

Hamid Lotfi, Ph.D., P.E.

Principal Investigator & Project Manager

Dr. Lotfi has more than 25 years of experience in structural assessment, structural rehabilitation, failure investigation, seismic evaluation, and nonlinear finite element analysis of structures. He has applied his expertise to evaluation, retrofit design, and failure investigation of concrete, steel, and masonry structures including buildings, bridges, parking structures, industrial structures, environmental structures, pipelines, and foundations.

Dr. Lotfi has developed and implemented several finite element analytical models for failure analysis of concrete and masonry structures. He has conducted extensive static and dynamic finite element analysis of concrete, steel, and masonry structures that involve extreme geometrical and material nonlinearities, instability, impact, and collapse.

Representative Project Experience

Structural Evaluation and Failure Analysis of Buildings

- Finite element structural analysis, design check, synthesis of observations, and mediation support in the investigation of the collapse of a concrete flat-plate condominium tower. Surfside, FL.
- Finite element structural analysis, design check, and synthesis of observations in the investigation of the collapse of a steel tower during construction. New Orleans. LA.
- Structural evaluation, design check, and retrofit design of a mechanical floor in the concrete flat-plate university residence hall in support of the installation of new heavier mechanical units. Chicago, IL.
- Structural evaluation, finite element analysis, and design check of the reinforced concrete structure of a university hall due to expansion of clayey soil under portions of the building that had resulted in several inches of upward movement of the piers supporting the columns, Jackson, MS.
- Finite element analysis and design check of the structural steel building of a public library where two roof connections had failed during construction and the cantilever portion of the building had displaced several inches in the vertical direction. Baton Rouge, LA.
- Explicit dynamic finite element analysis of the exterior concrete walls of a mansion due to impact of different tornado missiles, MN.
- Finite element analysis and design check of the reinforced concrete floor of a fire station and assessment of the floor capability to support new heavier ladder trucks. Austin, TX.
- Finite element analysis and design check of the reinforced concrete flat-plate structure of a correctional facility to evaluate strength, serviceability, and safety of the original slab design. Evaluation of potential as-built variability in slab construction on structural safety. Wausau, WI.



Academic Credentials

Ph.D. in Civil Engineering
University of Colorado at Boulder,
1992

M.S. in Civil Engineering
University of Tehran, Iran, 1986

Professional Affiliations

ASTM International

American Concrete Institute (ACI)

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Structural Evaluation and Failure Analysis of Buildings (Continued)

- Structural evaluation of floor deflections and cracking, finite element analysis, and design check of the reinforced concrete flat-plate structure of a condominium building. Chicago, IL
- Review available test results, review available reliability analyses, conduct finite element analysis, and design check of the reinforced concrete flat-plate structure of a tower for assessment of the non-conforming work during construction on the structure seismic performance. Las Vegas, NV.
- Nonlinear finite element analysis and capacity evaluation of the reinforced concrete core wall of a tower as a result of concrete segregation and cracking observed during construction. Investigation of the effect of concrete creep on load redistribution in the tower core wall. Riyadh, Kingdom of Saudi Arabia.
- Finite element analysis and design check of the reinforced concrete flat-plate structure of a community college building exhibiting excessive floor deflections. Portland, OR.
- Yield line analysis, finite element analysis, and design check of the reinforced concrete flat-plate structure of a convention center. Santa Fe, NM.
- Geometric and material nonlinear finite element analysis of the steel structure of a canopy at an airport terminal. Chicago, IL.
- Structural investigation to evaluate the adequacy of the reinforced concrete flat-plate structure of a tower to resist potential seismic loads based on the current structural conditions exhibiting concrete material deficiencies, reinforcement placement deficiencies, and corrosion of post-tensioned tendons. Seattle, WA.
- Structural analyses to identify the cause of the separation along the joints between CMU walls and intersecting precast concrete panels of a correctional center, Pinckneyville, IL.
- Investigation of the adequacy of precast concrete double-tee roof girders installed in a data Center building. Rochelle, IL.
- Failure investigation to identify the root cause of the collapse of a casino and resort reinforced concrete parking garage. This investigation involved extensive nonlinear finite element analyses of the reinforced concrete structure, Atlantic City, NJ.
- Structural evaluation and nonlinear finite element analyses of the reinforced concrete mat foundation of a library due to observed construction deficiencies. Indianapolis, IN.
- Structural evaluation, nonlinear finite element analysis, and design check of a post-tensioned concrete roof and peer review of design and strengthening calculations. Scottsdale, AZ.
- Finite element analyses to simulate the observed response and to predict the long-term deflections of floors of a reinforced concrete flat-plate tower, Chicago, IL.
- Seismic damage assessments, static and dynamic linear and nonlinear finite element analyses of four concrete structures due to Northridge and San Fernando earthquakes. Los Angeles, CA.
- Structural analysis for condition appraisal and structural retrofit design of a reinforced concrete stadium. East Lansing, MI.
- Investigations including finite element analysis to identify the source of cracking in composite panels of a residential building, Chicago, IL

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Structural Evaluation and Failure Analysis of Parking Structures

- Finite element analysis and design checks of several steel, reinforced concrete, and post-tensioned concrete parking structures in Midwest regions.
- Structural evaluation of a reinforced concrete parking. Dubuque, Iowa.
- Structural analysis of the strengthening methods for a precast prestressed parking structure. Austin, TX

Structural Evaluation and Failure Analysis of Bridges

- Structural analysis of the precast concrete slab panels of a bridge to assess the source of cracking, Stevensville, MD.
- Failure investigation to identify the root cause of the collapse of a bridge over the Mississippi River. This evaluation involved extensive static and dynamic, geometric and material nonlinear finite element analyses of the steel bridge, Minneapolis, MN.
- Structural evaluation of a reinforced concrete bridge to assess potential causes of the parapet and overhang cracking, Salina, KS.
- Structural evaluation of a bridge to investigate the source of observed reinforced concrete deck cracking, Luther, OK.
- Failure investigation to identify the root cause of the collapse of the prestressed concrete bridge girders during construction. This evaluation involved extensive stability analyses of the prestressed concrete bridge girders, Mesa, AZ.
- Identification of vibration characteristics and force determination of bridge hangers using nonlinear dynamic finite element analyses, NY.
- Probabilistic analysis of continuous monitoring data and finite element analysis of hanger connections of a suspension bridge, Istanbul, Turkey.
- Structural investigation including finite element analysis to identify the source of cracking and bond failure in precast prestressed concrete bridge panels, San Mateo, CA.
- Failure investigation to identify the root cause of the collapse of prestressed concrete bridge girders during construction of a bridge. This evaluation involved extensive stability and dynamic finite element analyses, Moore Haven, FL.

Structural Evaluation and Failure Analysis of Other Structures

- Design, evaluation, and finite element analysis of multiple antenna support pedestals for JPL Goldston and Madrid Deep Space Communications Complex.
- Nonlinear finite element analysis to identify the root cause of failure of a hot salt tank in a solar power plant, NV.
- Finite element analysis to identify the root cause of failure and the design of repair of a hot salt tank in a solar power plant, AZ
- Desktop study of potential ground vibration effects related to resource extraction activities near wind turbine towers, Cheyenne/Kit Carson Counties, CO.
- Desktop study of potential blasting effects from quarry blasting to wind turbine towers. Broome County, NY.

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Structural Evaluation and Failure Analysis of Other Structures (Continued)

- Engineering evaluation for potential blasting effects of a high-pressure gas loader device installed in a university physics laboratory. Chicago, IL.
- Nonlinear finite element analysis and design of a secant pile wall for waterfront project, Toronto, ON.
- Nonlinear finite element analysis for engineering evaluation of rooftop fall arrest anchors at a facility. Lake Forest, IL.
- Finite element analyses of a 370-ft tall natural draught hyperbolic cooling tower at a coal-fired power generating plant to assess repair of the defects in reinforced concrete shell. VW.
- Nonlinear finite element analysis and design checks to identify the root cause of excessive cracking in the walls and floor slab of an above-ground reinforced concrete aeration basin at a WWTP. Saratoga, NY
- Structural and durability evaluations of portions of a reinforced concrete stadium, and the design of the repair. Orchard Park, NY.
- Finite element analysis and design check of a reinforced concrete floor in a nuclear power plant to assess its ability to support a new heavier cask transporter. MI.
- Evaluation of water leakage from a reinforced concrete mat foundation of an embedded steel reservoir. Williston, ND.
- Analytical investigation of reinforced concrete gasifier support pedestal of a power plant for complex thermal loading criteria and assisting owner in development of appropriate retrofit plan. England
- Nonlinear finite element analysis of the reinforced concrete foundation of a condensate storage tank in a nuclear power plant for seismic loads and the design of the foundation retrofit. TN.
- Structural evaluation of the reinforced concrete filter basins of a water treatment plant, Modesto, CA.
- Structural calculations to evaluate the design and construction of a stadium reinforced concrete structure, Baton Rouge, LA.
- Structural evaluation of the precast prestressed concrete wastewater treatment tank and the analysis of the repair options. Calvert City, KY.
- Structural evaluation of the existing conditions of a power plant chimney mat foundation. This evaluation involved stability analyses of the chimney under wind load. TX.
- Assessment of the R-Value of an insulated concrete masonry unit by steady state heat transfer finite element analysis, West Bend, WI.
- Assessment of fire endurance of a twin concrete slab assembly by nonlinear transient heat transfer finite element analysis, Apopka, FL.
- Nonlinear steady state and transient heat transfer finite element analyses of a reinforced concrete notched beam of a cement plant preheater tower to study the internal temperature distribution. CO.
- Development of special-purpose computer programs for the analysis and design of steel tank flexible foundations. Skokie, IL.
- Development of a computer program for analysis and design of prestressed concrete cylinder pipes (PCCP). Skokie, IL.

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Structural Evaluation and Failure Analysis of Other Structures (Continued)

- Structural evaluation of a prestressed concrete cylinder pipeline (PCCP). This evaluation involved extensive phased nonlinear finite element analysis of the pipe/soil interaction, Chicago, IL.
- Failure investigation to identify the root cause of the failure of the prestressed concrete cylinder pipeline. Puerto Rico.
- Structural design of DFST and IDBT concrete slab tracks constructed at Transportation Technology Center and subjected to actual heavy axle loads. Pueblo, CO.
- Structural design of DFST and IDBT concrete slab track specimens constructed at CTLGroup structures laboratory and tested under repeated heavy axle loads. Skokie, IL.
- Structural investigation of the capacity of high-strength concrete columns under fire. This investigation involved nonlinear finite element analyses of the reinforced concrete columns. Skokie, IL.
- Structural analysis for evaluation and retrofit design of the preheater tower of the Portland cement plant, CO.
- Investigations including linear and nonlinear Finite element analyses to identify the source of cracking in prestressed concrete railroad ties.
- Structural analysis for evaluation and retrofit design of prestressed concrete box beams. Colts Neck, NJ.

Publications

Roller, J. J., and Lotfi, H. R., "Proposed Simplified Changes to ANSI/AWWA C304 Standard for Design of Prestressed Concrete Cylinder Pipe", Proc. of the ASCE Pipeline Conference, Baltimore, MD, 2015.

Lotfi, H.R., Oesterle, R. G., and Roller, J., "Reliability Assessment of Distressed Concrete Cylinder Pipe", Proc. of the ASCE Pipeline Division Specialty Conference, Houston, TX, pp. 838-852, 2005.

Lotfi, H. R. and Oesterle, R. G., "Analysis and Design of Slab Track Laboratory Specimens", PCA R&D Serial No. 2795a, Portland Cement Association, Skokie, IL, 2007.

Lotfi, H. R. and Oesterle, R. G., "Slab Tracks for 39-Ton Axle Loads, Structural Design", PCA R&D Serial No. 2832, Portland Cement Association, Skokie, IL, 2005.

Mehrabi, A. B., Tabatabai, H., and Lotfi, H.R., "Damage Detection in Structures Using Precursor Transformation Method", Journal of Intelligent Material Systems and Structures, Vol. 9, No. 10, pp. 808-817, 1999.

Mehrabi, A. B., Tabatabai, H., and Lotfi, H. R., "Precursor Transformation Method for Damage Detection in Structures", 5th Annual International Symposium on Smart Structures and Materials Proceedings, SPIE, pp. 232-243, 1998.

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Mehrabi, A. B., Tabatabai, H., and Lotfi, H. R., "Precursor Transformation Method for Damage Detection in Structures", 5th Annual International Symposium on Smart Structures and Materials Proceedings, SPIE, pp. 232-243, 1998.

Oesterle, R.G. and Lotfi, H.R., "Transverse Movement in Skewed Integral Abutment Bridges", Proceedings of the FHWA Integral Abutment and Jointless Bridges Conference, Baltimore, 2005.

Azizinamini, A., Pavel, R., and Lotfi, H.R., "Effect of Cross Bracing on Seismic Performance of Steel I-Girder Bridges", ASCE Structural Congress, pp. 751-755, 1997.

Lotfi, H.R., and Munshi, J.A., "Preliminary Analytical Investigation of High-Strength Concrete Column Structural Performance Under Fire Loading", Report to Portland Cement Association, Skokie, IL, 2001.

Lotfi, H.R., and Shing, P.B., "Embedded Representation of Fracture in Concrete with Mixed Finite Elements", International Journal of Numerical Methods in Engineering, V38, pp. 1307-1325, 1995.

Lotfi, H.R., and Shing, P.B., "Analysis of Concrete Fracture with an Embedded Crack Approach", Proc. of International Conference on Computer Aided Design of Concrete Structures, Austria, 1994.

Lotfi, H.R., and Shing, P.B., "Interface Model Applied to Fracture of Masonry Structures", ASCE Journal of Structural Engineering, V120(I), pp. 63-80, 1994.

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Publications (Continued)

Shing, P.B., Brunner, J.D., and Lotfi, H.R., "Analysis of Shear Strength of Reinforced Masonry Walls", Proc. of 6th North American Masonry Conference, pp. 1133-1144, 1993 (Outstanding Conference Paper Award).

Shing, P.B., Brunner, J.D., and Lotfi, H.R., "Evaluation of Shear Strength of Reinforced Masonry Walls", Masonry Society Journal, 1993.

Lotfi, H.R., and Shing, P.B., "Analysis of Masonry Walls with Smeared and Discrete Crack Models", ASCE Structural Congress, pp. 1179-1184, 1993.

Shing, P.B., Lotfi, H.R., Barzegarmehrabi, A., and Brunner, J.D., "Failure Analysis of Masonry Structures", Proc. of 9th ASCE Engineering Mechanics Conference, New York, NY, pp.780-783, 1992.

Shing, P.B., Lotfi, H.R., Barzegarmehrabi, A., and Brunner, J.D., "Finite Element Analysis of Resistance of Masonry Wall Panels With and Without Confining Frames", Proc. of 10th World Conference on Earthquake Engineering, pp. 2581-2588, 1992.

Lotfi, H.R., and Shing, P.B., "Nonlinear Finite Element Analysis of Reinforced Masonry Shear Walls", Computational Methods and Experimental Measurements V, A. Sousa et al., Eds., Elsevier Applied Science, New York, NY, pp. 519-530, 1991.

Lotfi, H.R., and Shing, P.B., "An Appraisal of Smeared Crack Models for Masonry Shear Wall Analysis", Computers and Structures Journal, 41(3), pp. 413-425, 1991.

Shing, P.B., and Lotfi, H.R., "Experimental and Finite Element Analysis of Single-Story Reinforced Masonry Shear Walls", Computer Methods in Structural Masonry, J. Middleton, and G.N. Pande, Eds., Books and Journals International, Swansea, UK, pp. 74-83, 1991.