



David Kosnik, Ph.D., P.E.

SENIOR ENGINEER

Dr. Kosnik draws from his dual background in civil and computer engineering to develop innovative performance monitoring and evaluation solutions for in-service infrastructure. His experience includes both long-term, continuous remote monitoring and short-term tests of occupied buildings, in-service bridges and structures, industrial facilities, movable structures, structures subject to ground vibration, and infrastructure vulnerable to hydraulic and geo-hazards. In addition, Dr. Kosnik is recognized internationally for his applications of acoustic emission technology to diagnose and evaluate structures and mechanical systems.

Dr. Kosnik's monitoring strategies link measured quantities to specific limit states or performance metrics to support infrastructure management decisions, particularly those related to risk management, beyond-design-basis events, evaluation of retrofits and life extension efforts, characterization of damage progression, and early warning of possible disruption. In addition, he has developed software and methods to support aggregation and analysis of large, heterogeneous data sets ("big data") for structural/mechanical performance monitoring, forensic engineering, and root cause analysis.

Prior to joining CTLGroup, Dr. Kosnik was a researcher at the Northwestern University Infrastructure Technology Institute, a multi-disciplinary center dedicated to research, education, and technology transfer to improve the nation's transportation infrastructure.

Dr. Kosnik has authored a number of peer-reviewed journal articles and conference papers on structure monitoring, acoustic emission technology, and computing in civil engineering, and speaks at national and international technical symposia on a regular basis. He has taught units in structural investigation and monitoring in civil engineering courses and serves as a peer reviewer for academic journals, industry publications, and conferences.

Academic Credentials

Ph.D. in Civil Engineering
Northwestern University, 2012

M.S. in Civil Engineering
Northwestern University, 2009

B.S. in Computer Engineering
Northwestern University, 2003

Licensure/Certification

Professional Engineer
IL, KY, TX

NCEES Record

FAA Part 107 sUAS ("drone")
Remote Pilot Certificate

PADI Adv. Open Water Diver

Contact Information

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Representative Project Experience

Performance Monitoring and Dynamic Characterization of In-Service Structures

- Designed and deployed an automated system to measure dynamic response of a several-hundred-foot-long pipe support structure at an energy facility to characterize its behavior under unanticipated flow regimes.
- Designed, deployed, and operated a system for monitoring differential settlement/heave related to alkali-silica reactivity on concrete pedestal structures for two 34-meter antennas of the NASA/JPL Deep Space Network. As the antennas are used to communicate with distant spacecraft, even relatively small pedestal displacements may impact mission performance.
- Led installation and operation of a combined bridge structural monitoring and weigh-in-motion system on a logging-truck-route bridge in northern Wisconsin; the acquired data were used to evaluate effects of increased truck weight limits on the structure.
- Managed system installation and data analysis for continuous remote monitoring of a Chicago Transit Authority elevated train overpass to evaluate retrofit performance.
- Conducted field tests of on the East Huntington Bridge (Huntington, West Virginia) to characterize the dynamic response of stay cables and to obtain measurement-based estimates of cable damping and tension as part of a recurring inspection program.
- Designed and deployed a structural monitoring system as part of load testing at a nuclear power plant in Michigan; tests were conducted to validate structural response to new, heavier-than-design cask transporter loads.

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Infrastructure Monitoring for Risk Management: Adjacent Construction, Resource Extraction, and Geo-Hazards

- Deployed a system of monitoring devices to help a prominent Chicago-area university manage structural/foundation risks associated with demolition and new construction on an urban campus. This distributed system of ground vibration, foundation settlement, and structure tilt measurements quantified possible effects of the work on an adjacent building owned and occupied by a third party.
- Deployed and operated an automated vibration monitoring system for a historic building in Washington, DC during reconstruction of an adjacent city street. The system characterized vibration and corresponding building response while meeting strict federal requirements for historic preservation and site security.
- Led system installation and data analysis for continuous remote monitoring of structure response to limestone quarry blasting at sites in Florida and Illinois.
- Developed software and methods to support interpretation of real-time and historic data from (1) tilt-based scour monitoring at seven highway bridges across California and (2) time-domain reflectometry monitoring against sinkhole, slope instability, and mine subsidence hazards in Ohio, Indiana, and Florida.

Acoustic Emission (AE) Technology

- Ongoing AE monitoring of life extension efforts related to trunnion bearings on a 100+ year old bascule bridge carrying a Class I railroad over a commercial waterway.
- Conducted AE field tests to identify source locations of audible noises during operation of movable stadium roof (Miller Park, Milwaukee, Wisconsin).
- Conducted AE tests during commissioning of a new swing bridge carrying a four-lane arterial street over a commercial waterway to locate and characterize unexpected noises during movements. Analysis identified two unrelated noise mechanisms that had been indistinguishable during previous investigations by ear alone.
- Conducted AE tests to locate sources of anomalous audible noises during commissioning of a new rolling bascule bridge carrying a city street over a commercial waterway. The noises were found to be benign and the bridge opened on schedule.
- Deployed AE monitoring during standardized fatigue testing of large steel castings to characterize development and progression of cracks.

Technology Development and Industrial Research

- Ongoing development of data acquisition, aggregation, and visualization software and methodologies for experimental evaluation of industrial process control devices at a Fortune 500 company.
- Developed and deployed scalable, extensible, and adaptable data aggregation and Web-enabled visualization tools for engineering data obtained from 27 remote structure performance/health monitoring installations in 11 states and DC.

Forensic Engineering and Failure Analysis

- As part of litigation regarding structural damage allegedly caused by blast-induced ground vibration from a limestone quarry, developed software and methods to analyze 35,000 pages of records from 30 years of blasting and visualize the results in time and space. Analyzed blast designs and vibration data to evaluate damage claims.
- Investigated ceiling collapse in a repurposed underground limestone mine, including planning and execution of small unmanned aerial system flights within the cavern to collect imagery safely from areas of ongoing rockfall.

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Professional Affiliations and Committee Service

Transportation Research Board of the National Academies

- Standing Committee AFF40: Testing and Monitoring of Transportation Structures
 - Member and Secretary (2010-2019)
 - Ad-hoc subcommittee on load test manual revisions (2017 - 2020)
- Task Force ABR35T: UTC Spotlight Conference - Rebuilding and Retrofitting the Transportation Infrastructure (2017-2018)
- Task Force ABJ25T: Traffic Monitoring Conferences (2013-2014)
- Structural Health Monitoring Joint Subcommittee (active 2009-present)
- Weigh-in-Motion Subcommittee (active 2009-present)

Acoustic Emission Working Group - Fellow

- Past Chairman (term ending 2021)
- Chairman, 2015-2019
- Vice-Chairman, 2013-2015
- Secretary, 2011-2013

Int'l Institute for Innovative Acoustic Emission - Fellow

American Society of Civil Engineers - Member

Academy of Model Aeronautics - Member

Peer Reviewer Service

- Journal of Structural Engineering
- Journal of Bridge Engineering
- Journal of Infrastructure Systems
- Journal of Civil Structural Health Monitoring
- Sensors
- Materials Evaluation (ASNT)
- Transportation Research Board Annual Meeting

Publications

Journal Articles

Kosnik, D. and Dowding, C. (2014). "Autonomous monitoring of dynamic response of in-service structures for decision support." *Journal of Structural Engineering*, 10.1061/(ASCE)ST.1943-541X.0001044, D4014003.

Kosnik, D., Zhang, W., and Durango-Cohen, P. (2014). "Application of statistical process control for structural health monitoring of a historic building." *Journal of Infrastructure Systems*, 20(1), 05013002.

Kosnik D. and Henschen, L. (2013). "Design and interface considerations for Web-enabled data management in civil infrastructure health monitoring." *Lecture Notes in Computer Science 8005:107-116 (Human-Computer Interaction Part II)*.

Kosnik, D., Hopwood, T. Kotowsky, M., Corr, D., Marron, D. (2010). "Continuous remote structural health monitoring for life extension of an uplift bearing assembly on a large cantilever truss bridge". *Transportation Research Record* 2201:139-147.

Kosnik, D. (2009). "Acoustic emission testing of a difficult-to-reach steel bridge detail". *Journal of Acoustic Emission* 27:11-17.

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Peer-Reviewed Conference Proceedings Papers

Kosnik, D. (2016). "Review of acoustic emission source mechanisms on large movable structures" [invited paper]. In Progress in Acoustic Emission XVIII: Proc. 23rd Int'l Acoustic Emission Symposium (IAES-23/ICAE-8, Kyoto), pp. 447-455. Japanese Society for Non-Destructive Inspection, Tokyo.

Kosnik, D. (2014). "Brief review of acoustic emission monitoring on two movable bridges". In Progress in Acoustic Emission XVII: Proc. 22nd Int'l Acoustic Emission Symposium (IAES-22 Sendai), pp. 61-66. Japanese Society for Non-Destructive Inspection, Tokyo.

Kosnik, D. (2012). "A combined weigh-in-motion and structural health monitoring system on a Wisconsin-Michigan border bridge". In Proceedings, 6th Int'l Conference on Weigh-in-Motion. Wiley-ISTE.

Kosnik, D., Hopwood, T., and Corr, D. (2010). "Acoustic emission monitoring for assessment of steel bridge details". In Review of Progress in Quantitative Nondestructive Evaluation, Vol. 30B. American Institute of Physics, Melville, New York.

Kosnik, D., Marron, D., Corr, D., and Kotowsky, M. (2010) "Noise localization via acoustic emission monitoring on a rolling bascule bridge". In Proceedings, 2010 International Bridge Conference. Engineers' Society of Western Pennsylvania. Paper No. IBC-10-68.

Kosnik, D., Kotowsky, M., Marron, D., Dowding, C., and Finno, R. (2010). "Autonomous Condition Monitoring of an In-Service Historic Utility Tunnel". In Compendium of Papers, 89th Annual Meeting of the Transportation Research Board. Paper ID 10-2422.

Kosnik, D. (2009). "Autonomous crack displacement monitoring of a residence near a quarry". In Proceedings, 35th Annual Conference on Explosives and Blasting Technique. Int'l Society of Explosives Engineers, Cleveland, Ohio.

Kosnik, D. and Hopwood, T. (2008). "Monitoring of in-situ strains in bearing assembly anchor bolts on a large through-truss bridge". In Proceedings, SMT 2008: NDE/NDT for Highways and Bridges, pp. 233-239. American Society for Nondestructive Testing, Columbus, Ohio.

Kosnik, D. and Marron, D. (2007). "Acoustic emission evaluation of retrofits on the I-80 Bryte Bend Bridge, Sacramento, California". In Advances in Acoustic Emission: Proc. Sixth International Conference on Acoustic Emission (Kanji Ono, editor), Acoustic Emission Working Group, Colorado, USA. Pages 179-183.

Kosnik, D. (2007). "Internet-Enabled Geotechnical Data Exchange". In Proceedings, FMGM 2007: Int'l Symposium on Field Measurements in Geomechanics. Geotechnical Special Publication No. 175, ASCE.

Kosnik, D., Kotowsky, M., Dowding, C., and Finno, R. (2007). "Case studies in integrated autonomous remote monitoring". In Proceedings, FMGM 2007: Int'l Symposium on Field Measurements in Geomechanics. Geotechnical Special Publication No. 175, ASCE.

Kosnik, D. (2006). "Internet-enabled remote monitoring of civil infrastructure with TDR." In Proceedings, TDR 2006 (Paper ID 6). Purdue University, West Lafayette, Indiana

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Selected Technical Reports and White Papers

Kosnik, D. and Ng, S. (2010). "White Paper: Tiltmeter-Based Bridge Scour Monitoring". Infrastructure Technology Institute, Northwestern University, Evanston, Illinois. 10 pp.

Kosnik, D. (2010). "Structural health monitoring of uplift bearings on the John F. Kennedy Memorial Bridge: interim report". Infrastructure Technology Institute technical report. Northwestern University, Evanston, Illinois. 84 pp.

Kosnik, D., Marron, D., Kotowsky, M., Corr, D., and Prine, D. (2009). "Noise localization via acoustic emission monitoring on a rolling leaf bascule bridge". Infrastructure Technology Institute technical report. Northwestern University, Evanston, Illinois. 19 pp.

Thomas, J., Kosnik, D., Kotowsky, M., Marron, D., and Schofer, J. (2008). "Structural health monitoring of civil infrastructure: philosophy, technical methods, and projects of the Infrastructure Technology Institute". Infrastructure Technology Institute technical report. Northwestern University, Evanston, Illinois. 29 pp.

Kosnik, D. (2008). "Autonomous remote crack displacement monitoring of a residence near a limestone quarry, Naples, Florida". Infrastructure Technology Institute technical report. Northwestern University, Evanston, Illinois. 38 pp.

Invited Lectures

"Data Aggregation and Statistical Process Control Methods for NDE and SHM of Civil Structures". Innovative Non-Destructive Testing for Civil Engineers workshop. Waikoloa, Hawaii, November 21-22, 2019.

"Structural Health Monitoring for Limit States Other Than 'Failure'". Northwestern University, Evanston, Illinois, October 30, 2019.

"Managing Adjacent Construction Risks with Autonomous Remote Monitoring: Case Studies from the Chicago Region". ASCE Illinois Section/Geo-Institute Chicago Meeting. Chicago, Illinois, November 13, 2018.

"Some Specialty Tools for the Bridge Inspection and Performance Monitoring Toolbox". New York State Dept. of Transportation Bridge Inspectors' Meeting. Saratoga Springs, New York, March 6, 2018.

"Performance Monitoring of In-Service Infrastructure: Life Extension and Beyond-Design-Basis Loads". Innovative Non-Destructive Testing for Civil Engineers workshop. Koloa, Hawaii, November 21-23, 2017.

Conferences and Seminars

Presenter/Panelist

"Introducing the Bridge Load Testing E-Circular". Workshop at Transportation Research Board 99th Annual Meeting, Washington, DC, January 12, 2020.

"3D Printing for AE: Acoustic properties of 3D-Printed Materials and Development of Custom AE Fixtures" (with J. Juliano, R. Nordstrom, and S. Anderson). Acoustic Emission Working Group. Chicago, Illinois, June 2019.

"Adjacent Construction: Hazards, Vulnerabilities, and Risk Management". ASCE Forensic Engineering 8th Congress – Forging Forensic Frontiers, Austin, Texas, December 1, 2018.

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Presenter/Panelist, continued

“A Dynamic Experience: The Dowding / ITI Legacy of Autonomous Monitoring of In-Service Infrastructure”. Charles H. Dowding Symposium on Geotechnical Engineering. Northwestern University, Evanston, Illinois, April 28, 2018.

“AE Noise Source Location on a Strauss-style Trunnion Bascule Bridge”. Acoustic Emission Working Group. Seattle, Washington, May 2017.

“AE Leak Rate Prediction: Some New Applications to Control Valves.” (with S. Jelken, R. Nordstrom, and S. Anderson). Acoustic Emission Working Group. Chicago, Illinois, June 2015.

“Relational Database Approach to AE Test Data and Metadata Management: Recent Work at Fisher Controls”. Acoustic Emission Working Group. Salt Lake City, Utah, June 2014.

“Acoustic Emission Monitoring to Locate and Characterize Anomalous Noises on a Swing Bridge.” (with D. Marron). Acoustic Emission Working Group. Anaheim, California, June 2013.

Chair/Moderator

Workshop: “Practical Health Monitoring for Transportation Structures II” (with N. Catbas) Transportation Research Board 92nd Annual Meeting. Washington, DC, January 13, 2013

Workshop: “Practical Health Monitoring for Transportation Structures” (with N. Catbas) Transportation Research Board 91st Annual Meeting. Washington, DC, January 22, 2012

Conference Organizer/Host

Int’l Conference on Acoustic Emission and Acoustic Emission Working Group (ICAE-9/AEWG-61). Chicago, Illinois, June 17-20, 2019

Acoustic Emission Working Group (AEWG-59). Seattle, Washington, May 17-18, 2017

Acoustic Emission Working Group (AEWG-52). Sturgeon Bay, Wis., Oct. 19-21, 2009

Conference Technical Committee or Advisory Board Member

25th Int’l Acoustic Emission Symposium (IAES-25), Tokyo, Japan, November 2020

Structural Health Monitoring for Intelligent Infrastructure (SHMII-9), St. Louis, Missouri, August 2019

8th Int’l Conference on Acoustic Emission and 23rd Int’l Acoustic Emission Symposium (ICAE-8 / IAES-23), Kyoto, Japan, December 2016

22nd Int’l Acoustic Emission Symposium (IAES-22), Sendai, Japan, November 2014

Prior Professional Experience


Northwestern University, Evanston, Illinois

Research Engineer, Infrastructure Technology Institute, 2003-2013


Related Experience and Training

National Highway Institute Course 130055: Safety Inspection of In-Service Bridges

National Highway Institute Course 130078: Fracture-Critical Inspection Techniques



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Academic, Professional, and Community Honors

- 2019 Joseph Kaiser Achievement Award, Acoustic Emission Working Group
- 2018 Fellow Award, Acoustic Emission Working Group
- 2012 Grassroots Conservation Leadership Award, Chicago Wilderness Habitat Project
- 2012 Best Presentation by a Young Researcher, Int'l Conf. on Weigh-in-Motion
- 2010 STAR Leadership Award, Northwestern Univ. McCormick School of Engineering
- 2008 Student Paper Award, Acoustic Emission Working Group
- 2000 Student of the Year Award, US DOT University Transportation Centers program (received as an undergraduate; award typically given to graduate students)