.21              89.72
AT THE PILE TIP    F(21)           -111.75              25.13


MAXIMUN DISPLACEMENT   DPR(22) IS       .76376
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.3093



          PRINT OF INPUT DATA COMPUTATION N.  5

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


4TH SET OF DATA
         CRL=13850.0000
         CRP= 3210.0000


LATERAL RESISTANCE  RL(TON)= 1385.000
POINT RESISTANCE    RP(TON)=  321.000
TOTAL RESISTANCE    RU(TON)= 1706.000
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -346.60              41.53
END OF 2ND STAGE   F(11)           -367.39              43.73
END OF 3RD STAGE   F(16)           -335.33              52.19
AT THE PILE TIP    F(21)           -123.39               8.92


MAXIMUN DISPLACEMENT   DPR(22) IS       .62255
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.6063
```

```
          PRINT OF INPUT DATA COMPUTATION N.  6

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


4TH SET OF DATA
         CRL=16620.0000
         CRP= 3852.0000


LATERAL RESISTANCE  RL(TON)= 1662.000
POINT RESISTANCE    RP(TON)=  385.200
TOTAL RESISTANCE    RU(TON)= 2047.200
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -346.60              15.42
END OF 2ND STAGE   F(11)           -373.66                .00
END OF 3RD STAGE   F(16)           -337.34              20.86
AT THE PILE TIP    F(21)           -131.79                .00


MAXIMUN DISPLACEMENT   DPR(22) IS       .49949
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.0020



          PRINT OF INPUT DATA COMPUTATION N.  7

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


4TH SET OF DATA
         CRL=19390.0000
         CRP= 4494.0000


LATERAL RESISTANCE  RL(TON)= 1939.000
POINT RESISTANCE    RP(TON)=  449.400
TOTAL RESISTANCE    RU(TON)= 2388.400
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -346.60                .00
END OF 2ND STAGE   F(11)           -380.69                .00
END OF 3RD STAGE   F(16)           -339.18                .00
AT THE PILE TIP    F(21)           -137.40                .00


MAXIMUN DISPLACEMENT   DPR(22) IS       .39189
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.5517
```

```
          PRINT OF INPUT DATA COMPUTATION N.  8

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


4TH SET OF DATA
         CRL=22160.0000
         CRP= 5136.0000


LATERAL RESISTANCE  RL(TON)= 2216.000
POINT RESISTANCE    RP(TON)=  513.600
TOTAL RESISTANCE    RU(TON)= 2729.600
RP/RU RATIO                =     .188


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

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

END OF 1ST STAGE   F( 6)           -346.60                .00
END OF 2ND STAGE   F(11)           -387.86                .00
END OF 3RD STAGE   F(16)           -340.88                .00
AT THE PILE TIP    F(21)           -140.57                .00


MAXIMUN DISPLACEMENT   DPR(22) IS       .29773
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   3.3588
```

```
          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

    88827.    88827.    88827.    88827.               1450.     1450.     1450.     1450.

              PILE SECTIONS                 *    TIP WEIGHT  *    EMBEDD.  LENGTH           PILE MODULUS
   7804.00   7804.00   7804.00   7804.00               2002.               2430.            2100000.


4TH SET OF DATA
         CRL= 2770.0000
         CRP=  642.0000


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


LATERAL RESISTANCE  RL(TON)=  277.000
POINT RESISTANCE    RP(TON)=   64.200
TOTAL RESISTANCE    RU(TON)=  341.200
RP/RU RATIO                 =     .188


COMPUTATION STOPPED AT ITERATION NUMBER  1500

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

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

END OF 1ST STAGE   F( 6)           -470.11             336.92
END OF 2ND STAGE   F(11)           -466.87             373.15
END OF 3RD STAGE   F(16)           -469.46             395.74
AT THE PILE TIP    F(21)           -176.80             101.80


MAXIMUN DISPLACEMENT   DPR(22) IS      2.74236
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .3646
```

```
          PRINT OF INPUT DATA COMPUTATION N.  2

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


4TH SET OF DATA
         CRL= 5540.0000
         CRP= 1284.0000


LATERAL RESISTANCE  RL(TON)=  554.000
POINT RESISTANCE    RP(TON)=  128.400
TOTAL RESISTANCE    RU(TON)=  682.400
RP/RU RATIO                 =     .188

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

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

END OF 1ST STAGE   F( 6)            -470.11              269.86
END OF 2ND STAGE   F(11)            -467.86              287.40
END OF 3RD STAGE   F(16)            -470.38              319.62
AT THE PILE TIP    F(21)            -173.72               82.13


MAXIMUN DISPLACEMENT   DPR(22) IS      1.55363
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .6437



          PRINT OF INPUT DATA COMPUTATION N.  3

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


4TH SET OF DATA
         CRL= 8310.0000
         CRP= 1926.0000


LATERAL RESISTANCE  RL(TON)=  831.000
POINT RESISTANCE    RP(TON)=  192.600
TOTAL RESISTANCE    RU(TON)= 1023.600
RP/RU RATIO                 =     .188

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

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

END OF 1ST STAGE   F( 6)            -470.11              212.49
END OF 2ND STAGE   F(11)            -468.90              215.11
END OF 3RD STAGE   F(16)            -471.38              252.80
AT THE PILE TIP    F(21)            -170.66               67.59


MAXIMUN DISPLACEMENT   DPR(22) IS      1.05271
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .9499
```

```
          PRINT OF INPUT DATA COMPUTATION N.  4

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


4TH SET OF DATA
         CRL=11080.0000
         CRP= 2568.0000


LATERAL RESISTANCE  RL(TON)= 1108.000
POINT RESISTANCE    RP(TON)=  256.800
TOTAL RESISTANCE    RU(TON)= 1364.800
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -470.11             162.94
END OF 2ND STAGE   F(11)           -469.99             192.45
END OF 3RD STAGE   F(16)           -472.40             238.14
AT THE PILE TIP    F(21)           -167.61              57.37


MAXIMUN DISPLACEMENT   DPR(22) IS       .82471
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.2125



          PRINT OF INPUT DATA COMPUTATION N.  5

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


4TH SET OF DATA
         CRL=13850.0000
         CRP= 3210.0000


LATERAL RESISTANCE  RL(TON)= 1385.000
POINT RESISTANCE    RP(TON)=  321.000
TOTAL RESISTANCE    RU(TON)= 1706.000
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -470.11             120.77
END OF 2ND STAGE   F(11)           -471.14              97.34
END OF 3RD STAGE   F(16)           -473.45             142.14
AT THE PILE TIP    F(21)           -166.99              50.51


MAXIMUN DISPLACEMENT   DPR(22) IS       .70374
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.4210
```

```
          PRINT OF INPUT DATA COMPUTATION N.  6

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


4TH SET OF DATA
         CRL=16620.0000
         CRP= 3852.0000


LATERAL RESISTANCE  RL(TON)= 1662.000
POINT RESISTANCE    RP(TON)=  385.200
TOTAL RESISTANCE    RU(TON)= 2047.200
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -470.11              85.23
END OF 2ND STAGE   F(11)           -472.34              48.45
END OF 3RD STAGE   F(16)           -474.55              96.79
AT THE PILE TIP    F(21)           -177.31              44.52


MAXIMUN DISPLACEMENT   DPR(22) IS       .59669
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.6759



          PRINT OF INPUT DATA COMPUTATION N.  7

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


4TH SET OF DATA
         CRL=19390.0000
         CRP= 4494.0000


LATERAL RESISTANCE  RL(TON)= 1939.000
POINT RESISTANCE    RP(TON)=  449.400
TOTAL RESISTANCE    RU(TON)= 2388.400
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -470.11                .00
END OF 2ND STAGE   F(11)           -473.59                .00
END OF 3RD STAGE   F(16)           -475.65              58.34
AT THE PILE TIP    F(21)           -184.65              29.35


MAXIMUN DISPLACEMENT   DPR(22) IS       .50156
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.9938
```

```
          PRINT OF INPUT DATA COMPUTATION N.  8

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


4TH SET OF DATA
         CRL=22160.0000
         CRP= 5136.0000


LATERAL RESISTANCE  RL(TON)= 2216.000
POINT RESISTANCE    RP(TON)=  513.600
TOTAL RESISTANCE    RU(TON)= 2729.600
RP/RU RATIO                =     .188


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

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

END OF 1ST STAGE   F( 6)           -470.11                .00
END OF 2ND STAGE   F(11)           -474.89                .00
END OF 3RD STAGE   F(16)           -476.78              21.13
AT THE PILE TIP    F(21)           -189.41              14.30


MAXIMUN DISPLACEMENT   DPR(22) IS       .41675
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.3995
```

```
          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

    88827.    88827.    88827.    88827.               1450.     1450.     1450.     1450.

              PILE SECTIONS                 *    TIP WEIGHT  *    EMBEDD.  LENGTH           PILE MODULUS
   7804.00   7804.00   7804.00   7804.00               2002.               2430.            2100000.


4TH SET OF DATA
         CRL= 2770.0000
         CRP=  642.0000

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


LATERAL RESISTANCE  RL(TON)=  277.000
POINT RESISTANCE    RP(TON)=   64.200
TOTAL RESISTANCE    RU(TON)=  341.200
RP/RU RATIO                 =     .188


COMPUTATION STOPPED AT ITERATION NUMBER  1500

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

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

END OF 1ST STAGE   F( 6)           -685.92              602.35
END OF 2ND STAGE   F(11)           -672.47              589.29
END OF 3RD STAGE   F(16)           -683.75              592.92
AT THE PILE TIP    F(21)           -358.16              233.43


MAXIMUN DISPLACEMENT   DPR(22) IS      2.63199
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .3799
```

```
          PRINT OF INPUT DATA COMPUTATION N.  2

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


4TH SET OF DATA
         CRL= 5540.0000
         CRP= 1284.0000


LATERAL RESISTANCE  RL(TON)=  554.000
POINT RESISTANCE    RP(TON)=  128.400
TOTAL RESISTANCE    RU(TON)=  682.400
RP/RU RATIO                 =     .188

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

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

END OF 1ST STAGE   F( 6)           -685.92             511.86
END OF 2ND STAGE   F(11)           -672.48             475.81
END OF 3RD STAGE   F(16)           -678.49             524.63
AT THE PILE TIP    F(21)           -351.50             194.21


MAXIMUN DISPLACEMENT   DPR(22) IS      1.55869
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .6416



          PRINT OF INPUT DATA COMPUTATION N.  3

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


4TH SET OF DATA
         CRL= 8310.0000
         CRP= 1926.0000


LATERAL RESISTANCE  RL(TON)=  831.000
POINT RESISTANCE    RP(TON)=  192.600
TOTAL RESISTANCE    RU(TON)= 1023.600
RP/RU RATIO                 =     .188

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

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

END OF 1ST STAGE   F( 6)           -685.92             427.09
END OF 2ND STAGE   F(11)           -672.50             376.29
END OF 3RD STAGE   F(16)           -673.43             431.61
AT THE PILE TIP    F(21)           -344.82             162.46


MAXIMUN DISPLACEMENT   DPR(22) IS      1.13098
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .8842
```

```
          PRINT OF INPUT DATA COMPUTATION N.  4

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


4TH SET OF DATA
         CRL=11080.0000
         CRP= 2568.0000


LATERAL RESISTANCE  RL(TON)= 1108.000
POINT RESISTANCE    RP(TON)=  256.800
TOTAL RESISTANCE    RU(TON)= 1364.800
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -685.92             352.72
END OF 2ND STAGE   F(11)           -672.50             376.85
END OF 3RD STAGE   F(16)           -668.45             455.46
AT THE PILE TIP    F(21)           -338.14             162.62


MAXIMUN DISPLACEMENT   DPR(22) IS       .84314
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.1860



          PRINT OF INPUT DATA COMPUTATION N.  5

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


4TH SET OF DATA
         CRL=13850.0000
         CRP= 3210.0000


LATERAL RESISTANCE  RL(TON)= 1385.000
POINT RESISTANCE    RP(TON)=  321.000
TOTAL RESISTANCE    RU(TON)= 1706.000
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -685.92             299.35
END OF 2ND STAGE   F(11)           -672.52             311.99
END OF 3RD STAGE   F(16)           -663.65             448.12
AT THE PILE TIP    F(21)           -331.47             140.54


MAXIMUN DISPLACEMENT   DPR(22) IS       .73552
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.3596
```

```
          PRINT OF INPUT DATA COMPUTATION N.  6

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


4TH SET OF DATA
         CRL=16620.0000
         CRP= 3852.0000


LATERAL RESISTANCE  RL(TON)= 1662.000
POINT RESISTANCE    RP(TON)=  385.200
TOTAL RESISTANCE    RU(TON)= 2047.200
RP/RU RATIO                =     .188


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

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

END OF 1ST STAGE   F( 6)           -685.92             234.35
END OF 2ND STAGE   F(11)           -672.53             145.23
END OF 3RD STAGE   F(16)           -659.15             198.76
AT THE PILE TIP    F(21)           -324.84             111.53


MAXIMUN DISPLACEMENT   DPR(22) IS       .64742
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.5446



          PRINT OF INPUT DATA COMPUTATION N.  7

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


4TH SET OF DATA
         CRL=19390.0000
         CRP= 4494.0000


LATERAL RESISTANCE  RL(TON)= 1939.000
POINT RESISTANCE    RP(TON)=  449.400
TOTAL RESISTANCE    RU(TON)= 2388.400
RP/RU RATIO                =     .188


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

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

END OF 1ST STAGE   F( 6)           -685.92             183.86
END OF 2ND STAGE   F(11)           -672.54              90.30
END OF 3RD STAGE   F(16)           -655.38             158.25
AT THE PILE TIP    F(21)           -318.25             105.67


MAXIMUN DISPLACEMENT   DPR(22) IS       .56813
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.7602
```

```
          PRINT OF INPUT DATA COMPUTATION N.  8

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


4TH SET OF DATA
         CRL=22160.0000
         CRP= 5136.0000


LATERAL RESISTANCE  RL(TON)= 2216.000
POINT RESISTANCE    RP(TON)=  513.600
TOTAL RESISTANCE    RU(TON)= 2729.600
RP/RU RATIO                =     .188


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

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

END OF 1ST STAGE   F( 6)           -685.92              75.35
END OF 2ND STAGE   F(11)           -672.55              44.42
END OF 3RD STAGE   F(16)           -652.89             125.01
AT THE PILE TIP    F(21)           -311.72             100.39


MAXIMUN DISPLACEMENT   DPR(22) IS       .49653
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   2.0140
```

```
          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

    88827.    88827.    88827.    88827.               1450.     1450.     1450.     1450.

              PILE SECTIONS                *    TIP WEIGHT  *    EMBEDD.  LENGTH           PILE MODULUS
   7804.00   7804.00   7804.00   7804.00              2002.              2430.            2100000.


4TH SET OF DATA
         CRL= 2770.0000
         CRP=  642.0000


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


LATERAL RESISTANCE  RL(TON)=  277.000
POINT RESISTANCE    RP(TON)=   64.200
TOTAL RESISTANCE    RU(TON)=  341.200
RP/RU RATIO                 =     .188


COMPUTATION STOPPED AT ITERATION NUMBER  1500

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

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

END OF 1ST STAGE   F( 6)           -926.13              812.99
END OF 2ND STAGE   F(11)           -954.88              806.70
END OF 3RD STAGE   F(16)           -957.62              823.92
AT THE PILE TIP    F(21)           -538.79              477.02


MAXIMUN DISPLACEMENT   DPR(22) IS      2.48083
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .4031
```

```
          PRINT OF INPUT DATA COMPUTATION N.  2

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


4TH SET OF DATA
         CRL= 5540.0000
         CRP= 1284.0000


LATERAL RESISTANCE  RL(TON)=  554.000
POINT RESISTANCE    RP(TON)=  128.400
TOTAL RESISTANCE    RU(TON)=  682.400
RP/RU RATIO                 =     .188

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

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

END OF 1ST STAGE   F( 6)           -926.13              683.19
END OF 2ND STAGE   F(11)           -954.88              671.07
END OF 3RD STAGE   F(16)           -950.33              701.27
AT THE PILE TIP    F(21)           -528.61              392.46


MAXIMUN DISPLACEMENT   DPR(22) IS      1.50466
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .6646



          PRINT OF INPUT DATA COMPUTATION N.  3

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


4TH SET OF DATA
         CRL= 8310.0000
         CRP= 1926.0000


LATERAL RESISTANCE  RL(TON)=  831.000
POINT RESISTANCE    RP(TON)=  192.600
TOTAL RESISTANCE    RU(TON)= 1023.600
RP/RU RATIO                 =     .188

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

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

END OF 1ST STAGE   F( 6)           -926.13              587.84
END OF 2ND STAGE   F(11)           -954.88              551.66
END OF 3RD STAGE   F(16)           -943.09              592.15
AT THE PILE TIP    F(21)           -518.60              332.97


MAXIMUN DISPLACEMENT   DPR(22) IS      1.11380
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=    .8978
```

```
          PRINT OF INPUT DATA COMPUTATION N.  4

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


4TH SET OF DATA
         CRL=11080.0000
         CRP= 2568.0000


LATERAL RESISTANCE  RL(TON)= 1108.000
POINT RESISTANCE    RP(TON)=  256.800
TOTAL RESISTANCE    RU(TON)= 1364.800
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -926.13              503.35
END OF 2ND STAGE   F(11)           -954.88              479.09
END OF 3RD STAGE   F(16)           -935.88              495.10
AT THE PILE TIP    F(21)           -508.36              313.40


MAXIMUN DISPLACEMENT   DPR(22) IS       .85037
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.1760



          PRINT OF INPUT DATA COMPUTATION N.  5

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


4TH SET OF DATA
         CRL=13850.0000
         CRP= 3210.0000


LATERAL RESISTANCE  RL(TON)= 1385.000
POINT RESISTANCE    RP(TON)=  321.000
TOTAL RESISTANCE    RU(TON)= 1706.000
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -926.13              426.01
END OF 2ND STAGE   F(11)           -954.88              463.52
END OF 3RD STAGE   F(16)           -928.71              408.81
AT THE PILE TIP    F(21)           -497.98              273.56


MAXIMUN DISPLACEMENT   DPR(22) IS       .70865
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.4111
```

```
          PRINT OF INPUT DATA COMPUTATION N.  6

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


4TH SET OF DATA
         CRL=16620.0000
         CRP= 3852.0000


LATERAL RESISTANCE  RL(TON)= 1662.000
POINT RESISTANCE    RP(TON)=  385.200
TOTAL RESISTANCE    RU(TON)= 2047.200
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -926.13             361.45
END OF 2ND STAGE   F(11)           -954.88             403.13
END OF 3RD STAGE   F(16)           -921.56             350.79
AT THE PILE TIP    F(21)           -487.51             245.55


MAXIMUN DISPLACEMENT   DPR(22) IS       .63301
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.5797



          PRINT OF INPUT DATA COMPUTATION N.  7

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


4TH SET OF DATA
         CRL=19390.0000
         CRP= 4494.0000


LATERAL RESISTANCE  RL(TON)= 1939.000
POINT RESISTANCE    RP(TON)=  449.400
TOTAL RESISTANCE    RU(TON)= 2388.400
RP/RU RATIO                =     .188

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

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

END OF 1ST STAGE   F( 6)           -926.13             385.68
END OF 2ND STAGE   F(11)           -954.88             460.84
END OF 3RD STAGE   F(16)           -914.65             375.95
AT THE PILE TIP    F(21)           -477.02             242.13


MAXIMUN DISPLACEMENT   DPR(22) IS       .56458
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.7712
```

```
          PRINT OF INPUT DATA COMPUTATION N.  8

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


4TH SET OF DATA
         CRL=22160.0000
         CRP= 5136.0000


LATERAL RESISTANCE  RL(TON)= 2216.000
POINT RESISTANCE    RP(TON)=  513.600
TOTAL RESISTANCE    RU(TON)= 2729.600
RP/RU RATIO                =     .188


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

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

END OF 1ST STAGE   F( 6)           -926.13             261.97
END OF 2ND STAGE   F(11)           -954.89             145.29
END OF 3RD STAGE   F(16)           -907.77             194.99
AT THE PILE TIP    F(21)           -466.56             166.49


MAXIMUN DISPLACEMENT   DPR(22) IS       .50252
BLOWCOUNT  - (BLOWS/CENTIMETER)  N=   1.9900
```