Morgan Broberg

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EDUCATION

Ph.D. in Civil Engineering December 2022
Lyles School of Civil Engineering, Purdue University, West Lafayette, IN
Title: Seismic Design of Coupled Composite Plate Shear Walls – Concrete Filled
Advisor: Amit Varma

Certificate in Teaching and Learning in Engineering December 2021
School of Engineering Education, Purdue University, West Lafayette, IN

B.S. in Engineering, Civil Engineering Concentration May 2017
LeTourneau University, Longview, TX

RESEARCH

Research Engineer 2022-Present
Purdue Applied Research Institute (PARI), West Lafayette, IN

- Conduct large-scale experimental testing on the blast and impact behavior of steel-plate concrete (SC) components, connections, and structures.
- Create benchmarked modeling approaches of various complexities from detailed 3D finite element models to simplified layered composite shell models in Abaqus.
- Author test plans, technical reports, and quality assurance/quality control reports for clients and outside agencies.
- Recruit, supervise, and mentor graduate and undergraduate researchers.

Graduate Research Assistant 2017-2022
Lyles School of Civil Engineering (Advisor: Amit Varma), Purdue University, West Lafayette, IN

- Conducted computational research on the seismic behavior of composite plate shear walls/concrete filled (C-PSW/CF).
- Developed design philosophy and code provisions for coupled and uncoupled C-PSW/CF.
- Design and analyze archetype structures using OpenSees to develop incremental dynamic analysis response curves

PUBLICATIONS

Refereed Journal Articles

Broberg, M., Agrawal, S., Varma, A., and Klemencic, R. (2023). “Seismic design parameters (R, C_d, and Ω_0) for uncoupled composite plate shear walls−concrete filled (C-PSW/CF).” *Earthquake Engineering and Structural Dynamics*, 1- 22. https://doi.org/10.1002/eqe.3917

Broberg, M., Shafaei, S., Kizilarslan, E., Seo, J., Varma, A. H., Bruneau, M., and Klemencic, R. (2022). "Capacity design of coupled composite plate shear walls – concrete-filled system." *Journal of Structural Engineering*, 148(4). http://doi.org/10.1061/(asce)st.1943-541x.0003296

Shafaei, S., Varma, A. H., **Broberg, M.**, Klemencic, R. (2021). "Modeling the cyclic behavior of composite plate shear walls/concrete filled (C-PSW/CF)." *Journal of Constructional Steel Research*, 184. http://doi.org/10.1016/j.jcsr.2021.106810

Kizilarslan, E., **Broberg, M.**, Shafaei, S., Varma, A. H., and Bruneau, M. (2021). "Non-linear analysis models for composite plate shear walls-concrete filled (C-PSW/CF)." *Journal of Constructional Steel Research*, 184. http://doi.org/10.1016/j.jcsr.2021.106803

Kizilarslan, E., **Broberg, M.**, Shafaei, S., Varma, A. H., and Bruneau, M. (2021). "Seismic design coefficients and factors for coupled composite plate shear walls/ concrete filled (CC-PSW/CF)." *Engineering Structures*, 244. http://doi.org/10.1016/j.engstruct.2021.112766

Manuscripts in Preparation

Broberg, M., Kizilarslan, E., Seo, J., Shafaei, S., Varma, A., and Bruneau, M. (2024). "Nonlinear Models for Behavior of Composite Coupling Beams in Coupled Composite Plate Shear Walls—Concrete Filled (C-PSW/CF)." *Engineering Structures*, Manuscript in preparation.

Lefebvre, A., **Broberg, M.,** Choe, L., and Varma, A. (2024). "Design of Full-Strength Steel-Plate Composite (SC) L-Joint Connections." *Journal of Constructional Steel Research*, Manuscript in preparation.

Books

Varma, A.H., **Broberg, M.**, Shafaei, S., and Taghipour, A. (2023). *Design Guide 38: SpeedCore Systems for Steel Structures*. Steel Design Guide Series 38. AISC.

Conference Proceedings

Broberg, M., Capa Salinas, J., Khalifah, S. (2024). "Lessons Learned through Multi-Year Team Teaching of an Engineering Course for Pre-College Students" *Proceedings of the Annual American Society of Engineering Education Conference*, Portland, OR, June 23-26, 2024.

Capa Salinas, J. and **Broberg, M.** (2024). "Creating a Pipeline of Civil Engineering Students Through Innovative Summer Course" *Proceedings of the Annual American Society of Engineering Education Conference*, Portland, OR, June 23-26, 2024.

Capa Salinas, J., Salmeron, M., Chobe, G., Montoya, H., **Broberg, M.** (2024). "Evaluation of Transfer of Learning in a Pre-College Engineering Short Course (Evaluation)" *Proceedings of the Annual American Society of Engineering Education Conference*, Portland, OR, June 23-26, 2024.

Broberg, M., Capa Salinas, J., Wagner, D. (2023). "A Pre-College Civil Engineering Course: Fostering Interest in Engineering Among High School Students and Developing Future Engineering Educators" *Proceedings of the Annual American Society of Engineering Education Conference*, Baltimore, MD, June 25-28, 2023.

Capa Salinas, J., **Broberg, M.,** Wagner, D., (2023). "Evaluation of a High School Engineering Short Course Integrating the Engineering Design Process, Creativity, and Innovation (Evaluation)" *Proceedings of the Annual American Society of Engineering Education Conference*, Baltimore, MD, June 25-28, 2023.

Broberg, M., Germann, C., Choe, L., Varma, A. (2023). "Behavior of Shear Connectors in Steel-Plate Composite Structures for Protective Structure Applications" *Proceedings of the 6th International Conference on Protective Structures*, Auburn, AL, May 14-17, 2023.

Broberg, M., Lefebvre, A., Choe, L., Varma, A. (2023). "Design of Steel-Plate Composite (SC) L-Joint Connection" *Proceedings of the 6th International Conference on Protective Structures,* Auburn, AL, May 14-17, 2023.

Broberg, M., Shafaei, S., and Varma, A. (2022). "Seismic Design of Coupled Composite Plate Shear Walls – Concrete-Filled" *Proceedings of the 12th National Conference on Earthquake Engineering*, Salt Lake City, UT, June 27-July 1, 2022.

Shafaei, S., **Broberg, M.,** Varma, A. (2022). "Lateral Seismic Load Behavior and Design of Coupled Composite Plate Shear Walls / Concrete-Filled (CC-PSW/CFs)" *Proceedings of the 12th National Conference on Earthquake Engineering*, Salt Lake City, UT, June 27-July 1, 2022.

Broberg, M., Bose, B., Pineda-Mendez, R. A., Devine, D., Gehr, R., Jange, C., McDermott, J., Loui, M., and Eisma, J. (2022). **"**Lessons learned – preparing graduate students and postdoctoral researchers for tenure track careers through mentoring circles" *Proceedings of the Annual American Society of Engineering Education Conference*, Minneapolis, MN, June 26-29, 2022.

Broberg, M., Khalifah, S., Gupta, A., and Nafakh, A. (2021). "An Evaluation of a University-Level, High School Course Taught to Foster Interest in Civil Engineering (Evaluation)" *Proceedings of the Annual American Society of Engineering Education Conference*, Virtual, July 26-29, 2021.

Broberg, M., Shafaei, S., Seo, J., Varma, A.H., and Agrawal, S. (2019). "Introduction to seismic analysis of coupled composite plate shear wall – concrete-filled (CC-PSW/CF)." *Proceedings of the Annual Stability Conference, Structural Stability Research Council*, St. Louis, MI, April 2-5, 2019.

Shafaei, S., Varma, A.H, **Broberg, M.**, and Seo, J. (2019). "An Introduction to Numerical Modeling of Composite Plate Shear Wall/ Concrete-Filled (C-PSW/CF)." *Proceedings of the Annual Stability Conference, Structural Stability Research Council*, St. Louis, MI, April 2-5, 2019.

Varma, A.H., **Broberg, M.**, and Shafaei, S (2019). "System Level Behavior of Coupled Composite Plate Shear Walls/Concrete-Filled (CC-PSW/CF)." *Proceedings of the Los Angeles Tall Buildings Structural Design Council Conference*, May 3, 2019.

Technical Reports

Agrawal, S., **Broberg, M.**, and Varma, A. H., "Seismic Design Coefficients for SpeedCore or Composite Plate Shear Walls - Concrete Filled (C-PSW/CF)" (2020). Bowen Laboratory Research Reports. Lyles School of Civil Engineering, Purdue University. http://doi.org/10.5703/1288284317125

Bruneau, M., Varma, A. H., Kizilarslan, E., **Broberg, M.**, Shafaei, S., and Seo, J. (2019). "R- Factors for Coupled Composite Plate Shear Walls /Concrete Filled (CC-PSW/CF)." Charles Pankow Foundation Grant # 05-17, McLean, Virginia.

Other Publications

Broberg, M., Shafaei, S., and Seo, J. (2019). "SpeedCore and Composite Plate Shear Walls." American Institute of Steel Construction, Modern Steel Construction.

Varma, A. H., **Broberg, M.**, Shafaei, S., and Taghipour Anvari, A. (2022). SpeedCore Design Examples. (Version 2.0). Purdue University Research Repository. http://doi.org/10.4231/ZVN1-4Q26

PRESENTATIONS

Conference Presentations

Broberg, M., Germann, C., Choe, L., Varma, A. "Behavior of Shear Connectors in Steel-Plate Composite Structures for Protective Structure Applications" 6th International Conference on Protective Structures, Auburn, AL, May 14-17, 2023.

Broberg, M., Lefebvre, A., Choe, L., Varma, A. "Design of Steel-Plate Composite (SC) L-Joint Connection" 6th International Conference on Protective Structures, Auburn, AL, May 14-17, 2023.

Broberg, M., Shafaei, S., and Varma, A. "Seismic Design of Coupled Composite Plate Shear Walls – Concrete-Filled" 12th National Conference on Earthquake Engineering, Salt Lake City, UT, June 27-July 1, 2022.

Varma, A.H., **Broberg, M.**, Shafaei, S., and Taghipour, A. "Sneak Peek: The New SpeedCore Design Guide" North American Steel Construction Conference, Denver, CO, March 23-25, 2022.

Broberg, M., Khalifah, S., Gupta, A., and Nafakh, A. (2021). "An Evaluation of a University-Level, High School Course Taught to Foster Interest in Civil Engineering (Evaluation)" American Society of Engineering Education Conference, Virtual, July 26-29, 2021.

Broberg, M., Shafaei, S., Seo, J., Varma, A.H., and Agrawal, S. (2019). "Introduction to seismic analysis of coupled composite plate shear wall – concrete-filled (CC-PSW/CF)." North American Steel Construction Conference, St. Louis, MI, April 2-5, 2019.

Invited Talks

Broberg, M. (2019). "Behavior of Coupled Composite Plate Shear Walls" Invited Presentation, Invited Presentation, Wabash College, Crawfordsville, IN.

Broberg, M. (2019). "Behavior of Coupled Composite Plate Shear Walls (SpeedCore)" Invited Presentation, Cedarville University, Cedarville, OH.

Local Meetings

Broberg, M., Shafaei, S., Varma, A. H. (2022). "Design of Coupled Composite Plate Shear Walls for Seismic Applications" Poster at Civil Engineering Graduate Research Symposium, Purdue University, West Lafayette, IN.

Broberg, M., Shafaei, S., Varma, A. H. (2021). "Design of SpeedCore Walls for Seismic Applications" Poster at Graduate Women in Engineering Symposium, Purdue University, West Lafayette, IN.

Broberg, M., Shafaei, S., Agrawal, S., Seo, J., Varma, A. H. (2019). "Introduction to SpeedCore Walls" Presentation at Indiana Structural Engineering Association Meeting, West Lafayette, IN.

TEACHING & MENTORING

Course Designer and Instructor

CE 299 Developing Infrastructure for Tomorrow	Summer 2021, 2022
CE 299 Resiliency & Sustainability in Civil Engineering	Summer 2020

Co-Instructor and Teaching Assistant

CE697 Seismic Design of Steel Structures	Fall 2021, Spring 2022
CE597 Structural Stability	Summer 2021
CE570 Advanced Structural Steel Design	Spring 2020, Spring 2021

Teaching Assistant

CE570 Advanced Structural Steel Design	Fall 2020

Guest Lecturer

CE470 Structural Steel Design	Fall 2021, Spring 2022
CE697 Seismic Design of Steel Structures	Fall 2019

Supplemental Instructor

CEGR3313 Structural Analysis	Fall 2016
CEGR4834 Structural Steel Design	Spring 2017

Mentor

Graduate Researchers (10+) and Undergraduate Researchers (10+)	2018-Present
Civil Engineering New Graduate Student Mentor Program (10+)	2019-2022

AWARDS & HONORS

NHERI Summer Institute for Early-Career Faculty NSF Travel Award, National Hazards Engineering Research Infrastructure (NHERI)	Summer 2024
NHERI at UC San Diego User Training Workshop Travel Grant, University of San Diego	Fall 2023
NSF NHERI Wall of Wind Facility User Workshop Travel Grant, Florida International University	Fall 2023
Purdue Doctoral Fellow, Purdue University	2017-2022
Graduate Student Engagement Award, Purdue Lyles School of Civil Engineering	Fall 2022
NHERI Summit Travel Grant, NHERI	Fall 2022
WiscProf Future Faculty in Engineering Workshop Participant, Univ. of Wisconsin-Madison	Summer 2022
Civil Engineering Graduate Research Symposium – Best Poster, Purdue University	Spring 2022
College of Engineering Conference Travel Grant, Purdue University	Spring 2022
PGSG Travel Grant, Purdue University	Spring 2022
Civil Engineering Professional Development Scholarship, Purdue University	Spring 2021
Distinguished Senior Award (Given to Top Five Undergraduate Seniors), LeTourneau University	Spring 2017
R.G. LeTourneau Award (Given to Top Engineering Student), LeTourneau University	Spring 2017
Summa Cum Laude, LeTourneau University	Spring 2017

LEADERSHIP & SERVICE

Professional Organization

Reviewer, Journal of Structural Engineering	2021-Present
Earthquake Engineering Research Institute, Younger Members Committee Member	2022-Present
Reviewer, Structures	2023-Present
American Society of Civil Engineering, Associate Member	2015-Present
American Institute of Steel Construction, Member	2024-Present
Structural Stability Research Council, Member	2024-Present

College and University

College of Engineering Dean Search Committee Member	2022-2023
Engineering Academic Career Club Leadership Team	2018-2022
Bowen Laboratory Student Advisory Council Leadership Team	2018-2021
College of Engineering Grade Appeals Committee Member	2019-2022
Engineering Graduate Student Advisory Council Member	2019-2021
Graduate Engineering Representative at Society of Women Engineers Conference	2021
Undergraduate Research Symposium Judge	2020
Indiana Structural Engineering Association Purdue Host	2019
Graduate Student Representative to Engineering Advisory Council	2019