Brad Davis, Ph.D., S.E., P.E.

Davis Structural Engineering, LLC
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Education

Ph.D., Civil Engineering, 2008, Virginia Tech
Dissertation: "Finite Element Modeling for Prediction of Low Frequency Floor Vibrations Due to Walking"
M.S., Civil Engineering, 1996, Virginia Tech
B.S., Civil Engineering, 1994, Virginia Tech

Professional Positions

Owner; Davis Structural Engineering, LLC; 2017-Present
Assistant / Associate Professor of Civil Engineering, University of Kentucky, 2009-Present
Structural Design Engineer, Structural Design Group, Nashville, TN, 2000-2005
Structural Design Engineer, Stanley D. Lindsey and Associates, Nashville, TN, 1998-2000
Structural Engineer; Hayes, Seay, Mattern, and Mattern; Roanoke, VA, 1997-1998
Research Engineer, American Buildings Company, Eufaula, AL, 1996-1997

Capabilities

- Structural Vibrations. Visit **DavisStructures.com** for detailed information.
  - Vibration testing for sensitive equipment applications
  - Experimental modal analysis and analytical calculations
- Structural Forensics
- Advanced applications in structural dynamics, structural analysis, and stability
- Structural Design: all major building materials, including cold-formed steel
- Structural Steel Connection Design
- Design of Steel Stairs and Guardrail Systems
- Development of Software and Design Aids
- Continuing Education Courses, Seminars, and Technical Writing
- Destructive Experimental Evaluations of Strength and Stiffness

Professional Licenses

State	Type	Number
Alabama	P.E. (Structural)	38503
District of Columbia	P.E. (Structural)	PE922574
Florida	P.E. (Structural)	88019
Georgia	P.E. (Structural)	PE044957
Illinois	S.E.	081-006088
Kentucky	P.E. (Structural)	32008
Massachusetts	P.E. (Structural)	55810
Mississippi	P.E. (Structural)	30396
North Carolina	P.E. (Structural)	048445
Ohio	P.E. (Structural)	PE.84820
South Carolina	P.E. (Structural)	ELS.37394
Tennessee	P.E. (Structural)	105257
Virginia	P.E. (Structural)	0402041235
West Virginia	P.E. (Structural)	23682

Project Experience Highlights

Vibration Site Surveys

Measured and assessed vibrations of structures supporting sensitive equipment.

- Ogden Regional Medical Center, Ogden, UT, CT imagers (2023)
- Williamson Medical Center, Franklin, TN, MRI (2022)
- Baptist Health Medical Center, Little Rock, AR, MRI and Cath Lab (2021)
- Sky Ridge Medical Center, Lone Tree, CO, MRI (2020)
- Putnam Community Medical Center, Putnam, FL, MRI (2019)
- Shepherd Center, Atlanta, GA, MRI (2018)
- Redmond Regional Hospital, Rome, GA, MRI (2017)
- University of Kentucky Academic Sciences Building Laboratories (2016)
- Rupp Arena, Lexington, KY, Balcony Vibrations Affecting Television Cameras (2015)
- Centennial Medical Center Hybrid, Nashville, TN, OR Floor Vibrations (2008)

Vibration Engineering Design Assistance

Provided vibration engineering during the structural design phase.

- UPMC Presbyterian Hospital, Pittsburgh, PA, complex floor vibrations (2023)
- Holford Recreation & Aquatic Center, Garland, TX, track and gym area (2022)
- Saint Thomas West Hospital, Nashville, TN, PET/CT floor vibration (2021)
- Carothers Medical Center, Franklin, TN, MRI floor vibration (2020)
- Skyline Medical Center, Nashville, TN, MRI floor vibration (2018)
- Shops at Riverside, Hackensack, NJ, monumental stair vibration (2016)
- Liberty University, Lynchburg, VA, balcony vibration (2014)
- Mission Trails Physicians Plaza, San Antonio, TX, MRI floor vibration (2010)
- St. Anthony Hospital, Denver, CO, MRI floor vibration (2009)
- Quest Community Church, Lexington, KY, balcony vibration (2008)

Vibration Reduction Projects

Structures with problematic vibrations. Measured vibrations and designed retrofit solutions. Cannot disclose structure names.

- Medical center rehabilitation facility with barbell impacts (2023)
- Multi-story condo with intermittent floor vibrations, Ocean City, MD (2022)
- Monumental stair with uncomfortable vibrations, Nashville, TN (2021)
- Hospital lobby with uncomfortable vibrations due to walking, KY (2018)
- Office floor with uncomfortable vibrations due to walking, Spokane, WA (2017)
- Hospital with unacceptable floor vibrations near CT scanner, Cynthiana, KY (2010)

Construction Vibrations

Assisted contractor by measuring and assessing vibrations. Cannot disclose structure names.

- Historical facility with priceless irreplaceable artifacts with nearby demolition activities (2022)
- Fortune 500 corporate data center with servers very close to demolition activities (2018)

Structural Design

- Norfolk Naval Shipyard Combined Heat and Power Plant, Portsmouth, VA: design of steel connections on 600 ton industrial project (2022)
- Orlando International Airport South Terminal C Airside Concourse Building: Provided design of over a dozen steel stairs (2019)
- Vanderbilt Children's Hospital, Nashville, TN: designed post-tensioned and conventional concrete structure while at Structural Design Group (2002)
- Parrish Medical Center, Titusville, FL: designed replacement hospital with steel moment frames and composite framing while at Stanley D. Lindsey and Associates (1999)

Awards

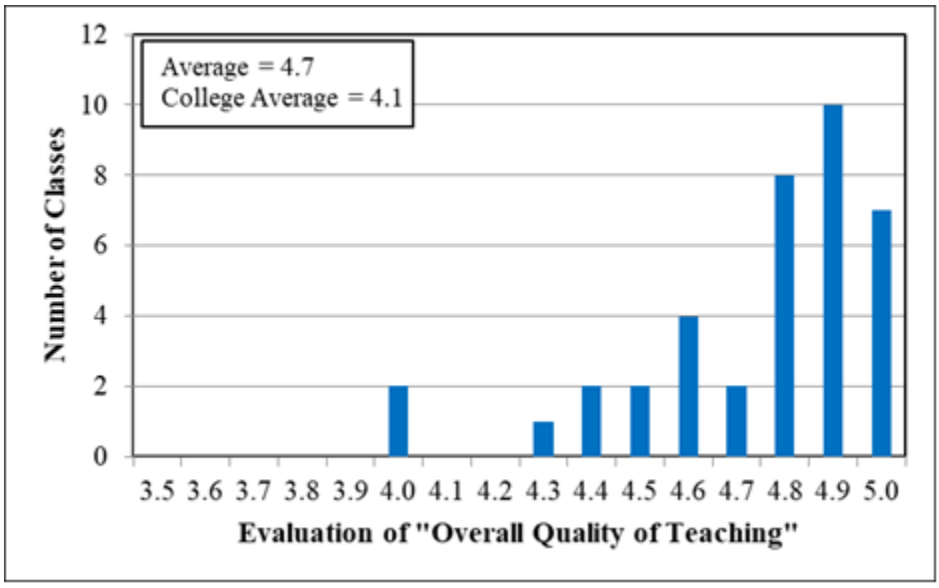
- 2009, 2013, 2021, and 2023 Outstanding Civil Engineering Teaching Award, University of Kentucky.
- 2016 Educator Special Achievement Award, American Institute of Steel Construction (AISC), for developing new vibration evaluation criteria for steel-framed floors supporting sensitive equipment.
- 2010 Outstanding Young Alumni Award, Virginia Tech Civil and Environmental Engineering Department.
- 2008 Best Overall Paper at American Society of Civil Engineers (ASCE) Architectural Engineering National Conference.
- 2005 Charles E. Via Fellowship, Virginia Tech.
- 2005 Walter P. Moore Structural Engineering Fellowship.

Memberships

- AISC Manuals Committee member, 2003-Present
- Steel Tube Institute
- AISC Solutions Center Consultant
- ASCE Structural Engineers Institute

University Teaching

- *Structural Analysis and Design*
  - Basic topics in Structural Analysis, Steel, Concrete, and Wood Design.
- *Steel Structures*
  - Traditional course in structural steel plus composite beams and **Floor Vibrations**.
- *Advanced Steel Design*
  - Slender and Unsymmetrical Columns and Plate Girders, Connections, and **Floor Vibrations**.
- *Design of Light Framing Systems*
  - Wood and Cold-Formed Steel Members and Connections.
- *Design of Structural Systems*
  - ASCE 7 Loads, **Floor Vibrations**, Diaphragms, Computerized Analysis and Design.
- *Intermediate Structural Analysis*
  - Indeterminate Structures, Loads of Unknown Locations, Matrix Structural Analysis.
- *Advanced Structural Analysis*
  - Matrix Structural Analysis, Geometric Nonlinear Analysis, Material Nonlinear Analysis.



Vibration Publications

Design Guides (Books)

- Murray, T.M., Ungar, E.E., Davis, B. (2019), *Facts for Steel Buildings No. 5, Vibrations*, AISC.
- Murray, T.M., Allen, D.A., Ungar, E.E., Davis, B. (2016), *Design Guide 11: Vibration of Steel-Framed Structural Systems Due to Human Activity*, AISC.
- Murray, T.M. and Davis, B. (2015), *Technical Digest No. 5 – Vibration of Steel Joist-Concrete Slab Floor*, Steel Joist Institute.

Peer-Reviewed Journal Articles (Total of 14. Eight in top quartile journals. Highlights below.)

- Royvaran M., Avci O., and Davis B. (2021), "Effect of Non-Structural Components on the Dynamic Response of Steel-Framed Floors: Tests Before and After Component Installations," *Front. Built Environ*. 7:725106.
- Abdeljaber, O., Hussein, M., Avci, O., Davis, B., and Reynolds, P. (2020), "A Novel Video-Vibration Monitoring System for Walking Pattern Identification on Floors," *Advances in Engineering Software*, 139(1), 102710.
- Royvaran, M., Avci, O., and Davis, B. (2020), "Analysis of Floor Vibration Evaluation Methods using a Large Database of Floors Framed with W-Shape Members Subjected to Walking Excitation," *Journal of Constructional Steel Research*, 164(1), 105764.
- Davis, B., and Liu, D. (2019), "Walking-Induced Vibration of Steel-Framed Floors Supporting Sensitive Equipment," *Engineering Journal*, 56(3), 159-172.
- Younis, A., Avci, O., Hussein, M., Davis, B., and Reynolds, P. (2017), "Dynamic Forces Induced on Building Floors by a Single Walking Pedestrian: A Literature Review," *Applied Mechanics Reviews*, 69(2).
- Davis, B. and Avci, O. (2015), "Simplified Vibration Serviceability Evaluation for Slender Monumental Stairs," *Journal of Structural Engineering*, ASCE, 141(11), 04015017-1 – 04015017-9.
- Liu, D. and Davis, B. (2015), "Walking Vibration Response of High Frequency Floors Supporting Sensitive Equipment," *Journal of Structural Engineering*, ASCE, 141(8), 04014199-1 – 04014199-10.
- Davis, B., Liu, D., and Murray, T.M. (2014), "Simplified Experimental Evaluation of Floors Subject to Walking Induced Vibrations," *Journal of Performance of Constructed Facilities*, ASCE, 28(5), 04014023-1 – 04014023-8.
- Davis, D.B., Barrett, A.R., and Murray, T.M. (2011), "Use of a Force Plate Versus Armature Accelerometer for Measuring Frequency Response Functions," *Experimental Techniques*, 35(1), 73-79.
- Davis, D.B. and Murray, T.M. (2009), "Slender Monumental Stair Vibration Serviceability," *Journal of Architectural Engineering*, ASCE, 15(4), 111-121.

Conference Papers (Total of 18. Highlights Below.)

- Royvaran, M., Donohue, K and Davis, B. (2020), "Localization of Stationary Source of Floor Vibration Using Steered Response Power Method," *Proceedings of the International Modal Analysis Conference*, Society for Experimental Mechanics.
- Davis, D.B. and Murray, T.M. (2009), "Comparisons of Measured and Predicted Modal Properties for Steel Framed Floors," *Proceedings of 2009 IMAC-XXVII*, The Society for Experimental Mechanics.

Invited Conference Presentations (Highlights Below)

- Davis, B. (2023), "Steel-Framed Floor Design for Vibration-Sensitive Equipment," The North American Steel Conference, AISC.
- Davis, B. (2022), "Steel Interchange: Vibrations," The Flash Steel Conference, AISC.
- Davis, B. (2022), "Vibration Analysis of Steel Joist / Concrete Floors," The North American Steel Conference, AISC.
- Davis, B. (2020), "Structural Vibration Serviceability with Finite Element Analysis," The Flash Steel Conference, AISC.

Vibration Publications, Continued

- Murray, T.M. and Davis, B. (2019), "Structural Vibration Serviceability – FAQ and More," North American Steel Construction Conference, AISC.
- Davis, B. (2016), "Steel Framed Floor Design for Vibration-Sensitive Equipment," North American Steel Construction Conference, AISC.
- Davis, B. (2010), "Simplified Finite Element Method for Predicting Low Frequency Floor Vibration Due to Walking," North American Steel Construction Conference, AISC.

Conference Moderating

- Technical Session Organizer and Moderator (2013), ASCE Structures Congress, "Structural Control and Vibration Mitigation."
- Technical Session Organizer (2010 and 2011), ASCE Structures Congress, "Floor Vibration Serviceability."
- Session Chair and Moderator (2008), ASCE Architectural Engineering Conference, "Innovations in Structural and Non-Structural Designs."

Invited Speaking Engagements

- Over 25 engagements. Highlights below.
- Structural Engineers Association of Kentucky Annual Conference (2023), "Overview of the AISC Design Guide 11, Vibrations of Steel-Framed Structural Systems," 60 minutes, 100 attendees
- AISC Live Webinar Series (2022), "Vibration Serviceability: Overview of AISC Design Guide 11 and Q&A," 90 minutes, 300 attendees.
- CFSEI Webinar (2022), "Vibration Serviceability of Floors with Cold-Formed Steel Framing," 90 minutes.
- SE University (2020), "Steel Framed Floor Design for Vibration-Sensitive Equipment," 90 minutes.
- NASA Marshall Space Flight Center (2019), "Steel Moment Connection Design," 24 hours.
- Structural Engineers Association of Texas Annual Conference (2018), "An Overview of AISC DG11 2nd ed. Vibrations of Steel-Framed Structural Systems Due to Human Activity," 90 minutes, 150 attendees.
- NASA Marshall Space Flight Center (2017), "Steel Connection Design," 16 hours, 25 attendees.
- AISC Night School Webinar (2016), "Vibration of Steel Framed Structural Systems Due to Human Activity: Sensitive Equipment, Monumental Stairs, and Retrofitting," 90 minutes, 400 attendees.
- Structural Engineers Association of Arkansas Annual Conference Keynote Speaker (2015), "Structural Vibration Serviceability: Technical Background, Sensitive Equipment, and Monumental Stairs," four hours.
- NCSEA Webinar (2014), "Floor Vibration Serviceability, Technical Background, and AISC Design Guide 11, Parts 1 and 2," 180 attendees.