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KORAY TUREYEN, PH.D., P.E.
SENIOR MANAGING CONSULTANT

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Dr. Koray Tureyen, a Senior Managing Consultant, is deeply committed to probing and resolving a wide array of intricate engineering issues at all scales, employing a blend of evidence collection, analysis and research, and insights gained from experience. During his 22-year career he has thought at Purdue University and consulted at Wiss, Janney, Elstner Associates Inc. and Engineering Systems, Inc. which provided him with a broad-based experience on a wide range of engineering and architectural disciplines and sectors. and has a deep understanding of mechanical behavior and distress mechanisms of today's engineering materials. In addition to these technical skills, Dr. Tureyen has also been involved in business development within the engineering and architecture sector throughout his career. This broad range of experiences has equipped him with a comprehensive understanding of both the technical and commercial aspects of the construction industry.

Dr. Tureyen has conducted forensic investigations to identify root causes of failure of various structural and architectural systems. To name a few, he has investigated issues with foundations, slabs on ground, parking structures, transportation structures, auditoriums, hospitals, high rise structures of concrete, steel, masonry and wood construction, traditional and renewable energy structures, various façade systems, roofing and waterproofing systems, and coatings. These forensic investigations have involved utilization of a combination of advanced structural analyses, materials and failure mechanism characterization through chemical, petrographic and metallurgical analyses, and non-destructive inspection and testing methods. Therefore, Dr. Tureyen possesses a robust understanding of cross-disciplinary investigation techniques, which he uses to discern the relationships between symptoms of distress and their root causes.

Dr. Tureyen also has a wealth of experience in assessing damage to the built environment after disasters such as earthquakes, wind, fire, explosion and water exposure. He has conducted assessments of damage on a wide range of structures constructed of reinforced, pre/post-tensioned concrete, steel, masonry, and wood, as well as architectural components and systems such as facades, roofing and waterproofing. He was also often involved in the repair, rehabilitation and strengthening of structures he assessed, and therefore, has gained design experience.

Dr. Tureyen's recent work has focused on solar and wind energy generation structures, communication towers, reinforced and post tensioned concrete structures, exterior envelopes of commercial and university buildings and fire research laboratory facility repair and renovations.

Areas of Specialization and Practice

- Failure investigation
- Pre/post-tensioned concrete structures
- Explosion/fire damage assessment
- Post-earthquake/wind damage assessment
- Advanced structural analyses
- Earthquake and wind engineering
- Renewable energy structures
- Telecommunication structures
- Non-destructive inspection
- Instrumentation and monitoring
- Steel, masonry, and wood construction
- Building façade systems
- Roofing and waterproofing
- Transportation structures
- Soil structure interaction
- Geotechnical engineering
- Fiber reinforced polymer materials
- Concrete petrography and chemistry
- Corrosion, fatigue, and fracture

Education

Ph.D., Civil Engineering, Purdue University, 2001

B.Sc., Civil Engineering, Middle East Technical University, 1997

Registered Professional Engineer (PE)

State of Michigan: License No. 6201052221

Certifications

Fracture Critical Insp/ Steel Bridges NHI 130078 Certification

Professional Affiliations

American Concrete Institute
- Committee 408 - Bond and Anchorage (past)
- Committee 445 - Shear and Torsion (past)
- Committee 349 - 00 Concrete Nuclear Structures
- Committee 349 - 0B Nuclear Structures-Design

BSSC 2023 Provision Update Committee
- Issue Team #1- Soil-structure interaction (current)
- Issue Team #6- Two-stage analysis provisions (current)

American Society of Civil Engineers
- Member

Precast-Prestressed Concrete Institute
- Past member

Languages

Fluent in Turkish

Positions Held

Engineering Systems, Inc., Aurora, Illinois

Senior Managing Consultant, Civil-Structural Engineering

Wiss, Janney, Elstner Associates, Inc.

Senior Associate, August 2007 – March 2024 (Northbrook, Illinois)

Associate I through III, July 2002 – August 2007 (Detroit, Michigan)

Purdue University, West Lafayette, Indiana

Adjunct Professor, January 2002 – June 2002

Peer Reviewer

American Concrete Institute, Structural Journal

American Society of Civil Engineers, Journal of Structural Engineering

Technical Publications

Tureyen, AK, “Influence of Longitudinal Reinforcement Type on the Shear Strength of Reinforced Concrete Beams without Transverse Reinforcement,” Ph.D. Thesis, Purdue University, December 2001, 232 pp.

Tureyen, AK, Frosch, RJ, “Shear Tests of FRP Reinforced Concrete Beams without Stirrups,” ACI Structural Journal, Vol. 99, No. 4, Jul-Aug 2002, 427-434

Mosley, CP, **Tureyen, AK**, Frosch, RJ, “Performance Related Specifications for Concrete Bridge Superstructures; Vol.3: Nonmetallic Reinforcement,” JTRP Final Report, Report No. FHWA/IN/JTRP-2001/08-III, Oct 2002

Tureyen, AK, Frosch, RJ, “Shear Strength of Concrete: Another Perspective,” ACI Structural Journal, Vol. 100, No. 5, Sep-Oct 2003, 609-615

Tureyen, AK, Wolf, TS, Frosch, RJ, “Strength of Reinforced Concrete T-beams in Shear,” ACI Structural Journal, Vol. 103, No. 5, Sep-oct 2006, 656-663

Anderson, NS, **Tureyen, AK**, Meinheit., DM, “Design Criteria for Headed Studs-Tension and Combined Tension and Shear. Phase 2 Wiss, Janney Elstner Associates Inc. report to PCI, 2nd draft”, 2007 https://doi.org/10.15554/pci.rr.conn-005

Tureyen, AK, Anderson, NS, Meinheit, D., “Permutations of The Combined Tension and Shear (N-V) Interaction for Headed Studs”, 2nd International Symposium on Connections between Steel and Concrete, Stuttgart, Germany, September 4-7, 2007

Mosley, CP, **Tureyen, AK**, Frosch, RJ, “Bond Strength of Nonmetallic Reinforcing Bars,” ACI Structural Journal, v.105 n. 5, September/October 2008, 634-642

Anderson, NS, **Tureyen, AK**, Meinheit, DF, “Tension Tests of Headed Stud Anchorages In Narrow/Thin Edge Members”, Befestigungstechnik, Bewehrungstechnik und. 2, Rolf Eligehausen zum 70. Geburtstag / Werner Fuchs; Jan Hoffmann (Hrsg.), 2012

Kehoe, B, **Tureyen, AK**, “Seismic Evaluation of Concrete Wall Buildings”, 15th World Conference on Earthquake Engineering, Proceedings, Lisbon, Portugal, 2012

Tureyen, AK, et.al., “ACI PRC-408.2-12 Report on Bond of Steel Reinforcing Bars Under Cyclic Loads”, American Concrete Institute, Farmington Hills, MI, 2012.

Hou, X, Powers, LJ, Lawler, JS, **Tureyen, AK**, “Thaumasite Sulfate Attack: Case Studies and Implications,” ICMA Conference Proceedings, 37th, 2015, 23

Klein, GJ, Rezaei, N, Garber, D, **Tureyen, AK**, “Shear in Discontinuity Regions: Changes for the ACI 318 Building Code”, Concrete International (ACI), 41(5), September/October 2012, 36-41

Itle, KM, **Tureyen, AK**, “Failures- Roof Drainage: Consider the Details,” Construction Specifier, Dec 2022, 50

Technical Presentations

Tureyen, AK, Irfanoglu, A, "2023 Kahramanmaraş, Türkiye Earthquake Sequence", ISEA Spring Conference, March 7, 2024.

Tureyen, AK, Chancellor, B, "Building and Infrastructure Performance During the Kahramanmaraş Earthquake Sequence", IABSE Webinar, December 12, 2023.

Tureyen, AK, Nelson, T, "It's Simple! It is Only Concrete Core Compressive Strength Testing", WJE Webinar Series, December 17, 2020.

Tureyen, AK, "Case study: The mysterious Case of Staining of a Breathable Exterior Coating", WJE Internal Conference, 2015.

Tureyen, AK, "UIUC Natural History Building Elevated Floor Slabs Assessment, Load Testing and Strengthening", WJE Internal Conference, 2015.

Tureyen, AK, "Slab Strengthening at an Early 20th Century Historic Building: A Forensic Case Study", CE 691S Structural Engineering Seminars – April 5, 2016

Tureyen AK, Nelson, T, "Slab-On-Grade: Introduction to Design Considerations", WJE Internal Webinar, 2012.

Tureyen, AK, Hill, H, "Understanding Then Fixing of a Bungled Seismic Retrofit of a 1960s Hospital Building", WJE Internal Conference, 2011.

Tureyen, AK, Anderson, NS, Meinheit, DF, ""Permutations of The Combined Tension and Shear (N-V) Interaction for Headed Studs", 2nd International Symposium on Connections between Steel and Concrete: University of Stuttgart, September 4th - 7th, 2007

Tureyen, AK, Anderson, NS, Meinheit, DF, "Design Criteria for Headed Studs-Tension and Combined Tension and Shear. Phase 2", PCI Annual Convention/Exhibition and National Bridge Conference, Grapevine-TX, October 22–25, 2006

Tureyen, AK, Frosch, RJ, "Proposal for Unification of Slender Beam Shear Strength Equations in ACI 318-08", Presentation to ACI 445 Committee during the ACI-ASCE 445 Fall meeting in Kansas City, KS, 2005.

Selected Project Experience

Failure Investigation

Failure investigations conducted to date ranged from various materials and structural and architectural systems such as reinforced/prestressed/post-tensioned concrete, steel, and wood. Investigations that were conducted ranged from determining the root cause of structural failures in steel and wood structures during construction to determining root causes of water intrusion in architectural systems such as windows, curtainwalls, stucco, EIFS and masonry façade systems as well as coating systems. These investigations were often multi-disciplinary in nature and involved advanced structural analyses, petrographic, chemical, and metallurgical analyses for materials and failure characterization and non-destructive testing techniques as well as field instrumentation and testing.

Communication Towers

These projects involved failure investigation of masts on communication towers and design review and consulting for improvement. Various entities were served as part of these efforts including owners, design services providers, manufacturers and erectors and the Division of State Architect of California, California Highway Patrol and Department of Forestry and Fire Protection.

Failure investigation projects typically involved metallurgical studies and advanced vortex shedding analyses of tower mast and lightning rods which are susceptible to fatigue failure. Design review and modification to improve fatigue strength of multiple communication tower masts and lightning rods were conducted.

Solar Power Generating Stations

Multiple projects. These projects involved structural design peer review of new solar power generation station trackers from several different manufacturers including NexTracker, Array, GameChange, PVH Hardware, etc. on behalf of owners and contractors. Also investigated failures at multiple solar power generating stations after various wind events as well as after operational failures. Generally, contractors were served for these services.

These projects typically involved generation of static and dynamic loading from wind tunnel studies conducted on the tracker systems, modeling of trackers and analyses using loads developed, and checking all components and connections of the solar tracker systems as well as their pile foundations.

On occasion, corrosion engineering services were provided to peer review findings of soil corrosivity studies by third parties, and design assist and quality assurance services for corrosion protection of pile supports installed in medium to high corrosion potential soils.

Failure investigation of multiple single axis and double axis solar tracking systems generally involved component failures due to design errors by the tracker system manufacturer or foundation designer.

Wind Power Generating Stations

Multiple projects. These projects typically involved design review of land-based wind turbine foundations, feasibility studies of existing wind turbine foundations for repowering reuse, and partially collapsed wind turbine tower demolition plans. These projects were typically conducted on behalf of contractors serving owners or on behalf of designers of these facilities.

Due to the large size of turbine foundations and difficulties in detailing/placement of reinforcing embedded in the foundations and difficulties involved in estimating ultimate load and fatigue strength of such foundations, these projects typically involved significant analytical effort to quantify both demand and strength for foundation elements.

Safe demolition of partially collapsed wind turbine towers pose unique challenges such as design of direction of full demolition, consideration of wind loads on the partially collapsed structure, stability of partially collapsed structure during preparation for demolition and during demolition activities among others. Various methods including simultaneous cutting and pulling as well as blast-based cutting and demolition were used.

Earthquake Engineering

Multiple Projects. These projects typically involved desk-top assessment of existing structures using ASCE 7 evaluation criteria. In one case, a botched seismic retrofit design for a six-story reinforced concrete hospital building by another design firm was studied and modifications to the seismic retrofit were designed on behalf of the owner. In another case, seismic robustness of a highly irregular reinforced concrete fire station on a nuclear waste storage and conversion facility was studied and the building's resilience was characterized in terms of its ability to resist an earthquake of a given return period. Clients for these projects were the state department, nuclear regulatory commission, and building owners.

In addition to analytical experience with earthquake engineering, participated in two post-earthquake reconnaissance teams after the 1999 Duzce and Kocaeli earthquakes, and the 2023 Kahramanmaras and Elbistan earthquake sequence in Turkiye. Data was collected from regional reinforced concrete building

stock for the purpose of learning from damage observed and collected information was disseminated to the general engineering and construction community to improve design and construction of new structures.

Non-Destructive Inspection, Instrumentation and Monitoring

Instrumentation and monitoring projects typically involved installation vibration, acoustic emission and strain measurement equipment and monitoring of existing structures to determine whether standardized damage thresholds are exceeded during adjacent/nearby construction activities or to monitor continued deterioration of existing structures due to known causes.

Non-destructive inspection techniques such as eddy current and ultrasonic flaw detection systems, ground penetrating radar, MIRA shear wave, impact echo/response, thermal imaging, multi-channel analysis of surface waves (MASW) and surface wave analysis of surface waves (SASW) have been also employed as part of various investigations.

Fire and Wind Damage Assessment

Fire damage assessments were conducted on various construction materials and systems including wood construction consisting of traditional lumber, glued laminated composites, and metal plate connected wood trusses, structural steel construction including welded plate construction and open webbed steel trusses, concrete construction including reinforced and prestressed concrete structures. Clients for these projects were typically insurance providers.

Wind damage assessment projects were completed after wind events such as hurricanes, a derecho wind event, and tornadoes. These assessments were generally focused on roofing and façade system damage characterization, but also required assessment of structural damage after some tornadoes. Clients for these projects were typically insurance providers.