

LANDMARKS IN THE DEVELOPMENT OF ISM – A QUICK HISTORY

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ABSTRACT

International Society for Micropiles (ISM) is a professional society organized through the dedication and interest of micropile enthusiasts across the world. The society is a group of colleagues involved in the design, construction, research and development, and instruction and promotion of micropile technology. ISM developed from an international review group assembled in 1997 for a micropile state-of-practice study commissioned by the U.S. Department of Transportation. The group evolved to present a series of workshops aimed at providing a forum for debate, advice, problem-solving, and support to micropile specialists and nonspecialists around the world. This paper summarizes the landmark activities in the society's history and highlights the invaluable participation and sponsorship of various contractors, suppliers, consultants, and professional societies throughout the evolution and sustenance of ISM. The authors hope that this paper will be of particular interest to ISM's newer members and workshop attendees.

1. INTRODUCTION

The paper summarizes the activities and leadership of ISM, including workshops, chairs, recipients of the Lizzi Lecture and Lizzi Scholarship for deserving students, and the winners of the World Cup. One theme which is not overlooked is the role of individuals, companies, and associated professional societies in directly promoting micropile practice internationally and supporting ISM. The support of the various contractors, suppliers, consultants, and trade organizations throughout the evolution and sustenance of ISM are gratefully acknowledged.

2. BACKGROUND AND EVOLUTION OF ISM

Although micropiles had been introduced into North American practice via European specialists in the early 1970s, it was more than a decade later when they became more popular and readily accepted nationally. Main markets were associated with urban construction and industrial remediations and began to be served by American contractors with previous experience in soil and rock anchors. Reflecting that many of these applications related to transportation projects, for example, the seismic retrofits conducted on Interstates in the San Francisco Bay area following the catastrophic Loma Prieta Earthquake of 1989, U.S. Department of Transportation's Federal Highway

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Administration (FHWA) funded a state-of-practice review of micropile technology worldwide.

The research was led by Al DiMillio of FHWA, and the Principal Investigators were Dr. Donald A. Bruce (then with Nicholson Construction) and Prof. Ilan Juran (then with Polytechnic University of Brooklyn) under FHWA Contract DTFH61-93-C-00128. FHWA intended that this project promote cooperation with their French counterparts who in 1993 had commenced a new 5-year project named “FOREVER” (Fondations Renforcées Verticalement). FOREVER was organized under the aegis of the Institute for Applied Research and Experimentation in Civil Engineering (IREX) and was under the technical direction of Prof. François Schlosser of the National Civil Engineering School (ENPC) and Dr. Roger Frank of the Center for Education and Research in Soil and Rock Mechanics (CERMES). An integral component of the FHWA program was the appointment of an international Advisory Board, which initially comprised:

- Dr. Fernando Lizzi (Italy) the visionary leader of ISM and author of the seminal book *Static Restoration of Monuments* (1982).
- Prof. François Schlosser (ENPC, France)
- Prof. Stuart Littlejohn (Bradford University, UK)
- Dr. Thomas Herbst (Dywidag Systems International, Germany)

It was later supplemented by other eminent micropile specialists including:

- Mike Turner (Applied Geotechnical Engineering, UK)
- Prof. Fred Kulhawy (Cornell University, USA)
- Dr. James Mason (California Department of Transportation, USA)
- Ray Zelinski (California Department of Transportation, USA)
- Prof. Reidar Bjorhovde (University of Pittsburgh, USA)
- Bob Lukas (Consultant, USA)
- Prof. Jouko Lehtonen (Turku University of Applied Sciences, Finland)
- Prof. Masaru Hoshiya (Musashi Institute of Technology, Japan)

The overall group therefore had a potent blend of contractor, consultants, academia, and owner that mirrored the team which had been assembled in France for FOREVER. The major tasks of the study were set by FHWA as follows:

Task A. State of Practice Determination

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| Task A.1 | Comprehensive review and detailed analysis of the available research and development results, laboratory and field testing data, and site observations and monitored case studies to establish a comprehensive engineering knowledge base. |
| Task A.2 | Critical assessment of the available analytical models and design methods for single piles, groups of piles, and networks of reticulated piles under both axial and lateral loading conditions and applications. |
| Task A.3 | Comparisons and analyses of currently used construction specifications and quality assurance procedures for each installation technique. |

Task B. Research Needs Assessment

Evaluation of the limitations and uncertainties in the current state of practice, and development of relevant research programs to effectively address the identified engineering research needs. This was published separately in July 1995 also under Contract FHWA-DTFH61-93-C-00128.

Task C. Research Coordination with Foreign Programs

Recognizing the major role of European specialists, the International Advisory Board was to be formed, and the Principal Investigators were to undertake a series of visits to other specialists in Europe.

Tasks D and E. Draft Final and Final Reports

- Volume 1 Background, Classifications, and Cost
- Volume 2 Design
- Volume 3 Construction, QA / QC, and Testing
- Volume 4 Case Histories

The International Advisory Board held three meetings. At the first meeting in Washington, DC, US, March 10-11, 1994, the attendees discussed the structure and purpose of the study and made presentations on local and national practices. By the second meeting, also in Washington DC, October 27-28, 1994, several chapters had been prepared in draft form and were reviewed by the group. At the third and final meeting in San Francisco, March 10-13, 1995, all chapters were reviewed in anticipation of conducting the Final Draft Report and much valuable verbal and written comments were received. The Final Reports later became the essence of the FHWA "Implementation Manual," initially produced by DBM Contractors Inc. in June, 2000 and later updated and revised in December, 2005 as the Reference Manual for NHI Course 132078.

Somewhat ironically, much of the first workshop revolved around determining the most appropriate generic name for the piles, given the various national and/or proprietary names then in use, including the original term "pali radice" (root pile). The group decided on the term "micropile": defined as a relatively small diameter drilled and grouted pile in which most or all the load is resisted by the steel.

3. EVOLUTION OF THE INTERNATIONAL SOCIETY OF MICROPILES

After the publication of the study reports, DiMillio was keen to keep the "micropile momentum" going, largely to encourage transfer of knowledge to and from various countries in North America, Europe and especially Japan, which was recovering from the deadly Hanshin Earthquake. The concept of a workshop was developed, with the first being held in Seattle, WA, USA in September 1997 and attended by 42 engineers invited from 6 countries. The workshop was strongly supported by Scandinavian piling suppliers and Prof. Jouko Lehtonen of Turku University of Applied Sciences, who were addressing the need for repairs to existing structures or new-build works in urban areas. Early

workshops were partially funded by FHWA, and through matching funds from the Industry Advancement Fund of ADSC: The International Association of Foundation Drilling (ADSC). Through subsequent workshops, attendees determined to form the International Society of Micropiles in 2006 as an independent non-profit organization incorporated in Pennsylvania, US. Data from each workshop are listed in Table 1.

Table 1. List of workshop years, attendees and countries represented.

Year	Workshop No.	Location	Countries Represented
1997	1	Seattle, Washington, USA	Finland, France, Germany, Japan, UK, USA
1999	2	Ube, Japan	Finland, France, Germany, Japan, Sweden, UK, USA
2000	3	Turku, Finland	France, Germany, UK, USA
2000	Planning Meeting	Lille, France	Austria, Belgium, Canada, Finland, France, Germany, Italy, Japan, Sweden, UK, USA
2002	4	Venice, Italy	Australia, Austria, Belgium, Canada, Finland, France, Germany, Italy, Japan, Sweden, UK, USA
2003	5	Seattle, Washington, USA	Canada, Finland, France, Germany, Japan, UK, USA
2004	6	Tokyo, Japan	Austria, Canada, Finland, France, Germany, Japan, Portugal, South Africa, Spain, Sweden, USA, UK
2006	7	Schrobenhausen, Germany	Argentina, Austria, Canada, Finland, Germany, Japan, Portugal, Sweden, UK, USA, Venezuela
2007	8	Toronto, Canada	Austria, Canada, Finland, France, Germany, Malaysia, Portugal, South Korea, Spain, Sweden, The Netherlands, UK, USA
2009	9	London, England	Australia, Austria, Canada, Finland, Germany, South Korea, Sweden, USA
2010	10	Washington, DC, USA	Australia, Austria, Brazil, Canada, Chile, Estonia, Finland, Germany, Israel, Italy, Nigeria, Norway, Poland, Saudi Arabia, The Netherlands, UK, USA
2012	11	Milan, Italy	Australia, Austria, Bulgaria, Canada, Finland, Germany, Korea, Poland, Portugal, Tunisia, UK, USA
2014	12	Kraków, Poland	Australia, Canada, China, Germany, Germany, Italy, Republic of Korea, Sweden, Taiwan, UK, United Arab Emirates, USA,
2017	13	Vancouver, BC	Australia, Canada, Germany, New Zealand, Norway, Panama, Poland, UK, USA
2019	14	Gold Coast, Australia	Austria, Bahrain, Canada, Colombia, Germany, Mexico, Poland, USA
2023	15	Vail, Colorado, USA	Finland, France, Germany, Japan, UK, USA
2025	16	Valencia, Spain	

4. VISION

The vision of ISM was established to be the global hub for state of the art micropile technology. By linking members together as an international network of colleagues, ISM

was created to be a platform upon which experienced professionals could mentor the less experienced and support the advancement of micropile technology.

As a result, key factors of concern for micropiles including lateral loading, buckling, thread strength, effects of cyclic loading, connection details, hollow bar installation, and innovative equipment evolution have been presented and shared at the many workshops. The publications and presentations for these innovations are available on the ISM website.

5. CHAIRS

The Society has been organized and managed by Mary Ellen Large (formerly Bruce) as Secretary and Executive Director since 1997. Throughout this time, she has worked closely with several Chairs selected by the Steering Committee to represent different professional skillsets and regional presences (Table 2).

Table 2. List of ISM Chairs.

Years	Name	Affiliation
1997-2006	Donald Bruce	Geosystems, LP (USA)
2006-2009	Jouko Lehtonen	Turku University of Applied Science (Finland)
2009	Jim Bruce	GeoFoundations Contractors (now Keller North America) (Canada)
2009-2014	Allen Cadden	Schnabel Engineering (USA)
2014-2023	Dan MacLean	Keller North America (Canada)
2023-present	Allan Herse	PCA Ground Engineering (Australia)

6. CONTRIBUTIONS OF ADSC, DFI AND OTHER INDIVIDUALS

Many members have contributed significantly to the mission of ISM providing leadership, exchanging information and publishing research and experiences. Particularly significant contributions to the development of ISM include:

- Mr. Paul Woodfield and Mark Hinton (Branlow Piling, UK) together with Mike Turner (Applied Geotechnical Engineering, UK) saw an opportunity to expand his foundation construction services to include high capacity micropile which were then unheard of in the UK market. To accomplish this, he realized that it would be necessary to educate the engineering and contractor community about this new tool if they were to succeed. Working closely with ISM, a 10-day, 9-city educational tour was developed and presented across England, Ireland and Scotland. The result was packed houses at each event totaling more than 300 attendees. Branlow Piling went on to install micropiles across the region with great success. The 2009 IWM Workshop was subsequently held in London with attendance at full capacity.
- The Ischebeck organization including the late Ernst Ischebeck and Horst Aschenbroich (Con-Tech Systems in Canada and USA), were instrumental to the adoption and growth of the alternative hollow bar micropile solution (Type E Micropiles). Without their immense support and commitment to ISM many of our workshops would not have been financially viable nor as rich with attendance and

innovative micropile solution presentations. The Ischebeck organization continues to be a strong support of ISM as demonstrated by their Host Support of this 2025 Workshop.

- Dr. Thomas Herbst formerly of Dywidag Systems International (Germany) was a steadfast contributor and supporter of ISM over two decades. He was the driving force behind the development of the listing of micropile documents. This project was aimed at archiving the references of as many micropile papers published as possible to provide an archive to share global resources and developments.
- Allan Herse of PCA Ground Engineering followed in Paul Woodfield's footsteps. Bringing a new region of interest to ISM (Australia/New Zealand) as well as a wealth of enthusiasm and vigor, Allan and his business partner Robert Bollman quickly became strong cheerleaders for the organization and the technology. Like Paul, Allan realized that education in his local community was a necessary step to success and again hosted a series of educational sessions across northeastern Australia, and the subsequent 14th IWM in the Gold Coast in 2019.
- Mariana Gomez and Bernardo Robles (Berma) are continuing this approach of facilitating teaching courses to introduce micropile technology in Mexico. Two very well attended short courses have been held with the support of ISM.
- The influence and support of specialty contractors and manufacturers and equipment suppliers over ISM's history cannot be underestimated. Dan MacLean and team (Keller) and Sue Frank and team (TEI Rock Drills) have been consistent and generous supporters for many years attending and enhancing workshops around the world.⁴
- ADSC and Deep Foundations Institute (DFI) have provided support to ISM over the years, including collaboration with the ADSC-DFI Joint Micropile Committee. Early funding for workshops was provided by FHWA and through matching funds from ADSC's Industry Advancement Fund. Between 2012 and 2019, ISM participated in an alliance with ADSC and DFI to leverage resources and further promote micropile use and understanding. DFI incorporated much of ISM's early website into their more extensive platform and provided membership management and organizational services for the 11th workshop in Milan, Italy in 2012. ADSC staff provided organizational services for the 12th and 13th workshops in Krakow, Poland, and Vancouver, respectively.

7. LIZZI LECTURE

ISM established the Lizzi Lecture in 2003 in memory of the late Dr. Lizzi. The lecture is delivered by an invited speaker who is recognized by ISM as making distinguished contributions to the micropile industry. The lecture honors the spirit and memory of Dr. Fernando Lizzi, the spiritual leader of ISM and the inventor of the "pali radice" or original "root pile" foundation system. Lizzi Lecturers are listed in Table 3.

⁴ The authors feel it is important to this history to recognize the affiliations of the original and subsequent supporting members of IWM and ISM, while acknowledging that many other companies have consistently contributed to the fortunes of ISM over the years. These include Ischebeck, Con-Tech Systems, Schnabel Engineering, Keller, Casagrande, Bauer, and others.

Table 3. List of Lizzi Lecturers.

Year	No.	Lecturer (Affiliation)	Subject
2003	1	Dr. James Mason (Cornell University, US, at the time)	Lizzi's Philosophy. Concepts to Practice
2004	2	Prof. François Schlosser (CERMES, France)	Practice and Research on Micropile Groups and Networks
2006	3	Jiro Fukui (Public Works Research Institute, Japan)	Performance of Seismic Retrofits with High Capacity Micropiles
2007	4	Dr. Thomas Herbst (Dywidag Systems) (Germany)	Historical Review and Analysis of 55 Years of Micropiles
2009	5	Dr. Donald Bruce (Geosystems) (USA)	Micropiles in Middle Age: Triumphs, Failures and Challenges
2010	6	Ernst Ischebeck, Dipl.-Ing. (Germany)	The Design and Execution of Drilled and Flush-Grouted Titan Micropiles Is Governed in European Union (EU) by National Technical Approval Z-34.14-209 (DIBT)
2012	7	Paul Woodfield (Branlow Piling, UK)	The Good, the Bad, and the Ugly (Part 2)
2014	8	Nadir Ansari (Isherwood Associates, Canada)	Market Development of Micropiles
2017	9	John Wolosick (Keller North America)	Loading Effects on Battered Micropiles Supporting Lateral and Compression Forces
2019	10	Allen Cadden (Schnabel Engineering, USA)	Micropiles: World Wide Evolution
2023	11	J. Erik Loehr (University of Missouri Columbia, USA)	Mainstreaming of Micropiles: Probabilistic Calibration of Axial Resistance for Load and Resistance Factor Design

8. THE LIZZI SCHOLARSHIP

ISM established the Lizzi Scholarship in 2004 in memory of Dr. Lizzi. The award funds for a graduate student to attend the International Workshop on Micropiles. Awardees are graduate students conducting research on micropiles. The scholarship award includes travel and accommodation expenses for attendance at the workshop, complimentary workshop registration and a selection of micropile publications. Recipients deliver a short presentation on their research. Scholarship recipients are listed in Table 4.

Table 4. List of Lizzi Scholarship recipients.

Year	No.	Lecturer	Subject
2004	1	Shingo Morimasa, Toyohashi University of Technology (Japan)	Bearing Capacity of Foundations Reinforced with Prestressed Micropiles
2006	2	Stefan Vogt, Technical University of Munich (Germany)	Buckling of Slender Piles in Soft Soils
2007	3	Mohamed Elkasagby, University of Western Ontario (Canada)	Finite Element Analysis of the Axial Capacity of Micropile
2009	4	James Amos of Balfour Beatty Ground Engineering (UK)	Micropiles — The Green Choice
2010	5	Sherif Lotfy A. Abdelaziz, Ph.D. candidate, Virginia Tech (USA)	Utilization of Micropiles for Heat Exchange
2014	6	Maciej Szczygielski, AGH University of Science and Technology (Poland)	Assessment of Soil-Micropile Interface Parameters Using 3D Numerical Modeling
2017	7	Maged AbdIbrahim, Ph.D. candidate, Western University (Canada)	Lateral Performance of Hollow Bar Micropile in Cohesionless Soil
2019	8	Ben Brittain, Queensland University of Technology (Australia)	Quality Assurance of Neat-Cement Grout
2023	9	Kelly Flanagan, Ph.D. candidate and adjunct instructor at North Carolina State University (USA)	Interface Shear Strength Characterization between Subsea Installed Micropile Grout and Textured Rock for Micropiles Anchoring Offshore Renewable Ocean Energy Devices

9. THE WORLD CUP

ISM's World Cup of Micropiles was created by Chair Dan MacLean as an international competition to seek out an outstanding micropile project. Five regions of the globe compete at the ISM: North America, South and Central America, Europe, Africa, Central Asia (Middle East, and India) and Australasia. A panel of experts from each region selects one project to represent their region, and proponents for each selected project present during a session at the workshop. ISM delegates vote for the winner during the workshop. The competition is an enthusiasm-generating activity that quickly became a hallmark of the workshops. World Cup winners are listed in Table 5.

Table 5. ISM's World Cup winners.

Year	World Cup No.	Winner	Subject
2014	1	Crux Subsurface representing North America	Sunrise Powerlink Project
2017	2	PCA Contracting representing Australasia	Life Extension of 132kV Lattice Tower Foundations in Townsville, Australia
2019	3	TITAN POLSKA representing Europe	Museum of the Second World War in Gdańsk, Poland
2023	4	Condon-Johnson Associates representing North America	Battling the Elements with Helicopters at Elevation 11,260 Feet

10. FINAL COMMENTS

From the perspective of the authors, living the evolution of a technology growth and the development of a committed community of industry experts from around the world has been a milestone in our careers. By gathering dedicated interested advocates for regular workshops, we have observed the rapid growth and advancement of a new technology dissemination around the world. This would have likely taken far longer without the Workshops. What is more important to us, however, is the enduring friendships we have formed over the past three decades. We deeply miss our colleagues who have passed and look forward to a long ongoing friendship with those who remain and those that will arise from our gathering in Valencia.

11. REFERENCES

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