# SPRING 2006 - ENSOFT SHORT COURSE

## Design of Deep Foundations: Drilled Shafts and Piles Under Lateral and Axial Loading

*A Seminar and Workshop Featuring Computer Programs from Ensoft, Inc.*

**March 15-17, 2006**

## LOCATION & RESERVATIONS

**Ensoft, Inc. – Office Building**
3003 West Howard Lane, Austin, Texas 78728
Tel. (512) 244-6464, Fax (512) 244-6067

**Hotel Information:**

***LaQuinta Suites***, Tel. (512) 832-2121
11901 N. MoPac Hwy., Austin, TX 78729

***Hampton Inn (Northwest)***, Tel. (512) 349-9898
3908 W. Braker Lane, Austin, TX 78759

***Courtyard by Marriott***, Tel. (512) 502-8100
9409 Stonelake Blvd., Austin, TX 78759

*(These hotels are within 5-15 minutes driving distance from the training facility)*

## REGISTRATION & FEES

***Single Registration****

Early Rate (by February 17, 2006)..... $695
Standard Rate ..... $795

***Multiple Registrations****
***(valid only for attendees from the same organization)***

Early Rate/Person (by February 17, 2006)..... $595
Standard Rate/Person ..... $695

**Includes a bound manual of material on discussed topics and refreshments.*

*TOTAL*..... *$*_____

*Name(s):* _____

_____

*Company:* _____

*Address:* _____

*City/ST/Zip:* _____

*Phone:* _____ *Fax:* _____

*E-mail:* _____

*Please select your method of payment:*

☐ *Check enclosed* ☐ *Credit card*

*Name on card:* _____

*Number:* _____ *Exp.:* _____

**Send by Fax to (512) 244-6067 or register online**

**www.ensoftinc.com**

## SPEAKERS

**Lymon C. Reese, Ph.D., P.E.**
*Honorary Member, ASCE; Principal, Ensoft, Inc., Professor Emeritus, The University of Texas at Austin*. Dr. Reese has over 40 years of experience in research on pile foundations and continues his active involvement in research and design. He has pioneered performing field studies of instrumented piles at The University of Texas at Austin and the University of California at Berkeley. Analytical methods developed by Dr. Reese are now widely used in the design of major structures. He has been a member of the National Academy of Engineering for over 25 years. Author of over 150 technical papers and reports, he has presented invited lectures in the United States and abroad. He has also co-authored three design manuals published by the US Federal Highway Administration, including *"Design and Analysis of Piles and Pile Groups Under Lateral Loads"* and *"Drilled Shafts: Construction Procedures and Design Methods,"*

**William M. Isenhower, Ph.D., P.E.**
*Project Manager, Ensoft, Inc*. Dr. Isenhower is a registered professional engineering in the State of Texas, with over 25 years of experience in civil engineering, with an emphasis on geotechnical engineering. His experience has been in consulting, government service, university teaching, and contract research. He has been engaged in consulting projects, site investigations, foundation analysis and design, slope stability analysis and design, and retaining structure analysis and design. Dr. Isenhower has served as an Expert on Mission for the United Nations Development Program and has served as a consultant to the US Army Corps of Engineers. He has authored over 30 technical papers and reports, and has presented invited lectures in the United States and abroad. Dr. Isenhower is currently an instructor of the National Highway Institute short course *"Drilled Shafts."*

**Shin-Tower Wang, Ph.D., P.E.**
*President, Ensoft, Inc.* Dr. Wang is a registered professional engineering in the State of Texas, with over 25 years of experience in civil engineering, with an emphasis on geotechnical and structural engineering. He has engaged in numerous consulting projects in soil structure interaction analyses, pile loading tests, deep foundation designs, and numerical analyses. Dr. Wang received M.S. and Ph.D. degrees from The University of Texas at Austin. He has published over 30 technical papers and reports, and has co-authored several computer programs that are currently sold by Ensoft, Inc.

**José A. Arréllaga, M.S.**
*Technical Support Manager, Ensoft, Inc.* José Arréllaga has a strong academic and practical background in the field of structural engineering. He has organized and directly participated in a variety of large consulting projects requiring a combination of earthquake, forensic, structural, and geotechnical engineering concepts. At Ensoft, Mr. Arréllaga has been in charge of technical support, Internet updates, and programming. His consulting practice involves projects where applications of structural theories are needed along with geotechnical engineering concepts.

## SPECIAL OFFER

Software products developed by ENSOFT, INC. may be purchased by course attendees at a 20% discount within one month of the Short Course.

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### Wednesday March 15, 2006

| Time | Subject | Description | Speakers |
|---|---|---|---|
| 8:00 | Arrival at Ensoft Office Building | Participants having personal laptop computers are asked to arrive early to install software, broadband, and network connections | Arréllaga |
| 8:30 | Start of instruction, course introduction | Information about workshop, introduction of attendees introduction of speakers, description of facilities, coffee breaks | Isenhower |
| 8.45 | Soil-Structure Interaction | Modern principles of design of foundations, kinds of loading | Reese |
| 9:30 | Description of models to be employed in analyses | Analysis of piles under lateral loading | Isenhower |
| *10:30* | *Coffee Break* | | |
| 10:15 | Introduction to single pile under lateral loading | Differential equation, solution for case of constant soil modulus for "long" pile, values of subgrade modulus given by Terzaghi used in "early days," solution by use of difference equations | Reese and Wang |
| 11:15 | Software Training | LPILE Plus for Windows, detailed overview of commands, modeling procedures, interpretation of output from analyses | Isenhower |
| *12:00* | *Lunch* | | |
| 1:00 | Load testing of piles under lateral load | ASTM procedures, results of typical tests | Isenhower |
| 1:30 | Load testing of instrumented piles | Examples of instrumentation, results of testing, *p-y* curves for static loading, cyclic loading | Reese and Arréllaga |
| 2:00 | Theoretical basis of *p-y* curves and their validation | Early part of *p-y* curves, values of $p_{ult}$, comparison of results from variety of tests with results from computer analyses, case studies | Reese and Wang |
| *2:45* | *Coffee Break* | | |
| 3:00 | *p-y* curves in LPILE | Soft clay, stiff clay, sands, weak rock, strong rock, layering, sloping ground surface | Isenhower |
| 4:00 | Software Training | Structural analysis and design of a single pile under lateral load by use of computer methods | Arréllaga |

For more details or online registration, visit us at **www.ensoftinc.com** or send email to **seminars@ensoftinc.com**

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### Thursday March 16, 2006

| Time | Subject | Description | Speakers |
|---|---|---|---|
| 8:30 | Structural analysis | Computation of nonlinear curves for bending stiffness and ultimate moment capacity, effects of axial thrust load | Isenhower |
| 9:30 | Software Training | Comparison of results from computer analyses with experimental results for reinforced concrete pile, investigation of differences between fixed head and free-head piles | Wang |
| *10:15* | *Coffee Break* | | |
| 10:30 | Introduction to single drilled shaft under axial loading | Differential equation for drilled shaft under axial loading, definition of *t-z* curves and *q-w* curves for drilled shafts used in program SHAFT | Isenhower |
| 11:00 | Testing of a fully instrumented pile under axial loading | ASTM procedures, results of a typical test, description of instrumentation, experimental procedures, and results from load testing | Isenhower and Arréllaga |
| 11:30 | Introduction to single piles under axial loading | Theory for *t-z* and *q-w* curves for driven piles, computation methods used in APILE | Wang |
| *12:00* | *Lunch* | | |
| 1:00 | Software training | Use of SHAFT and APILE to compare results from computer analysis and load testing | Wang and Isenhower |
| 2:00 | Pile groups under axial and lateral loading | Development of analytical methods and group reduction factors for lateral and axial loading | Isenhower |
| *2:45* | *Coffee Break* | | |
| 3:00 | Load tests of pile groups and recommendations for interaction factors | Discussion of tests by Awoshika, Brown, and others | Wang and Reese |
| 3:45 | Software Training | GROUP for Windows, comparison of results from computer analyses and load testing | Wang |
| 4:30 | Case study | Analysis of pile-supported bridge foundation using GROUP | Reese and Wang |

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### Friday March 17, 2006

| Time | Subject | Description | Speakers |
|---|---|---|---|
| 8:30 | Case study | Analysis of pile-supported transmission towers using LPILE Plus and GROUP | Wang and Reese |
| 9:00 | Case study | Stabilizing a slope with deep foundation, general descriptions and analytical procedures using LPILE Plus and STABLPRO | Isenhower and Wang |
| *10:00* | *Coffee Break* | | |
| 10:15 | Case study | Design of flexible retaining wall, analysis using PYWALL | Wang |
| 10:45 | Problem solving session | Problems submitted by attendees | All |
| *12:00* | *End of course* | | |

## GENERAL NOTES

Course attendees are encouraged to bring a laptop computer to the course. Those bringing computers to the course will be loaned software to use during the course will be able to participate in the solution of design exercises. A limited number of desktop computers are available for rental during the course at a nominal fee (call Ensoft for details). Each attendee will have access to a broadband Internet connection at the site to send and receive email and to access local printers.

Those attending the short course are also encouraged to bring design problems of interest to them and their employers. Advice on how to set up design computations for the design problem and guidance about preparation of plans and specification will be provided by the instructors.

The number of spaces available in the short course is limited, so registration will be based on a first come-first served basis.

Companies wishing to inquire about having the same training course or another advanced training course to be held at their offices may call Ensoft to obtain a cost proposal.

Companies wanting information about the two-day short course on Design and Construction of Drilled Shafts offered by Ensoft and ADSC–The International Association of Foundation Drilling may call or email Ensoft to obtain information on the next scheduled course and location.

## CURRENT SOFTWARE/BOOKS

LPILE Plus 5.0 for Windows .....$950
GROUP 6.0 for Windows .....$1,450
SHAFT 5.0 for Windows .....$750
APILE Plus 4.0 for Windows .....$750
PYWALL 2.0 for Windows .....$750
TZPILE for Windows .....$750
SuctionPile 1.0 for Windows .....$1,190
LPA 3.0 for Windows .....$490
PRConn 3.0 for Windows .....$995
GeoMat 1.0 for Windows .....$990
DynaPile 1.0 for Windows .....$1,490
DynaMat 1.0 for Windows .....$1,490
DynaN 2.0 for Windows .....$2,900
StablPro 3.0 for Windows .....$490
BorinGS for Windows .....$295
GRLWEAP for Windows .....$990
AMPS (General Finite Element)..... call

**Call for volume, upgrade, and academic pricing**

Extra copies of any Ensoft manual .....$30 each

*Single Piles and Pile Groups Under Lateral Loading* by Lymon C. Reese and William F. Van Impe (2002)
Hardback.....$110
Paperback .....$65

*Analysis and Design of Shallow and Deep Foundations* Lymon C. Reese et al. (2005)
Hardback.....$110

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