



Gary L. Seider, *Chairman*  
**Helical Piles & Tiebacks Committee**  
Deep Foundations Institute  
326 Lafayette Avenue  
Hawthorne, NJ 07506 USA

Dear Helical Pile Industry Advocate:

On behalf of all the volunteer members of the DFI Helical Piles & Tiebacks Committee (HPTC), we would like to thank you and your company for considering making a donation to help fund our proposed Helical (Screw) Pile Seismic Study – a comprehensive study to evaluate the effectiveness of helical (screw) piles in a seismic event.

The HPTC is recommending this study for several important reasons including:

- For some time now many engineers in the U.S., who are intimately familiar with slender shaft helical (screw) piles have theorized that this class of piles tends to provide dampening and ductile response when subjected to seismic forces; thus preserving the structural integrity of the structure that is built upon slender shaft piles. Unlike other deep foundations that have been studied for effects during a seismic event, there has never been a similar comprehensive study done for helical (screw) piles.
- A limited, but nonetheless significant, amount of anecdotal information about the performance of helical (screw) piles in seismic events in the U.S. has been accumulated by industry engineers and researchers, and this information has confirmed that slender shaft piles do in fact mitigate structural damage caused by seismic-related forces.
- Discussions with screw pile contractors in or around Christchurch, New Zealand have revealed that upwards of 100 structures in that region were built upon helical (screw) piles prior to the catastrophic earthquakes that occurred between 2010 and 2012. Documented post-quake studies of these structures were conducted, and over 95% of these structures survived the seismic events with little-to-no loss of structural integrity.
- Assuming the results of the study confirm that helical (screw) piles do mitigate the damaging effects of seismic forces, the HPTC will submit the study results along with proposed Code changes to the International Building Code (IBC) in conjunction with a request that helical (screw) piles be approved for use in seismic design categories D, E, and F, and soil site classes D (stiff soil), E (soft soil), and F (special soil)

The HPTC has decided that the proposed study will be directed by Amy B. Cerato, Ph.D., P.E., Rapp Foundation Presidential Professor at the University of Oklahoma, Department of Civil Engineering and Environmental Science. A document that details the timeline, budget and deliverables of the study and a copy of Dr. Cerato's CV have been included for your review.

The cost of the study is projected to be \$280,000, and the study is expected to take somewhat less than three years to complete. Contributions of any amount are welcome. Please see the attached contribution information for instructions to make a contribution.

Thank you in advance for helping us to meet the financial goal so we can launch this very important study for our industry.

Sincerely,

Bill Bonekemper – *Project Manager*  
Helical Piles & Tiebacks Committee

Gary, L. Seider, *Chairman*  
Helical Piles & Tiebacks Committee



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## **DFI Helical (Screw) Pile Seismic Research Study**

### ***Timeline, Budget and Deliverables:***

**PHASE 1)** An extensive global literature review and interview process with organizations involved with helical piles in seismic areas, culminating with a written report of findings (Current: June 15, 2015- February 15, 2016 (8 months): **Funded in full** (\$35K) by the DFI HPTC)

**Deliverable:** February 15, 2016 – Compiled Report submitted to DFI

**PHASE 2) NEW** Full-Scale Field Load Tests of Helical Piles under Seismic Conditions at the UC San Diego Shake Table Facility (4+ month duration, January 1, 2016- May 15, 2016: **Funded in full** (\$70K cash + \$100K+ in-kind donations) by the DFI HPTC))

**Deliverable:** May 15, 2016 – Testing report and raw data submitted to DFI

**PHASE 3)** Helical Pile Full-Scale Test Data Analysis (12-month duration, May 16, 2016- May 15, 2017 (\$40K needed)

**Deliverable:** May 15, 2017 – Provide practical, design guideline to the helical piling community that are immediately implementable

**PHASE 4)** Helical Pile Building Retrofit Instrumentation in Seismically Active Zone (New Zealand) (May 16, 2016 – May 15, 2017 (In parallel with Phase 3 due to project timing) (\$60K needed)

**Deliverable:** May 15, 2017 – Compile testing report submitted to DFI

**PHASE 5)** Finite element modeling of helical piles under seismic conditions (May 16, 2017-May 15, 2018) (\$75K needed)

**Deliverable:** May 15, 2018 – Compile report submitted to DFI; suggest design guidelines and recommendations for inclusion in IBC 2021 and the seismic design guide

### **Benefit to DFI Members and the Deep Foundations Industry:**

The last 25 years have seen exponential growth in the use of helical piles and tiebacks. Some of the reasons for this growth include efforts by the HPTC to inform and educate DFI members and the deep foundations industry on the proper design and installation of helical piles and tiebacks. These efforts include highly successful seminars sponsored by DFI as well as technical publications by many HPTC

members. Through efforts of several HPTC members, provisions for helical piles were written and adopted into the 2009 International Building Code. Thus, helical piles and tiebacks are now a standard of practice in the deep foundations industry.

The research will benefit the public by helping to ensure that helical piles are being applied and used correctly in seismically active areas. The research will benefit the DFI by generation of a high quality journal article and design guide based on original research partially funded and directed by the DFI; DFI also will get credit for contributing to the standards of practice and building codes affecting pile use in seismic areas. The research also may lead to better understanding of other slender pile types including small diameter driven piles, micropiles, pin piles, and more.

The total cost of this research project is \$280,000 over three years; \$105,000 of that total has been raised already by the HPTC to cover Phases 1 and 2. Additionally, another \$100,000 has been donated in the form of in-kind funding consisting of materials, equipment, labor and mobilization costs associated with the full-scale load testing utilizing the UC San Diego shake table.

**Amy B. Cerato, Ph.D., P.E.**

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**Rapp Foundation Presidential Professor**  
**School of Civil Engineering and Environmental Science**  
**University of Oklahoma**  
**202 W. Boyd St., Rm. 334**  
**Norman, OK 73019**

**Phone: (405)-313-8937; Fax: (405)-325-4217; Email: [acerato@ou.edu](mailto:acerato@ou.edu)**  
**<http://cerato.ou.edu/>**

**Academic Employment**

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*Associate Professor* of Civil Engineering, University of Oklahoma – Norman (5/11 – current)  
*Assistant Professor* of Civil Engineering, University of Oklahoma – Norman (1/05 – 5/11)  
*American Association for University Women (AAUW) Selected Professions Fellow* (7/04-6/05)  
*Research Assistant*, Civil Engineering, University of Massachusetts (6/99-9/04)

**Education**

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<b>Ph.D. Geotechnical Engineering</b>	University of Massachusetts-Amherst, Massachusetts: (2005)
<b>M.S. Geosciences</b>	University of Massachusetts-Amherst, Massachusetts: (2004)
<b>M.S.C.E. Civil Engineering</b>	University of Massachusetts-Amherst, Massachusetts: (2001)
<b>B.S.C.E. Civil Engineering</b>	Lafayette College, Easton, Pennsylvania: (1999)

**Industry Related Experience**

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**Geotechnical Engineer:** Cerato Geotechnical Engineering, PLLC - Norman, OK - August 2014 - present.  
**Civil Engineer:** Pietrzak and Pfau Engineering and Surveying, PLLC - Goshen, NY - Summer 1998.

**Professional Awards and Honors**

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2011 UMass - Amherst Outstanding Young Alumni Award  
2010 ASCE Arthur Casagrande Professional Development Award  
2009 Presidential Early Career Award for Scientists and Engineers (PECASE)  
2009 Rapp Foundation Presidential Professorship  
2009 Alumni Teaching Award (top 10% Fall '08 & Spring '09 course evaluations in OU CoE)  
2008 National Science Foundation (NSF) CAREER Award  
2008 George W. Tauxe Outstanding Professor Award (awarded by the OU-CEES students)  
2008 Graduate College Special Recognition for Outstanding Efforts in Graduate Recruiting  
2005 Junior Faculty Research Program Award  
2004 American Association for University Women (AAUW) Selected Professions Fellowship  
2004 Society of Women Engineers (SWE) Past Presidents Scholarship  
2004 UMass - Amherst Geotechnical Engineering Fellowship  
2003 Association for Women in Science (AWIS) Predoctoral Certification of Merit  
2002 Trent R. Dames and William W. Moore Fellowship (ASCE)  
2001 National Fraternity (Delta Delta Delta) Graduate Fellowship  
2001 UMass - Amherst Geotechnical Service Award  
2001 National Science Foundation Graduate Fellowship - Honorable Mention

## Research Related Experience

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### Active Grants

#### National/International Grants

NIST Center for Risk-Based Community Resilience Planning. 2014 NIST-CR-COE-01. Co-PI. 33% credit, \$1,374,998 total; with N. Wang and C. Nicholson at OU and Colorado State University (co-directors: John van de Lindt and Bruce Ellingwood) as lead. 2/1/2015-1/31/2020. **(active)**

Collaborative Research RSB: A Risk-Informed Decision Framework to Achieve Resilient and Sustainable Buildings that Meet Community Objectives. National Science Foundation (NSF). Co-PI. 50% credit, \$380,000 total; with N. Wang at OU and Colorado State University (PI: John van de Lindt) as lead. 2/15/15-2/14/19. **(active)**

Design and performance of helical piles under seismic conditions: Phase I. Deep Foundations Institute (DFI): Helical Piles and Tiebacks Committee Proposal for Funding Through the Committee Projects Fund. **PI**. 100%, \$35,000 total; 6/15/2015-2/15/2015. **(active)**

#### State Grants

Validating Field Employed X-Ray Fluorescence (XRF) on Stabilized Subgrade Projects to Assess Impact of Extreme Precipitation Events, Improve Construction Quality Control and Facilitate Geotechnical Forensic Investigations, Southern Plains Transportation Center (SPTC); **PI**: 50% credit, \$167,923 total; with G. Miller; 10/1/2014-9/30/16. **(active)**

## Publications

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### *Refereed Journal Publications (25 total) – only most recent shown*

\*Denotes graduate or undergraduate research assistant co-authors.

\*Lin B., Jin Y., Pang H., Cerato A.B. (2015). Experimental Investigation on Dilation Mechanisms of Land-Facies Karamay Oil Sand Reservoirs under Water Injection. *Rock Mechanics and Rock Engineering*. DOI: 10.1007/s00603-015-0817-8.

\*Lin, B. and Cerato, A.B. (2015). Shear Strength of Shale Weathered Expansive Soils along Swell-Shrink Paths—Analysis Based on Microscopic Properties. *Environmental Earth Sciences*. DOI: 10.1007/s12665-015-4691-1

\*Tabet, W., Cerato, A.B., Miller, G.A. (2014). The Influence of Clod Size and Moisture Condition on the Shearing Behavior of Compacted Soil. *Geotechnical and Geological Engineering (GEGE)*. Vol. 32, Issue 5 (2014), pp. 1253-1260. DOI:10.1007/s10706-014-9796-x

\*Lin, B. and Cerato, A.B. (2014). Applications of SEM and ESEM in Microstructural Investigation of Shale-Weathered Expansive Soils along Swelling-Shrinkage Cycles. *Engineering Geology*. Vol. 177, 22 July 2014, pp. 66–74. DOI:10.1016/j.enggeo.2014.05.006

\*Lin, B., Cerato, A.B., Madden, A.S. and Elwood-Madden, M.E. (2013). Effect of Fly Ash on the Behavior of Expansive Soils: Microscopic Analysis. *Environmental Engineering and Geosciences (EEG)*. Vol. 19, pp. 85-94, DOI:10.2113/gsegeosci.19.1.85



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## Helical (Screw) Pile Seismic Study

### Pledge Form

#### Contributor Information (please print or type)

Company Name	
Billing address	
City	
State	
ZIP Code	
Contact Person	
Telephone (business)	
Fax	
E-Mail	

#### Pledge Information

The above-named company (the Contributor) pledges to donate a total of \$\_\_\_\_\_ to DFI's Helical (Screw) Pile Seismic Study, as detailed in a solicitation letter and attachment received from DFI's Helical Piles and Tiebacks Committees (HPTC)

The total cost of the project is estimated to be \$250,000. The project will be carried out in three phases. The contributor promises to pay DFI the pledged amount immediately upon being notified by DFI that the first phase is about to commence.

Contributions shall be deemed to be donations and shall not confer upon the Contributor any proprietary interest in the study, its findings, or any related deliverables. All proprietary rights shall be vested in DFI only. Contributor will receive a copy of the study at no cost.

The Contributor understands that the contribution is not tax deductible as a charitable contribution.

#### Acknowledgement Information

Please use the following company or individual name in all acknowledgements of this donation:

#### Signature

<b>Name</b>	
<b>Title</b>	
<b>Signature</b>	
<b>Date</b>	



## **Helical (Screw) Pile Seismic Study**

### *Payment of Donations* *Instructions*

#### **By Check:**

Make check payable to: Deep Foundations Institute  
(Please write "Helical Pile Seismic Study" on memo line)

Send to: Deep Foundations Institute  
326 Lafayette Avenue  
Hawthorne, N.J. 07506

#### **By Credit Card:** **(Visa, MC, Amex)**

Please call DFI Headquarters at (973) 423-4030 (M-F, 9AM-5PM, Eastern Time) and give credit card information to staff member over the phone. Specify that you are making a donation to the Helical Pile Seismic Study.

#### **By Wire Transfer:**

A Bank Wire transfer can be made to DFI's Account directly from your bank. \$30 US MUST BE ADDED TO YOUR PAYMENT TO COVER DFI's BANK SERVICE CHARGES. You will need to give your bank the following information:

**Wire to:** TD Bank N.A., Wilmington, DE

**For further credit to:** TD Bank N.A., 617 Lafayette Ave, Hawthorne, NJ 07506

**Routing Number:** 031201360

**In favor of Account #:** 4278386268

**Beneficiary:** Deep Foundations Institute, 326 Lafayette Avenue, Hawthorne, NJ 07506

- ◆ Please have your bank annotate the wire transfer with payment reference information such as invoice number or description of what the transfer is for.
- ◆ Please cover any charge your bank may impose on the wire to assure DFI will receive the entire net due amount.
- ◆ Please notify DFI by fax (973 423 4031) when you have made the Transfer.

NOTE: Donations are not tax-deductible as charitable contributions