Technical Sessions
Monday, May 6—Salon IV

Opening Session
Session Moderator: *Theodore L. Neff, Executive Director, Post-Tensioning Institute*

8:05 a.m. – 8:30 a.m. PTI Vision
Marc Khoury, President, Post-Tensioning Institute

PTI is recognized as the worldwide authority on post-tensioning. In this presentation, we will discuss actions and programs PTI has developed to keep up with the ever-changing nature of the business. A plan for growth will also be presented, with emphasis on global opportunities and new markets.

8:30 a.m. – 8:55 a.m. Technical Initiatives in PT Buildings
Cary Kopczynski, PE, SE, FACI, Senior Principal, CEO, Cary Kopczynski & Company

The use of post-tensioning in buildings is improving. Steady advancements are being made with the materials, design practices, and construction systems used for post-tensioned building structures. This talk will discuss the initiatives and other new developments currently being reviewed by PTI's Technical Advisory Board (TAB), which the speaker Chairs. Some of these changes have been welcomed by all—others are more controversial. Nevertheless, they will affect nearly all material suppliers, designers, and contractors in the post-tensioning industry. Come hear about what the future holds.

8:55 a.m. – 9:20 a.m. Government/Industry Partnership
Brian D. Merrill, P.E., State Bridge Construction & Maintenance Engineer, Texas DOT

Post-tensioning is gaining broader acceptance in the structural engineering community as designers recognize the structural advantages it offers and owners and specification writers adopt more unified specifications. PTI has put great effort into writing new specifications for post-tensioning and grouting with input from many diverse groups to gain more universal acceptance. This presentation will cover some of these efforts, as well as the government/industry partnerships established to address some recent issues that affect the post-tensioning industry.

9:20 a.m. – 9:45 a.m. Developments in Repair and Retrofit of PT Structures
Garth Fallis, P.Eng., Vice President, Vector Construction

There have been many developments in the repair and retrofit of post-tensioned structures, both in the field and at PTI. As post-tensioned structures get older, there is a need to develop techniques and guidance so that the repairs will last. To this end, PTI Committee DC-80, Repair, Rehabilitation & Strengthening, has several initiatives either completed or on the go. This presentation will look at these and their place in the post-tensioning industry. The presentation will also look at some interesting repair situations and a couple of interesting new things that are happening.

Session #2: Bridges

Session Moderator: *José-Luis Quintana, President, MEXPRESA*

10:15 a.m. – 10:20 a.m. Session Introduction
José-Luis Quintana, President, MEXPRESA

10:20 a.m. – 10:45 a.m. State-of-the-Art Saddle Technology for Cable-Stayed Bridges
Drew Micklus, COO, Freyssinet

In response to the increasing demand for extended design lives, especially in the case of major cable-stayed bridges, the industry has responded with improved stay cable technologies for both the U.S. and international markets.

Durability of stay cable systems is critical to the long-term health and performance of our cable-supported bridges; therefore, design, materials, performance testing, and system qualification have been closely scrutinized. Stay cable system details have been developed to ensure that modern stay cables are designed, tested, fabricated, installed, and maintained to comply with design lives of up to and beyond 100 years.

Over the past 30-plus years, saddle technology for cable-stayed bridges has gone through major developments from simply placing making the stays continuous through the pylons with embedded steel pipe to today's highly refined systems that provide improved performance, durability, inspection, and replacement.

This presentation will review some of the past systems and focus on the many improvements to and advantages of using the current saddle technologies for cable-stayed bridges, rendering the use of saddles an attractive alternative for designers, owners, and contractors.

10:45 a.m. – 11:10 a.m. Significant Bridges in Mexico
José-Luis Quintana, President, MEXPRESA

Two concepts of post-tensioning techniques in recent Mexican bridges are addressed:

1. N-U Beam-Mania: Extensive use of these PT efficient beams has been made along the last 10 years, with good and bad experiences. Deck design, fabrication, handling, and erection under different site conditions are presented, including alternative solutions.

2. An extensive PT use cable-stayed bridge: Vidalta Bridge solutions in design and erection show how far PT techniques can be taken.

The presentation covers both topics, along with a reflection on durability and environmental friendliness, with the use of the appropriate materials.

Monday, May 6—Session #2: Bridges, cont.

11:10 a.m. – 11:35 a.m. Challenges in Constructing the Harbor Drive Pedestrian Bridge, San Diego, CA, USA
Khaled Shawwaf, Technical Director, Dywidag-Systems International Inc., and Bryan Lampe, Sales Engineer, Dywidag-Systems International Inc.

The Harbor Drive Pedestrian Bridge provides a safe crossing for pedestrians and bicycle traffic over the busy four-lane major arterial Harbor Drive and six existing train and trolley tracks. It also provides access to the multi-level parking structure that serves the Petco Park baseball stadium and nearby city attractions in San Diego and a gateway to the famous Gaslamp Quarter. Considering the prominent location of this bridge, a very aesthetically pleasing and spatial structure was planned and constructed.

The bridge, having a 354 ft main span, was a self-anchored cable suspension structure having a 580 ft radius curved single-cell concrete box girder. The suspension cable was supported by a 131 ft high central pylon inclined at 60 degrees and anchored at both sides at the end of stairs leading up to the bridge. The inclined pylon was supported by two backstay cables anchored in the footings. The curved bridge deck box girder was supported by the suspension cable at one side only, and this resulted in a challenge how the balance the torsional effects due to curvature.

This paper will describe the design, details, and construction methods for the cables, hangers, post-tensioning tendons, and soil anchors used to support this structure. The cost for this bridge was $26.8 million and has become a San Diego landmark.

11:35 a.m. – 12:00 p.m. Segmental Cable-Stayed Construction in an Aggressive Environment
Drew Micklus, COO, Freyssinet

In 2012, the Delaware Department of Transportation (DelDOT) opened the new SR-1 Indian River Inlet Bridge to traffic. This structure is located in an extremely aggressive environment along the coast just south of Dewey Beach, DE, and is routinely awash in salt-laden ocean spray.

The Indian River Inlet was built to avoid natural breaching of the highway during storms. The first bridge over the inlet was a timber structure that washed away in a 1934 storm. Since that time, the bridge has been rebuilt in 1938, 1952, and 1965. In 1976, the bridge was widened. The current bridge is the fifth and, hopefully, the last bridge over the inlet.

Tidal flow through the inlet is very powerful, as the entire exchange of water between the Indian River Bay and Atlantic Ocean is funneled through the 500 ft wide inlet. Over the past 20 years, DelDOT has been battling Mother Nature against the constant scouring of the substructure to keep the old bridge in service.

The new cable-stayed structure included a 950 ft main span to avoid placing any on the supports in the violent channel. DelDOT demanded a 100-year design life; to meet this requirement, details of the structure were carefully developed and constructed.

This presentation will review some of the particular challenges faced and details developed and installed to ensure the 100-year design life would not be compromised, in particular those relating to post-tensioning and cable-stay systems.

Session #3: Bridges/PT Applications

Session Moderator: *Paul Virmani, Federal Highway Administration*

1:30 p.m. – 1:35 p.m. Session Introduction
Paul Virmani, Federal Highway Administration

1:35 p.m. – 2:00 p.m. Cast-In-Place Segmental Bridge Construction "Rising to Great Heights"
Robert Bennett, EI, Sr. Bridge Inspector, RS&H CS, Inc., and Timothy Barry, PE, Project Engineer, RS&H CS, Inc.

In 2011, construction began for the Route 460 connector project in the Appalachian region of Virginia. This design/build project consists of constructing twin 1700 ft (518 m) long cast-in-place segmental bridges over Grassy Creek. These bridges, when complete, will be the tallest in the Commonwealth of Virginia at 265 ft (81 m). The project owner is the Virginia Department of Transportation with CEI oversight consultant RS&H CS. The design/build team consists of Prime Contractor Bizzack Construction, Bridge Subcontractor Mahan, and Designers Stantec and Janssen & Spaans Engineering. The complex challenges of cast-in-place segmental construction and the mountainous environment make this project quite unique.

2:00 p.m. – 2:25 p.m. Construction of the Simcoe Street Tunnel, Toronto, ON, Canada
Roger Frenn, Branch Manager, Eastern Canada, Dywidag-Systems International Canada Ltd., and Edward Li, Vice President, Transportation and Civil Structures, Morrison Hershfield Limited, Canada

Development of downtown Toronto along the frontage of Lake Ontario targeted converting previously vacant and underutilized properties into top-class residential, business, and recreational districts. The Simcoe Street in lakefront Toronto, located adjacent to sports complexes, exhibition centers, and prestigious residential and business developments, will provide a connection between the waterfront and the rest of downtown Toronto. Passing under the largest rail corridor of Canada, the Simcoe Street Tunnel in Toronto posed significant challenges to the design engineers and contractors. The method of construction must keep the trains running with minimal or no disruption during the works. All night works must be completed before the morning rush hours, and all weekend construction activities—which may include excavation, removal of temporary tracks and structures, deck installation, post-tensioning and splicing, waterproofing, ballast and track laying, signals, and other finishing works—must be completed before the following Monday morning to avoid causing delay to the train services. This presentation describes how strand and bar post-tensioning systems were successfully used to address some of the challenges of construction and allow completion of the project within given constraints.

Monday, May 6—Session #3: Bridges/PT Applications, cont.

2:25 p.m. – 2:50 p.m. Precast Post-Tensioned Pavement—PT Details
Michael Schwager, Vice President, Schwager Davis Inc.

With an increasing demand for pavement construction and rehabilitation with minimal traffic impact, precast pavement has been increasingly used to expedite the process. The success of these projects is largely dependent on the details used. This presentation will highlight some of the recent post-tensioning details implemented on these projects.

2:50 p.m. – 3:15 p.m. Post-Tensioning Systems—Protection Level 2
Jacob Myer, Design-Engineer, Schwager Davis Inc.

The history and cause for development of Post-Tensioning Protection Level 2: This talk will cover the differences between PL1 and PL2 at the component and system level as well as the methods used to achieve PL2 in cast-in-place cantilever and segmental precast construction methods.

Session #4: Durability of Infrastructure

Session Moderator: *Paul Virmani, Federal Highway Administration*

3:45 p.m. – 3:50 p.m. Session Introduction
Paul Virmani, Federal Highway Administration

3:50 p.m. – 4:15 p.m. Structural Health Monitoring and Testing for Wire Breaks and Corrosion in PT Tendons and Cabled Bridges
Terry Tamutus, Director of Infrastructure Business Development, Mistras Group, Inc.

In late 2011, the discovery of chloride-contaminated grout in PT tendons led to a heightened awareness of potential tendon failures. Tendons have failed on several U.S. bridges and in Europe—some only 7 and 15 years old. In the UK, corroding internal tendons closed a major bridge in London. In Virginia and Texas, tendons have broken. In-service PT tendon inspection methods are still not well-known to DOTs.

Tendons were designed to be maintenance free, but they are also difficult to inspect because steel tendons are inaccessible. They can be encased in grout, metal, or plastic or sometimes buried in concrete. In 2007, Dr. Washer of the University of Missouri stated to Congress, "An important gap in research presently is effective methods for the condition assessment of prestressed and post-tensioned bridges. For these structures, prestressing strands or tendons that play a critical role in structural performance are embedded in concrete, such that they are unavailable for visual inspection. These tendons are highly susceptible to the effects of corrosion, and tendon failures have been experienced in the field. It should be noted that the construction of bridges with these design features began on a widespread basis in the 1960s, such that this population of bridges is just now reaching 50 years of age. New bridge designs, such as cable-stayed bridges, also utilize these strands within the main stays … The critical need for research and development to address this gap is urgent."

After surveying experts, our scientists and engineers have found several ideal technologies and some with field experience. Methods discussed as possible solutions for PT tendon inspection were ultrasonics, radiographic, computed digital radiography, ground-penetrating radar, magnetic flux leakage, eddy current, electromagnetics, impact echo, acoustic emission (AE), and infrared thermography. This presentation will discuss four methods and their findings. AE monitoring of wire breaks was done as early as 1972 and currently there are many using AE monitoring. This report will discuss an ongoing application for the Hammersmith PT Flyover Bridge. AE monitoring has been used on internal and external tendons and cable stays for over a decade and is recommended in NCHRP 353 and NCHRP 534 for wire breaks. The potential for AE tendon monitoring to detect localized active corrosion will also be discussed.

Monday, May 6—Session #4: Durability of Infrastructure, cont.

4:15 p.m. – 4:40 p.m. Fracture Projection for Corroding Post-Tensioned Wire and Strand
William H. Hartt, PhD, PE, F-NACE, Professor Emeritus, Florida Atlantic University

A sampling of unbonded post-tensioned (PT) strands was recovered from a relatively large structure 9 years after substantial completion, and the extent of corrosion inboard of anchorages was quantified at the location along individual wires where metal loss was greatest. From the remaining cross section area of strands that had experienced corrosion and assuming—first, a time at which corrosion initiated and second, that corrosion rate was constant during the preceding and ensuing periods—the rate of future area reduction was characterized. Based on a separate study that provided a statistical representation of the residual fracture strength of PT wires with varying degrees of corrosion and statistics of wire cross section area reduction over time for the above structure, it was possible to project the rate at which future wire and strand fractures would occur. The analysis is applied to, first, unbounded, and second, bonded PT tendon systems with physical or chemical (excess chlorides) grout deficiencies (or both); and the approach is proposed as a methodology for projecting the future performance of such structures.

4:40 p.m. – 5:05 p.m. Corrosion Mitigation Options for Post-Tensioned Structures
Garth Fallis, P.Eng., Vice President, Vector Construction

Corrosion of the strands in post-tensioning is a serious structural and safety concern. Bonded post-tensioned tendons may corrode and present unique challenges when this corrosion risk is present due to the installation of insufficient, defective, or contaminated grout. The tendons can also corrode if the grout becomes contaminated with chlorides or other chemicals after it is installed. Another factor is that voids in the grout in the ducts increase the risk of corrosion by allowing water and chlorides to get into the ducts and the voids. Until now, there have been limited solutions to address the corrosion actively and ultimately slow it down or potentially stop it.

This presentation will focus on corrosion mitigation options for slowing or stopping the future corrosion activity in post-tensioning. These methods can be used on both bonded and unbonded tendons as well as for prestressing strands. These technologies include tendon drying, corrosion inhibitor impregnation, void detection, regrouting technologies, and other methods.

Monday, May 6—Session #4: Durability of Infrastructure, cont.

5:05 p.m. – 5:30 p.m. Innovations in Bridge Superstructure Condition Assessment with Sonic and Radar Methods
Larry D. Olson, P.E., Principal Engineer, Olson Engineering, Inc., and Patrick Miller, P.E., Sr. Project Engineer, Olson Engineering, Inc.

Results are presented for nondestructive evaluation (NDE) of concrete bridge girders and decks with sonic impact echo scanning (IES) with a handheld scanner for voided versus grouted post-tensioned ducts and a bridge deck scanner for deck conditions (void, honeycomb, delamination), respectively. Structural health monitoring (SHM) of displacements and vibrations of bridges with non-contacting interferometric phase radar are also discussed. The use of IES allows for much more rapid and closely spaced sonic testing of concrete bridge girders and decks than was previously possible with sonic methods. Specific IES applications to date include the following: 1) checking for areas of poorly grouted/voided ducts that are at risk of corrosion in post-tensioned bridge ducts; 2) concrete bridge deck scanning to identify areas of delamination and cracking damage due to reinforcing bar corrosion for repairs; and 3) bridge deck scanning to check for areas of internal void/honeycomb, concrete integrity, and thickness. Similarly, the use of interferometric phase radar with the IBIS-S system allows for rapid load testing of bridges by precise measurements of displacements to a precision of up to 0.0004 in. (0.01 mm) and vibration frequencies from 0 to 100 Hz for concrete and steel bridges.

Tuesday, May 7

Session #5: Retrofit/PT Applications

Session Moderator: *Neel Khosa, Vice President, AMSYSCO, Inc.*

8:00 a.m. – 8:05 a.m. Session Introduction
Neel Khosa, Vice President, AMSYSCO, Inc.

8:05 a.m. – 8:30 a.m. External Post-Tensioning of Existing Steel Bridges
Clyde Ellis, Vice President, VSL

Many bridges have been found to be understrength because of increased loads, widening of the bridge deck, or change of the type of traffic. In many cases, bridges that rate low are strengthened with conventional methods.

Increasing live load capacity using external tendons for steel girders, truss chords, and floor beams has been used successfully since the 1960s. The addition of longitudinal post-tensioning tendons is an effective means of reducing tension overstresses resulting from service load and fatigue stresses. The post-tensioning system is relatively lightweight, resulting in a nominal increase to the dead load. The structural benefits of a post-tensioning system include: improved fatigue category details, increased bending moment capacity, and reduced deflections. This technique is growing in popularity because of the speed of construction and the minimal disruption to traffic flow. This presentation will provide information on how this technique can be applied.

Tuesday, May 7—Session #5: Retrofit/PT Applications, cont.

8:30 a.m. – 8:55 a.m. Infrastructure and Unbonded Post-Tensioning
Neel Khosa, Vice President, AMSYSCO, Inc.

This presentation features a nontechnical case study on the use of unbonded post-tensioning in pedestrian bridges and slab-on-ground roadways.

8:55 a.m. – 9:20 a.m. External PT Splices for Tank Modifications
Hume Ross, Project Manager, VSL

This presentation focuses on the design and installation of a retrofit new sluice gate to an oxidation ditch. The oxidation ditch consists of concrete rings reinforced with internal unbonded PT tendons. The retrofit required VSL to develop and plan a fast turnaround with limited access and that all work be completed within the 36-hour shutdown.

9:20 a.m. – 9:45 a.m. High-Capacity PT Rock Anchors—Implementation of a Quality Assurance Program
Julio Diamante, P.E., Sr. Geotechnical/Structural Engineer, D&B Consulting Engineers

High-capacity rock anchors (HCRAs) are a viable deep foundation solution when structures need to counteract large uplift and horizontal forces. The system has increased in complexity during the last 50 years, allowing engineers to increase the anchor's design load and extend their service life. The implementation of a well-planned QA/QC program is a key factor to deliver the best possible product. The presentation will guide the assistants through the minimum quality controls to be performed during the installation of HCRAs.

Session #6: Repair/Retrofit

Session Moderator: *Garth Fallis, P.Eng., Vice President, Vector Construction*

10:15 a.m. – 10:20 a.m. Session Introduction
Garth Fallis, P.Eng., Vice President, Vector Construction

10:20 a.m. – 10:45 a.m. External Post-Tensioning Repair of a Parking Structure with Limited Access
Kyle Stanish, Ph.D., S.E., P.E., Project Manager, Walker Restoration Consultants, and Daniel E. Moser, S.E., P.E., Principal and Department Head, Walker Restoration Consultants

An 11-level parking structure in Indianapolis, IN, required significant rehabilitation. It was originally constructed in 1969 using a button-head post-tensioning system in both the beams and one-way slabs. Among other deterioration, significant cracking and corrosion had developed in the beams. To address this issue, the beams were strengthened using external post-tensioning. The design and installation was complicated by the restricted access to the outside face of the edge columns, limiting the locations where it was possible to anchor the tendons. For several locations, it was necessary to install the external post-tensioning anchorage plates slotted through the columns. During the repairs, alternative approaches to the external post-tensioning repairs became possible, as original as-built details were uncovered. It was discovered that the tendons for the two-span beams had an intermediate anchor, which allowed the repair of a single span of the two span beams where appropriate.

10:45 a.m. – 11:10 a.m. Strengthening of Large Storage Tank Foundation Walls in an Aggressive Environment by External Post-Tensioning
Dominique Deschamps, Technical Director, Freyssinet Inc.

In 2010, three large petroleum product storage tanks servicing the Port of New York, each with a capacity of 115,000 barrels of petroleum product, were found to have structural deficiencies in the foundation system. The tank foundation perimeter ring walls (116 ft, 0 in. diameter) exhibited significant cracking and displacement due to insufficient reinforcing to contain tensile stress induced by tank loading. Furthermore, the tanks are located in an aggressive environment subject to frequent coastal flooding and persistent water infiltration surrounding the tank foundation. This presentation details a repair method using external post-tensioning that restored the structural integrity of the ring walls while providing high durability and quick installation, which minimized in-service shutdown. The discussion includes explanation of the analysis and design approach that uses post-tensioning to actively compress the ring wall and balance tensile stress, and continues with a description of the special external post-tensioning system used to enable durability while exposed to an aggressive environment. Discussion also includes a detailed description of the site installation of the external tendons.

Tuesday, May 7—Session #6: Repair/Retrofit, cont.

11:10 a.m. – 11:35 a.m. Replacement of Post-Tensioned Strands from Below-Grade Structures
Richard Mitchell, P.Eng., LEED AP, Design Engineer, Read Jones Christoffersen Ltd.

This $2.5 million project included replacement of 100% of the PT strands (over 500) from the beams of a largely below-grade, four-level parking structure. Supervised by Dennis Gam, PEng, we designed a program that allowed the contractor to replace the strands from within the structure rather than from the below-grade exterior. This interior replacement approach was more complex, but it saved $1,000,000 in excavation costs associated with a standard exterior replacement approach.

A discussion will include standard approaches to PT strand replacement; the standard approaches that do not work below grade; details of the interior replacement approach, including the installation of new inset anchors on each strand; and the load transfer from the inset strands back into the existing structure by newly installed concrete pilasters.

11:35 a.m. – 12:00 p.m. Repairs to Parking Ramp Structures with Corroded Button-Head Systems
Gabriel A. Jimenez, PhD, P.E., S.E., P.Eng., Principal/Managing Director, Walter P Moore

The repairs of parking ramp structures with unbonded wire systems, commonly known as the "button-head" system, are considered one of the most difficult repairs in the industry. Even though this system is no longer specified in the industry, there are a significant number of legacy structures with this type of system. The reasons why this post-tensioned system has not performed as initially planned include the labor-intensiveness of wrapping tendons by hand, poor construction details, and corrosion protection. This presentation provides a review of the typical problems experienced by parking ramp structures with button-headed systems and presents guidelines for repair strategies for such structures.

Session #7: Buildings

Session Moderator: *Thomas Kang, Ph.D., P.E., Seoul National University*

1:00 p.m. – 1:05 p.m. Session Introduction
Thomas Kang, Ph.D., P.E., Seoul National University

1:05 p.m. – 1:30 p.m. Post-Tensioning Projects in the Middle East and Gulf Regions
Ziad Nasser, Branch Manager for CCL KSA (Saudi Arabia), CCL Group

The building market boom of the Middle East gave rise to a wave of glorious projects mostly built using post-tensioning. This presentation will offer a glimpse of the post-tensioning market in several countries and showcase some of the projects. It will highlight why post-tensioning was used and the benefits it brought to these projects.

Tuesday, May 7—Session #7: Buildings, cont.

1:30 p.m. – 1:55 p.m. Diversion of Prestress Effects in Strength Design of Post-Tensioned Structures
Jonathan Hirsch, P.E., Development Manager, Bentley Systems, Inc.

Diversion of prestress is a common phenomenon in post-tensioned structures. Oftentimes, rigid shear walls divert prestress away from the floors that they are intended to reinforce, resulting in a reduction of prestress in the floors. It is intuitive to account for this reduction of prestress in serviceability checks by adjusting the calculated gross stresses. However, this behavior also significantly impacts strength—an effect that is sometimes ignored completely by engineers. One way to account for this effect in design is by using a complete set of secondary forces. The importance of incorporating the effects of secondary moments into the strength design of post-tensioned structures is well documented and is an accepted part of standard design practice. Early post-tensioning design software considered these effects automatically. However, the analyses performed in early frame analysis software lacked the ability to accurately account for external restraint and other common sources of secondary axial forces. As a result, the inclusion of secondary axial forces in strength design is a far less recognized but no less important phenomenon. With the advent of modern finite element software, the effects of external restraint and other diversion behaviors can be predicted with much greater accuracy. As a result, it is generally appropriate to consider the entire set of secondary forces in strength design, including axial forces, moments, and shears. Secondary axial forces are normally most significant in structures with high external restraint, but can also be present in completely unrestrained structures. This presentation will discuss the effects of diversion of prestress and their treatment using secondary axial forces in the analysis and design of post-tensioned structures.

1:55 p.m. – 2:20 p.m. Corner Connections in PT Flat Plate Buildings
Thomas Kang, Ph.D., P.E., Seoul National University

The behavior of corner post-tensioned (PT) slab-column connections was rarely studied. This study performs in-depth research for better understanding of complicated moment and shear-transfer mechanism at corner PT slab-column connections. Literature was reviewed and finite element simulations were performed on two previously tested isolated corner PT connections. The documented test results, along with the finite element simulations, provide an innovative way to review the scarce test data in detail. Using such a unique approach, ACI 318 punching shear provisions were assessed for possible update.

Tuesday, May 7—Session #7: Buildings, cont.

2:20 p.m. – 2:45 p.m. Challenges of Post-Tensioning Design in the International Market
Florian Aalami, PhD, President & CEO, ADAPT Corporation, and Spencer R. Lee, PE, SE, Vice President of Client Services, ADAPT Corporation

Outside North America, there are various construction technologies and methods; prevailing building codes; design experiences; relative costs of labor to material; and, in particular, relative costs of reinforcing bars to post-tensioning. Coupled with differences in understanding of post-tensioning principles, interpretations of building codes, and expectations from post-tensioning, this leads to a plethora of options in design and construction, each addressing the specific conditions of the project's locality. Based on first-hand experience, the presenter will review the critical parameters and unique challenges for efficient design worldwide, where post-tensioning is used and becoming more widely accepted in building construction.

Session #8: Buildings/Slab-on-Ground

Session Moderator: *Ryne Stoker, PE, Principal Engineer, GeoTek Operations Limited*

3:30 p.m. – 3:35 p.m. Session Introduction
Ryne Stoker, PE, Principal Engineer, GeoTek Operations Limited

3:35 p.m. – 4:00 p.m. Recent Developments of PT Research in Korea
Thomas Kang, Ph.D., P.E., Seoul National University; Yongnam Kim, Deputy General Manager, Samsung C&T Corporation; and JK Yoon, Manager, Daelim Industrial

In Korea, a series of interesting practical research programs have been and are being developed regarding post-tensioned concrete elements and systems. This presentation will introduce such ongoing efforts and preliminary research results, which would also be beneficial to the engineers in North America and other continents.

4:00 p.m. – 4:25 p.m. Design of Slabs-On-Ground— New Standard & Certification
Ryne Stoker, PE, Principal Engineer, GeoTek Operations Limited

Geotechnical slab-on-ground (SOG) design has changed slightly with the new combined standard, which is set for inclusion in the 2015 International Building Code. The speaker will discuss some of these changes.

In addition, much discussion has been given to the misapplication of geotechnical design requirements by practicing engineers; to address these items, the SOG committee has taken a two-prong approach: 1) develop a certification program; and 2) develop a design guide. The progress made and the intent of both efforts will be discussed.

Tuesday, May 7—Session #8, cont.

4:25 p.m. – 4:50 p.m. Adaptation of PTI Method for Slabs-on-Ground Foundation in Brazilian Condition

Fabio Albino de Souza, Civil Engineer - CEO EBPX – Escritório Brasileiro de Protensão, Master of Science Student – State University of Campinas – UNICAMP

In recent years, the Brazilian construction sector registered a strong growth due to the combination of several factors, but the most important was the creation of government programs (Programme for Acceleration Growth and My House, My Life). With that there was a great demand for new construction methods and construction techniques that generally exhibit characteristics and principles of constructive rationalization. The purpose of this presentation is to show the use of the PTI Method for slab-on-ground foundations, with the main application in low-cost housing for Brazilian conditions. We know that the type of soil and climatic conditions in Brazil are very different from those in the United States and since this date in Brazil there is no specific standard for slab-on-ground, then these parameters could serve as a consultation in the near future. Thus, this work will present a case study about the use of the PTI Method, where applications and proposed recommendations for Brazilian conditions resulted in design of post-tensioned slab-on-ground foundations safe and economical.