

The DFI “Digital-Visual-Virtual” Data Revolution

THE REASON FOR STARTING THE DFI PROJECT INFORMATION MANAGEMENT SYSTEMS (PIMS) COMMITTEE

The successful future of any business is undoubtedly connected to the understanding and use of the continuing evolution of digital and automated procedures and the large amounts of data provided by modern equipment, testing devices and tools. This is particularly important for the geotechnical and deep foundation (i.e., geo-foundation) industry where safety, quality and production are interconnected. The requirement to record and analyze information in increasingly faster time and with greater frequency, will soon, if not already, become the only method to prove a project’s completion and to ensure the quality and durability of the work performed.

While frequency and speed of obtaining, analyzing and providing data is important for a project’s schedule, the procedures will be required to prove the data authenticity and to demonstrate the information has not been corrupted. Businesses of all types and sizes will increasingly realize the impossibility of surviving and being competitive without digitally proving the quality and the safety of the work performed. As such, businesses will be indirectly forced to adopt automated procedures and equipment needed to outperform the competition. The challenge is on, especially for small- to medium-sized businesses, which comprise most of the geo-foundation industry.

DFI PIMS Committee

For the above reasons, the DFI Project Information Management Systems (PIMS) Committee was formed. The main goals of the committee include:

- Providing the industry a forum to discuss the requirements and challenges of understanding and adapting to the inevitable changes required in our industry.
- Supporting the DFI membership to maximize the benefits obtainable from the correct management of information collected and analyzed.

To achieve these goals, the committee is evaluating the development of guidelines on how to adopt and be ready for the “ongoing data recording revolution.” Depending on the project type, location, logistics, environment, technologies used or other specific project requirement, the guidelines should identify the challenges with and the importance of specific data produced to comply with the project specifications requirement and acceptance criteria. While multiple goals and guidelines will be developed, the main objective will continue to be the maximization of safety and quality procedures, which will result in reducing risk and obtaining more durable and sustainable project results, with direct positive impact to our industry.

The Ongoing “Revolution”

When discussing the incredible changes in our business during the last four decades, I used to say that my life changed in the early 1980s when I received my first pager while working in Singapore.



Gianfranco Di Cicco, DFI Trustee, Liaison to the PIMS Committee and 2017-2018 Secretary, GDConsulting LLC Principal

Every day, that little box would go crazy and wake me up many nights requesting my attention, sending me “coded” information on what was happening on the projects I was managing. And, yes, my mistake, I always tried to read and answer ASAP because it seemed every message was considered of “high importance.”

Since then, it’s been an increasingly faster and faster race of collecting, sending and receiving more and more information, trying to store and remember everything, and using all of the analyzed data on the next project and to solve the next challenge.

The intent of the PIMS Committee is to guide the geo-foundation industry in understanding the importance and benefits of connecting and using all the data from various phases and sources.

Big Dreams

Let’s dream for a moment about how nice it would be to open your computer and review all the information — analyzed, formatted and interconnected, as needed — from your first project. Mine was in 1979, in Italy, learning about drilled shafts, diaphragm walls and grouting technologies. Imagine contract documents, geological/geotechnical data, maps, drawings estimates, budgets, daily reports, correspondence, technical reports, photos, videos (8 mm, of course), test results, contacts, etc. all accessible in thousands of files interconnected as needed on your computer!

Let’s face it, most of us did not have the possibility, intuition, imagination or just the time to collect all the information that, now, we try to remember. Yes, we may have boxes somewhere with some photos or old handwritten reports, or a typewritten document. However, how long will it take us to organize it all and, then, analyze what and how to use it to improve your next “project” — and your life?

What if we could travel back in time with a computer program that will give us all the information of the future/past experiences to use whenever needed and for whatever the new project and challenge you are facing? The “application,” will be able not only to improve your experience but also “share specific knowledge” with the other parties involved on your new project, while separating the information needed (and approved to be shared) in a safe protocol, as required.

This is what PIMS should represent for any project — a procedure to collect all the available data from the past and present (while planning for what will be needed in the future) during the initial feasibility study, development, design, construction, testing, acceptance and predicting the recording of future maintenance of the specific structure and for the surrounding influencing structures and environment. In addition, the data would be available in the future and usable whenever needed.

Today, only limited large and complex projects are requiring data information systems. However, we can clearly envision the requirement will soon be extended to all the public projects and to most private projects. But, before it becomes a forced requirement, we are suggesting that DFI members evaluate the respective interest and benefits to consider the PIMS platform as an important (if not vital) investment to insure future competitiveness.

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To understand the scope of this new DFI “venture” in greater detail, the DFI PIMS Committee has spearheaded the development of a white paper authored by expert leaders representing different sectors of our industry. Vanessa Bateman of USACE representing the views of an owner; Massimo Mucci of Bencor Global (a Keller Company) representing the contractor views; Mark Petersen, P.E., G.E., of Black & Veatch representing engineers’ views; and Jamey Rosen, P.Geo., of Geosyntec those of a service provider. The

paper, “Project Information Management Systems in the Deep Foundations Industry,” will be available shortly at www.dfi.org.

Benefits

The initial challenge for any new proposed venture is to explain why it should be done and the benefit of participation. Understanding the importance and impact PIMS will have in the geo-foundation industry is critical in the decision of how any business will operate in the future.

The need for more electronic solutions is connected to the consideration of the indisputable challenge for the industry to find, train and retain qualified and experienced site personnel that know how to do the work and how to not only deliver production but also ensure quality while exercising maximum safety standards during any specialized operation. It is clearly foreseeable that we will have fewer and fewer qualified personnel willing to work on site and will be forced to use more and more sophisticated automated

tools/equipment (or robots?) to perform the work and verify the quality of the work performed.

The intent of the PIMS Committee is to guide the geo-foundation industry in understanding the importance and benefits of connecting and using all the data from various phases and sources. More sophisticated automated monitoring equipment will be used, which will emphasize the need for guidelines and understanding on how contemporaneous data from multiple sources will be collected, evaluated, interconnected and visualized in various formats. All the above, including procedures that will ensure authenticity of the data used and, at the end, guarantees the satisfactory project executions.

If this is achieved, the benefits of using a PIMS will be shared by the geo-foundation industry, while reducing overall project risk, in particular:

- Owners and owner representatives will receive proof of validity of the work performed in real time and immediately after the project completion, and will have available a complete set of construction data of the work performed. The information will be used to seal the project completion documentation and will be available for any future requirement (expansion, rehabilitation, repairs or maintenance) resulting in more project resiliency.
- Engineers, designers and consultants will be able to visualize data and control processes, evaluate data gathered, and confirm design intent is being met as required by specifications and contractual documents. QA/QC and acceptance criteria data will be easily controlled during construction and reviewed/approved reducing greatly the turnaround time.
- Contractors will be able to demonstrate, visualize and evaluate that the work performed satisfies the contractual requirements while controlling the construction methodology, promptly correcting any quality concerns, improving project sustainability, ensuring all the acceptance criteria requirements, and requesting faster payment and final project retention releases. However, at the same time, contractors will be able to keep any required proprietary data for future use while evaluating production, improving efficiency and productivity, and controlling equipment and tooling running/maintenance information.
- Equipment manufacturers, material suppliers and service providers will be able to understand and improve their products and services (performance, wear, quality, durability, etc.).
- Stakeholders (including taxpayers on government projects) will benefit from the execution of projects where more quality control will result in more durable and sustainable infrastructures while reducing/eliminating possible construction delays and the overall cost.
- Academics will be able to provide and teach updated data and information on design, technology application and construction management to the future engineers, managers and technology specialists.

Data Collection and New Expertise Requirements

It is understandable that depending on the project scope, dimension and location, different data will be collected from various project phases and sources. In addition, depending on the different geo-foundation technologies applied and different reporting models, specific data formats will be required to satisfy the sections of the corresponding contract specifications.

Most importantly, the owner of the program will, as needed, retain the information collected and analyzed while the other various parties will be able to access the particularly selected data as specified in the contractual documents. For this reason, on most of the projects the contractor may be the preferred host of the PIMS and owner of the data and tools or, at least, the developer and custodian of the system that will assemble and connect the various software packages and tools involved. Clearly, the completeness requirements, responsibilities and dimension of the program will depend on the project type and the specific contractual requirement.

We need to recognize that for some time, the industry has been using technologies and programs able to collect data electronically in “close” to real time. However, new technologies are under development that will have direct applications to deep foundations and may be integrated into existing PIMS structures or represent entirely new methods. Adapting to the new PIMS concept will require consideration in approaching business and projects, including the requirement to have personnel with the right skills, tools and experience to insure the reliability of the technology (or outsourcing using specialized technology providers).

This type of personnel may not have specific geo-foundation experience but will need to work in concert with geo-foundation specialists. Geotechnical site personnel (engineers, supervisors, operators, etc.), will need to work with computer/electronic specialized personnel with the skills and tools required to develop the protocol to collect, manage, connect, analyze, prioritize, present and store all this data. Altogether, companies will need to be capable of interpreting and meeting the specific requirements and provide the data management systems needed to ensure the uncorrupted control of the project.

Conclusion

There is no doubt that the application of information management technologies offers innumerable benefits to the DFI community, even when specifications do not explicitly require them. The major immediate benefits of having more reliable information available include the increased safety and quality control resulting in emphasizing the improvement of risk management. DFI’s commitment to represent and advance the geo-foundation industry should include the support and implementation whenever possible of PIMS technologies and platforms to reduce/eliminate risk while insuring maximum safety and quality of our work that results in durability, sustainability and resilience of our projects.

To learn more about the DFI PIMS Committee, visit www.dfi.org.

This article was developed with reference from the DFI PIMS Committee white paper prepared by the leaders of the PIMS Committee: Vanessa Bateman, Massimo Mucci, Mark Petersen and Jamey Rosen.

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