THE VALUE OF BEING AN ACTIVE PTI MEMBER

By

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I have been an active member of PTI since it was first organized. During this time, I have grown to understand the vital role that PTI has played in the advancement of the post-tensioning (PT) industry and by way of this article want to show the benefits that can be derived from active participation in one or more of the many PTI Committees and Task Groups. These have been developed to address topics that face the engineering and construction communities related to PT and are designed to continue to advance the use of PT, as well as to educate the design and construction industry on the many varied applications of PT. Hopefully by the end of this article, I will have conveyed to you what PTI has brought to the engineering and construction communities through its role in PT and convinced you that PTI is a worthy organization for you to become actively involved in through participation in one or more of its Committees and/or Task Groups.

To start, I want to give you a brief history of how PTI was formed. Our industry was originally represented by a committee within the Prestressed Concrete Institute (PCI). In the early 1970s, PT was quickly gaining popularity within the construction community, especially with the expanding use of unbonded tendons in floor systems for high-rise buildings and slab-on-ground construction. In 1975, PCI realized that the precast industry, a major source of their funding, was being threatened by this advancing technology, and decided to boot the PT group out of PCI and in 1976, the Post-Tensioning Institute was formed. The Charter Membership of PTI included 15 Company Members, 10 Associate Members, 7 Affiliate Members, and approximately 150 Professional Members. This early membership included many recognized leaders within the construction and engineering community, including many legends within our organization such as Ken Bondy, Jim Cagley, Greg Chacos, and the late Dr. Ned Burns, just to mention a few of the pioneers that advocated and advanced the use of PT by believing that it was the future of cast-in-place concrete construction.

Today, the membership of PTI includes 36 Company Members, 7 Strand Producers, 19 Associate Members, 14 Affiliate Members, 10 Consulting Members, 29 Contractor Members, and over 450 Professional Members. This expanded list of membership categories illustrates how PTI has brought various sectors of the engineering and construction community into the organization and given them a voice at the table as to the needs and the direction of the PT industry. The membership also includes 30 International members, showing how PTI's reputation has spread internationally, making PTI the global authority on PT.

What makes PTI the "authority" on PT? The membership. Through PTI's vast membership network of PT companies, producers, affiliates, associates, contractors, and professional members, PTI is able to assemble the best-of-the-best in all applications of PT. Whether it is an issue with materials for a bridge, an installation issue on a building project, or a design question for a slab-on-ground application, PTI has the resources through its membership network to obtain the correct information for the situation. While PTI has maintained a streamlined internal staff to ensure that its revenues are spent in the advancement of the industry through publications, seminars, technical events, certifications, and research, the technical resources available to PTI, whether they be engineering- or construction-related, are very extensive due to the vast and varied experience of the PTI membership and the membership's active commitment to the advancement of PT.

By becoming a PTI member you have shown you are interested in and/or involved in the use of PT either as a designer or someone that works with the system at the jobsite—whether as an inspector, installer, contractor, or owner and therefore, you believe in the benefits of PT construction.

Post-tensioning is a unique reinforcing system that can improve almost any common concrete application, such as many of the high-rise buildings you see today dotting the

skyline of most major cities (Fig. 1). But it is also the main structural reinforcement for some amazing structures.

Some of these structures are large and involve special applications of PT technology, such as segmental construction for major bridges, and some are small, but all structures that otherwise would have been more difficult or more expensive to construct or perhaps would not exist today had PT not been a consideration (Fig. 2).

Engineering technology and the technology age has been one of the main drivers behind the expanded use of PT (Fig. 3). Designers have long recognized the benefit that prestressing brings to concrete structures. With the intricate, complex architectural designs that structural engineers are now confronted with (Fig. 4), and the challenges that both the engineer and the contractor are faced with when numerous design changes occur during the course of construction of a project, the old days of tedious hand calculations are gone. Sophisticated computer programs that allow the licensed design professional to use prestressed post-tensioned concrete for both the complex as well as the straightforward projects, while meeting these design challenges, has greatly increased the use of PT.

While obviously affected over the years by both national and regional economic conditions, the industry has enjoyed rapid growth since technology became a major design tool in the engineering community.

From 1976 through 1996, the industry grew in buildings as the benefits of PT became more apparent and grew in slab-on-ground (SOG) construction as this sector was recognized as a major contributor in post-tensioned construction (Fig. 5). SOG was not a recognized classification within the PT industry until PTI broke away from PCI in 1976. But the major amount of growth has been over the past 20 years, when engineers using improved and

Fig. 1—Example of PT structure.

Fig. 2—Special applications of PT technology.

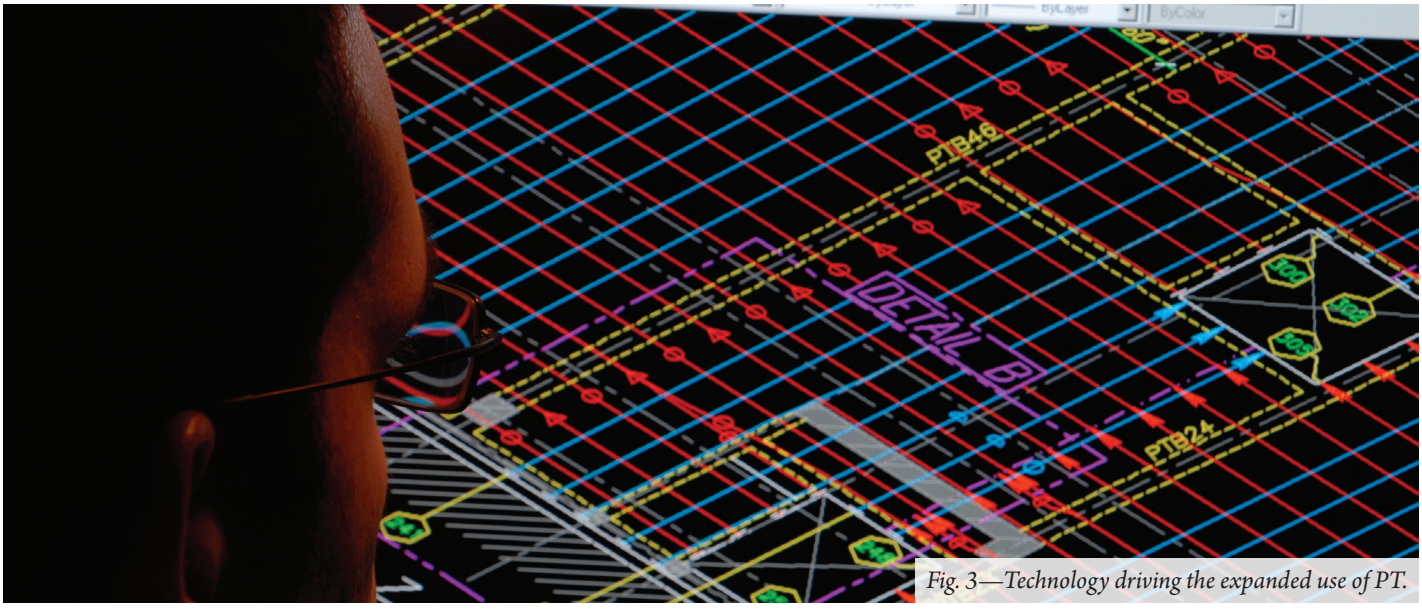

Fig. 3—Technology driving the expanded use of PT.

efficient computer systems for design made PT the system of choice for their projects.

PT SOG likewise has grown through acceptance of the system for both single- and multi-family home foundations built throughout the country. PTI has worked with the SOG industry to bring more and more designers and contractors into the Institute by showing them the benefits that this classification of the industry can gain from membership in PTI.

For example, the design methodology developed by PTI through the consensus-based process resulted in the recognized design standard for foundations on expansive soils, *Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils* (Fig. 6). It is referenced as the design standard for these foundations in the International Building Code (IBC) and referred to in the ACI 318 Building Code. The Code specifically excludes this type of foundation in its design requirements.

While the majority of the growth has been in unbonded tendon applications, the development of the use of bonded PT technology, in earthwork applications such as retention systems and cable stayed bridge construction are examples of how the use of PT has affected these sectors of the construction industry as well (Fig. 7).

As the number of post-tensioned projects increased over the years and more companies became involved in unbonded post-tensioned construction, the need for improved and consistent material production to ensure that the quality of the delivered PT system meets the owners and design professional's requirements became apparent. This is where PTI has played a significant role in achieving the uniform and consistent improvement in the quality of the material delivered to the jobsite. PTI did this by coordinating the development of the Unbonded Tendon Plant Certification Program to meet this need.

With PTI's guidance, the program was developed through the cooperation of industry stake holders and the PT Member Companies (Fig. 8). This involved countless meetings, document drafts, ballots, and what seemed like endless discussions to arrive at the beginning of the program. The program first came out in 1989 and has undergone numerous revisions and updates under PTI's guidance and urging to keep up with new requirements and needs and is now accredited by the American National Standards Institute (ANSI)—not an easy accreditation to gain. But it was PTI that made the recommendation that our program move in this direction and it was PTI that put in all of the work to make it happen—and in record time.

One example of the improvements that have occurred from PTI guidance of the industry is in the quantity of PT coating and sheathing used in unbonded tendons (Fig. 9). In the early days of unbonded PT, the quantity of PT coating and thickness of the tendon sheathing was only thought to be the amount necessary to prevent rifling of the tendon sheathing and to eliminate "most" breaches in the tendon sheathing. This subjective approach produced wide variations in friction coefficients, even within the same producing company, that resulted in measured elongations falling outside of the specified tolerance. This was addressed through PTI by gaining acceptance from the producing companies that there be a measureable minimum quantity of 15 mils of PT coating over the crown of the wires that ensured that the entire circumference of the strand was completely coated and that the sheathing have a minimum thickness (50 mils for ACI 318-designed structures and 40 mils for SOG) so that breaches in the tendon sheathing were virtually eliminated.

Another example of how PTI's involvement has improved the quality of the PT system is how encapsulation of the anchorages in unbonded tendons was developed and has

Fig. 4—Intricate architectural designs using PT.

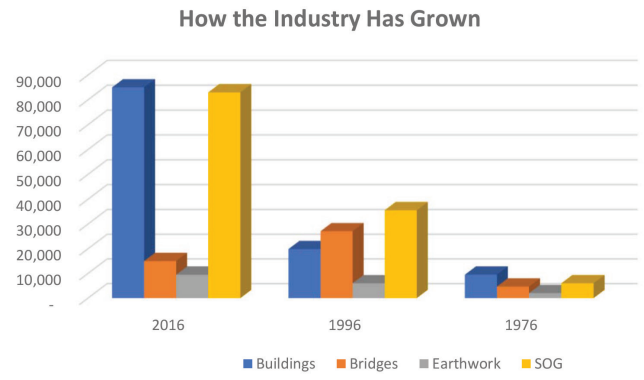

Fig. 5—PT industry growth.

subsequently been improved over the years. In May 1997, the first meeting of the Durability Committee—formed by PTI to address corrosion issues in unbonded tendons—met in Chicago, IL, because there were discussions of not allowing unbonded tendons to be used in exposed structures in this part of the country. The work of this committee developed the early requirements for encapsulation of the anchorages, improvements in the sheathing quality, and the requirement that special corrosion protection components be used for selective projects based on exposure and environment. After the initial work of the Durability Committee was complete, the discussion on encapsulations continued and was moved to M-10: Unbonded Tendon Committee, where work progressed on improvements that needed to be made to meet production and field installation challenges. As the use of encapsulation in selective projects continued over the years, it became apparent within the industry that the encapsulation requirement was getting eliminated from some structures where the encapsulation requirement should have remained. This became a concern amongst the PT Member companies and PTI along with the industry stakeholders addressed the situation by making a unanimous decision at the Board of Directors meeting in 2011 to recommend that all projects designed under the ACI 318 Building Code require the use of encapsulated anchorages, regardless of the exposure or environment.

With PTI making this strong recommendation, ACI followed suit, making the use of encapsulated anchorages a requirement in the Code. Without PTI's guidance, and refereeing in some cases, the systems that are in place today that protect the anchorage system might not be as highly effective as they are because of the varied interests of the committee members, from PT companies, to vendors, to installers—everyone had a different opinion of what needed to be done. But it was PTI that brought everyone together to make a unified decision to better the industry (Fig. 10).

On the opposite side of the coin, in the field where the rubber meets the road, the installation process is still done much the same way today that it has been since the begin-

Fig. 8—PTI's Unbonded Plant Certification Program documentation.

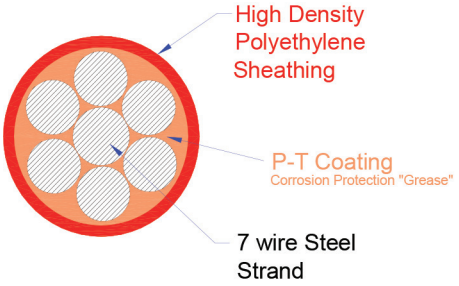

Fig. 9—PT coating used in unbonded tendons.

Fig. 6—PT slab-on-ground foundation.

Fig. 7—Bonded PT used in earthwork and cable-stayed bridge applications.

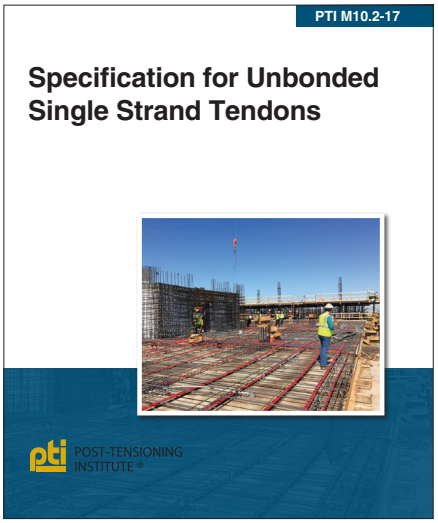

Fig. 10—PTI M10.2-17: Specification for Unbonded Single Strand Tendons.

ning of my career. When I went to my first jobsite in 1973 and worked with ironworkers such as Dick Merideth, Ron Torico, Jim Pollock, and my ironworker mentor George Deeds, they performed their duties the same way that current workers do (Fig. 11)—strap on their tool belt with their Ideal Wire reel and their No. 9 Kleins and through hard, often times dangerous, back-breaking work—and in some cases a lot of fighting with the contractor and other building trades—they installed, stressed, and in some cases grouted the PT system; and at the end of the day, the projects all got built. This part has not changed. It is still through the ironworkers in the field, craftsmen in their trade, that we entrust the PT system to be installed correctly.

Fig. 11—Installation of PT system.

Fig. 12—PTI Certification Workshops.

However, with new workers entering the trade, the expanded use of PT, and the changes to the material requirements that have occurred, the need for improvement in the field was recognized by industry stakeholders; and through PTI, the Field Certification Programs were developed. The current PTI Field Certification programs include Unbonded Field Installer, Slab-on-Ground Installer/Stressor, Unbonded Inspector, and Bonded Field Specialist (Fig. 12). The PTI Field Certification Program is also recognized as a training aid by the union ironworker apprenticeship training program and PTI has assisted the union in several training classes in the United States and Canada. These certification programs are also often requested in central and even South America. Several inquiries in the Middle East and elsewhere indicate that these programs do address what is needed in the industry—an educated workforce and inspection that are better trained on the correct installation procedures for PT Systems. Each of these programs have undergone continued development and improvement over the years tailored to meet industry needs. For example, in the early days of the program, the workshops were at scheduled times and predetermined venues around the country. Today, because of the heightened awareness and need for the workshops, many of them are special request based on project and user needs. PTI has accommodated this need by engaging more industry specialists to conduct the workshops and can, in most cases, accommodate requests on relative short notice. The

Fig. 13—New and updated PTI publications.

PTI training programs comply with the requirements of IBC, ACI 318, and ACI 301.

The third illustration of what PTI has brought to the industry is the many Technical Documents that have been developed and are made available through PTI (Fig. 13). These documents include specifications, recommendations, and procedures and are a collection of information brought together by PTI from collaboration of professionals that are involved in all phases of post-tension design, material production, and field applications.

The Institute is also responsible for the publication of this PTI *Journal* that contains technical papers; case studies; industry news; and discussions on state-of-the-art research, design, modifications, and construction advances in all sectors of post-tensioned construction, as well as construction-related FAQs and Technical Notes, such as the correct procedure for measuring elongations and how to evaluate the results (Fig. 14).

Fig. 14—PTI Journal*, Technical Notes, and Frequently Asked Questions.*

CONCLUSIONS

As I said at the beginning of this article, PTI became the recognized global authority on PT because of the membership. This does not occur easily. For our organization to produce the quality of technical documents and programs—both design and construction—that we do, it takes an enormous commitment from its individual members, in all categories, in terms of time, expertise, and the financial commitment that is involved. It is not easy to be engaged. You have to believe in making a difference and have to be dedicated to being an active member. Setting aside the time in everyone's busy work schedule and personal time responsibilities is not easy. But when you meet that deadline or review that technical document that you know will have a positive impact on the industry or to another industry professional, it is most rewarding.

My association with PTI over the past 40 years has offered me the opportunity to associate with many other individuals that all have had a common goal—to improve the use of PT. The individuals have included competitors, vendors, contractors, installers, academics, and other professional engineers. While sometimes we do not see eye-to-eye on a particular issue, at the end of the day, we come together to make the best decision possible for our industry. This group, with all of our different opinions and business interests, has been able to achieve this common goal of improving PT because PTI has provided the platform and the organization for us to meet together. Through face-to-face meetings, some structured meetings, some social events, or even some casual lunches at the PTI Convention or Committee Days, we as individuals are able to get to know one another better and appreciate the "other opinion." This creates a working environment where competitors and individuals with strong opinions can meet together to get whatever task is at hand mutually completed and the ultimate goal achieved—to improve the quality of post-tensioned design and construction. Personally, I know that I have developed a special group of friends and associates through my active involvement in PTI over the past 40 years that has benefitted me both professionally as well as personally.

Without PTI, we, the industry stakeholders, would not have been able to collectively make the decisions that are necessary to improve the industry because of our diverse interests and beliefs and the industry would not be as strong as it is today.

I encourage you to benefit as I have by getting involved in PTI. Become active in a Committee or Task Group that aligns with your interests and make a difference.

Russell Price *started his professional career with a consulting/engineering firm in 1972, where he was first exposed to post-tensioning. He moved from the consulting side to the construction side of the post-tensioning business the next year. For the past 41 years, he has worked on the construction side of PT and has been Executive Vice President of Suncoast Post-Tension since 1991. Russ has a Bachelor of Science in Engineering from the University of Texas at Arlington. He has held many positons within PTI, including as a Past President, Board of Directors, Finance Committee Member, numerous technical committees, and a Fellow. He has been a principal author for many of PTI's publications. He's also a member of ACI and the Structural Engineers Association in Texas.*