

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

*A Global Initiative to Evaluate the Performance  
of Helical (Screw) Piles in a Seismic Event*

The Initiative will be Directed by the  
Deep Foundations Institute Helical Piles and Tiebacks Committee

***Gary L. Seider, P.E., Chairman***



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## Purpose for the Research Study

Helical (Screw) Piles are currently not approved as deep foundation elements in seismic zones D, E, and F in the International Building Code (IBC). However, “screw piles” represent one of the preferred deep foundation elements in the province of Canterbury, New Zealand. Scores of structures built upon screw pile foundations survived seismic events in the Canterbury region from 2010-12 by exhibiting little-to-no structural damage.

The Deep Foundations Institute (DFI) Helical Piles & Tiebacks Committee (HPTC) has been in communication with one of the largest screw pile contracting companies in the Canterbury region relative to these documented post-seismic evaluations of structures. This company has agreed to join in the proposed global initiative by sharing documentation about the original foundation designs and the post-quake evaluations.

The purpose of the proposed research study is to collect this valuable information and any similar documentation from other parts of the world and combine it with the results of full-scale field load tests, small-scale laboratory load tests and finite element modeling. This comprehensive collection of data and information is intended to represent a logical conclusion that affirms helical (screw) piles as being a valid deep foundation solution in seismic zones D, E and F of the IBC.

## Research Study Director

The HPTC has selected Amy B. Cerato, Ph.D., P.E., Rapp Foundation Presidential Professor at the University of Oklahoma, Department of Civil Engineering and Environmental Science, as the research director for the project.

In addition, several people have volunteered to serve on the Technical Advisory Team to periodically confer with Dr. Cerato at certain project intervals. Technical Advisory Team members include:

- Daniel Pradel, Ph.D., P.E., G.E., DGE
- Armin Stuedlein, Ph.D., P.E.
- Hesham El Naggar, Ph.D., P.Eng.
- Moncef Souissi, M.S.C.E
- Sam Clemence, Ph.D., P.E.
- James Wood, PileTech of New Zealand
- Yasser Abdelghany, Ph.D., P.Eng.

## Research Study Definition

The research study was conceived by the HPTC – under the auspices of DFI. The study will focus on the design and performance of helical (screw) piles in a seismic event. The results of this research study will be available to stakeholders immediately upon completion. Interim information on the study's progress will also be available to stakeholders via presentations by Dr. Cerato at the annual HPTC seminar.

The research study will concentrate on provisions for Seismic Design Categories D, E, and F as designated in the IBC, and soil Site Classes D (Stiff Soil), E (Soft Soil), and F (Special Soil) per the IBC.

The scope of the project will include:

- (1) an extensive literature review and writing of a report summarizing all the findings on previous work on helical piles in seismic conditions
- (2) the use of specialty laboratory equipment to perform small-scale tests under seismic conditions
- (3) full-scale field load test(s) of the helical piles under seismic conditions
- (4) finite element modeling of the helical piles under seismic conditions.

## Expected Research Study Deliverables

Expected deliverables include:

- ***Design Guide*** published by DFI. Stakeholders will early access to the research and design guide as part of their return on investment.
- ***DFI Journal Paper***
- Recommendations for ***2021 International Building Code*** changes submitted for consideration in 2018.

## Research Study Timeline, Cost Estimate and Payment Plan

Dr. Cerato plans to complete the study in (2) years. The cost estimate for the project is \$250,000. Payments will be made to the university quarterly, and the payment amounts will coincide with expenses incurred during the period.

Stakeholder investment contributions can be paid in one lump sum or split into (2) payments a year apart. The HPTC fund raising and stakeholder liaison team will be responsible for communicating with potential stakeholders and managing investment procurement.

- Currently verbal commitments for contributions are being recorded, and actual contributions will be collected at a future time. Contributors should contact Bill Bonekemper, *DFI-HPTC Member and Publisher of HelicalPileWorld.com* via email at [bbones@helicalpileworld.com](mailto:bbones@helicalpileworld.com) or via phone at 513-386-8158

## **Stakeholders Return on Investment**

The \$250,000 required to fund the study will be raised through investment contributions from organizations that understand the potential value of the study and share a vested interest in the growth of the helical (screw) pile industry.

Stakeholders will share in the following return on investment opportunities:

- ***Design Guide*** – early access to the design guide
- **2021 International Building Code Changes** – early access to the recommendations for changes to the building code
- **Interim Progress Reports** – presented by Dr. Cerato at the annual *DFI HPTC Seminar*