

**Harry W. Shenton III, Ph.D.**

Professor

Department of Civil and Environmental Engineering  
University of Delaware  
Newark, Delaware 19716

**EDUCATION**

Ph.D. in Civil Engineering, The Johns Hopkins University, Baltimore, Maryland, 1990

*Thesis:* Response of Rigid Bodies to Base Excitation

*Advisor:* Dr. Nicholas P. Jones

Master of Civil Engineering, The University of Delaware, Newark, Delaware, 1984

*Thesis:* Analysis of Track Stiffness in the Vertical and Lateral Planes

*Advisor:* Dr. Arnold D. Kerr

Bachelor of Civil Engineering, The University of Delaware, Newark, Delaware, 1982

**EXPERIENCE**

*Professor, Department of Civil and Environmental Engineering, University of Delaware, Newark, Delaware; September 2008–present.* Teach – undergraduate and graduate engineering mechanics. Conduct basic and applied research in structural health monitoring, bridge evaluation, and innovative systems and materials for low rise construction. Advise and mentor undergraduate and graduate students.

*Chair, Department of Civil and Environmental Engineering, University of Delaware, Newark, Delaware; September 2008 – July 2017.* Responsible for overall administration of undergraduate and graduate academic programs; management and operation of the department; research administration; hiring and professional development of faculty and staff; coordination of programs within the college. Teach undergraduate and graduate courses in dynamics, structural dynamics and solid mechanics.

*Acting Chair, Department of Civil and Environmental Engineering, University of Delaware, Newark, Delaware; September 2007– August 2008.*

*Associate Professor, Department of Civil and Environmental Engineering, University of Delaware, Newark, Delaware; September 2000 – August 2008.*

*Assistant Professor, Department of Civil and Environmental Engineering, University of Delaware, Newark, Delaware; September 1994 – August 2000.*

*Research Structural Engineer, Building and Fire Research Laboratory, National Institute of Standards and Technology, Gaithersburg, Maryland; 1990-1994.*

*General Engineer, U.S. Army Ballistics Research Laboratory, Aberdeen Proving Ground, Maryland, 1984-1986.*

## **PROFESSIONAL MEMBERSHIP**

American Society of Civil Engineers

International Society for Structural Health Monitoring of Intelligent Infrastructure

Earthquake Engineering Research Institute (1991-1996)

Transportation Research Board (1996, 2000)

Sigma Xi

Tau Beta Pi

## **REFEREED JOURNAL PUBLICATIONS**

1. Sparacino, M., Shenton, H., and Weykamp, P. (2018) "Compression Set in Closed-Cell Foam Bridge Expansion Joints," ASCE Journal of Bridge Engineering, 23(1), pp 04017122-1-10
2. Kadivar M.\*, Manahiloh K.N., Kaliakin V., and Shenton H.W. (2017). "Relative assessment of dynamic load allowance for buried box culverts from field testing, two-dimensional, and three-dimensional finite element analyses." Journal of Transportation infrastructure geotechnology, 5(1): 24-41, DOI: 10.1007/s40515-017-0045-7.
3. Wells A.\*, Shenton H.W., Manahiloh K.N., and Wenczel G. (2017). "Dynamic load allowance provisions for box culverts with low fill depth." Journal of Transportation infrastructure geotechnology, 5(1): 42-58, DOI: 10.1007/s40515-017-0046-6.
4. Shenton III, H.W., Al-Khateeb, H.T., Chajes, M.J., and Wenczel, G. (2017) "Indian River Inlet Bridge (Part A): Description of the Bridge and The Structural Health Monitoring System," Bridge Structures, Vol. 13, No. 1, pp. 3-13.
5. Shenton III, H.W., Al-Khateeb, H.T., Chajes, M.J., Wenczel, G., Arndt, J., and Stevens, C. (2017) "Indian River Inlet Bridge (Part B): Lessons Learned from the Design, Installation and Operation of the Structural Health Monitoring System," Bridge Structures. Vol. 13, No. 1, pp. 15-24.

6. McConnell, J., Shenton, H., and Mertz, D. (2016) "Performance of Uncoated Weathering Steel Bridge Inventories: Methodology and Gulf Coast Region Evaluation", ASCE Journal of Bridge Engineering, Vol. 21 (12).
7. McConnell, J., Shenton III, H.W., Mertz, D.R., and Kaur, D. (2014) "National Review on Use and Performance of Uncoated Weathering Steel Highway Bridges," ASCE Journal of Bridge Engineering, Vol. 19, No. 5.
8. McConnell, J.; Shenton, H.; Mertz, D.; and Kaur, D. (2014). "Performance of Uncoated Weathering Steel Highway Bridges Throughout the United States", Transportation Research Record, Issue 2406, 61-67.
9. Shenton, H., Carson, P.D., Chajes, M.J., O'Shea, D., and Kursinsky, C., (2010), "Delaware's Indian River Inlet Bridge: a comprehensive plan for long-term structural monitoring," Transportation Research Record: Journal of the Transportation Research Board, No. 2201, pp. 148-153.
10. Dinehart, D. W., Blasetti, A. S, and Shenton III, H. W. (2008) "The Experimental Performance of Viscoelastic Gypsum Connections and Shear Walls," ASCE Journal of Structural Engineering, Vol. 134, No. 1, January, pp. 87-95.
11. Huang, H., Chajes, M. J., Mertz, D.R., Shenton III, H. W., and Kaliakin, V. (2007). "Strength Behavior of Filled Grid Decks for Bridges," Journal of Bridge Structures, 3(2), 105-118.
12. Huang, H., Kaliakin, V., Chajes, M.J., Mertz, D.R., and Shenton, III, H.W. (2007) "Application of orthotropic thin plate theory to fill steel grid decks for bridges," ASCE, Journal of Bridge Engineering, Vol. 12, No. 6, November/December, pp. 807-810.
13. Hu, B., Dweib, M., Wool, R. and Shenton, H (2007) "Bio-Based Composite Roof for Residential Construction" ASCE Journal of Architectural Engineering, Vol. 13, No. 3, 136-143.
14. Hu, X. and Shenton III, H.W., (2007) "Dead load based damage identification method for long-term structural health monitoring," Journal of Intelligent Material Systems and Structures, Vol. 18, No. 9, pp. 923-938.
15. Chajes, M.J., and Shenton III, H.W., (2006) "Using Diagnostic Load Tests for Accurate Load Rating of Typical Bridges," Journal of Bridge Structures, Vol. 2, No. 1, pp. 13-23.
16. Shenton III, H.W., and Hu, X. (2006) "Damage Identification Based on Dead Load Redistribution: Methodology," ASCE Journal of Structural Engineering, Vol. 132, No. 8, pp. 1254-1263.

17. Hu, X., and Shenton III, H.W., (2006) "Damage Identification Based on Dead Load Redistribution: Effect of Measurement Error," ASCE Journal of Structural Engineering, Vol. 132, No. 8, pp. 1264-1273.
18. Johnson, A.R., Dean, P.K., and Shenton, H.W. (2006) "Effects of Vertical Load and Hold Down Anchors on the Cyclic Response of Wood Framed Shear Walls," ASCE Journal of Structural Engineering, Vol. 132, No. 9, pp. 1426-1434
19. Howell, D.A. and Shenton III, H.W., (2006) "System for In-Service Strain Monitoring of Ordinary Bridges", ASCE Journal of Bridge Engineering, Vol. 11, No. 6, pp. 673-680.
20. Dweib, M.A., Hu, B., Shenton III, H. W., and Wool, R. P. (2006) "Bio-based Composite Roof-Structure: Manufacturing and Processing Issues," Composite Structures, Vol. 74, pp. 379-388.
21. Zhao, L. and Shenton III, H.W., (2005) "Structural Damage Detection by Best Approximation Method", Structural Health Monitoring: an International Journal, Vol. 4, No. 4, pp. 319-339.
22. Dean, P.K., and Shenton III, H.W. (2005) "Experimental Investigation of the Effect of Vertical Load on the Capacity of Wood Shear Walls," ASCE Journal of Structural Engineering, Vol. 131, No. 7, pp. 1104-1113
23. Dweib, M.A., Hu, B., O'Donnell, A., Shenton, H.W., and Wool, R.P. (2004) "All natural composite sandwich beams for structural applications," Composite Structures, Vol. 63, No. 2, pp. 147-157
24. Huang, H., Shenton, H.W., and Chajes, M.J. (2004), "Load Distribution for a Highly Skewed Bridge: Testing and Analysis," ASCE Journal of Bridge Engineering, Vol. 9, No. 6, pp. 558-562
25. Shenton III, H.W., Chajes, M.J., Sivakumar, B., and Finch, W.W. (2003) "Field Tests and In-Service Monitoring of the Newburgh-Beacon Bridge," Transportation Research Board, No. 1845, Design of Structures 2003
26. Huang, H., Chajes, M.J., Mertz, D.R., Shenton III, H.W., and Kaliakin, V.N. (2002). "Behavior of Open Steel Grid Decks," Journal of Constructional Steel Research, 58(5-8), 819-842.
27. Chajes, M.J., Shenton III, H.W., and Finch, W.W. (2001), "Diagnostic and In-Service Testing of Transit Railway Bridge," Transportation Research Record 1770, Design of Structures 2001: Bridges, Other Structures and Hydraulics and Hydrology, pp. 51-57.

28. Chajes, M.J., Shenton III, H.W., and Finch, W.W. (2001), "Performance of Glass Fiber-Reinforced Polymer Deck on Steel Girder Bridge," *Transportation Research Record 1770, Design of Structures 2001: Bridges, Other Structures and Hydraulics and Hydrology*, pp. 105-112.
29. Shenton III, H.W. and Zhang, L, (2001) "System Identification Based on the Distribution of Time Between Zero Crossings," *Journal of Sound and Vibration*, Vol. 243, No. 4, pp 577-589.
30. Shenton III, H.W. and Holloway, E.S. (2000), "Effect of Stiffness Variability on the Response of Isolated Structures," *Earthquake Engineering and Structural Dynamics*, Vol. 29, No. 1, pp. 19-36.
31. Dinehart, D.W. and Shenton III, H.W. (2000), "Model for Dynamics Analysis of Wood Frame Shear Walls," *ASCE Journal of Engineering Mechanics*, Vol. 126, No. 9, pp. 899-908.
32. Chajes, M.J., Shenton III, H.W. and O'Shea, D., (2000) "Bridge Condition Assessment and Load Rating Using Nondestructive Evaluation Methods," *Journal of the Transportation Research Board, TRB*, 1696(2), 83-91.
33. Gillespie, J.W., Eckel II, D.A., Edberg, W.M., Sabol, S.A., Mertz, D.R., Chajes, M.J., Shenton III, H.W., Hu, C., Chaudhri, M., Faqiri, A. and Soneji, J., (2000) "Bridge 1-351 Over Muddy Run: Design, Testing and Erection of an All-Composite Bridge," *Journal of the Transportation Research Board, TRB*, 1696(2), 118-123.
34. Shenton III, H.W. and Hampton, F.P., (1999) "Seismic Response of Isolated Elevated Water Tanks," *ASCE, Journal of Structural Engineering*. Vol. 125, No. 9, 965976.
35. Dinehart, D.W., Shenton III, H.W, and Elliott, T.E., (1999) "The Dynamic Response of Wood Frame Shear Walls with Viscoelastic Dampers," *Earthquake Spectra*. Vol. 15, No. 1, 6786.
36. Dinehart, D. W. and Shenton III, H.W. (1998), "Comparison of the Static and Dynamic Response of Timber Shear Walls," *ASCE, Journal of Structural Engineering*, Vol. 124, No. 6, 686695.
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38. Shenton III, H.W. (1997) "Analysis of Crosstie Track in Lateral Plane Using New Track Equations," *ASCE, Journal of Transportation Engineering*. Vol. 123, No. 3, May/June, 202-208.

39. Shenton III, H.W. (1996) "Criteria for Initiation of Slide, Rock and SlideRock RigidBody Modes," ASCE, Journal of Engineering Mechanics, Vol 112, No. 7, July, 690693.
40. Shenton III, H.W. and Lin, A.N. (1993) "Relative Performance of FixedBase and BaseIsolated Concrete Frames," ASCE, Journal of the Structural Division, Vol. 119, No. 10, Oct, 2952-2968.
41. Lin, A.N. and Shenton III, H.W. (1992) "Seismic Performance of FixedBase and BaseIsolated Steel Frames," ASCE, Journal of Engineering Mechanics, Vol. 118, No. 5, May, 921941.
42. Shenton III, H.W. and Jones, N.P. (1991) "Base Excitation of Rigid Bodies. I: Formulation," ASCE, Journal of Engineering Mechanics, Vol. 117, No. 10, Oct, 22862306.
43. Shenton III, H.W. and Jones, N.P. (1991) "Base Excitation of Rigid Bodies. II: Periodic Slide-Rock Response," ASCE, Journal of Engineering Mechanics, Vol. 117, No. 10, Oct, 2302-2328.
44. Jones, N.P. and Shenton III, H.W. (1991) "A Modified SlowlyVarying Parameter Approach for Systems with Impulsive Loadings," ASME, Journal of Applied Mechanics, Vol. 58, No. 1, Mar., 251258.
45. Shenton III, H. W. and Jones, N. P. (1989) "PCBased Data Acquisition System for Structural Monitoring," ASCE, Journal of Computing in Civil Engineering, Vol. 3, No. 4, Oct., 333347.
46. Kerr, A.D. and Shenton III, H.W. (1986) "Railroad Track Analyses and the Determination of Parameters," ASCE, Journal of Engineering Mechanics, Vol 112, No.11, Nov., 1117 1134.

### *Closures*

1. Dinehart, D.W., Shenton III, H.W, and Elliott, T.E., *Closure to the Discussion of "The Dynamic Response of Wood Frame Shear Walls with Viscoelastic Dampers," Earthquake Spectra*, Vol. 15, No. 5, Nov., pp 841-844.
2. Dinehart, D. W. and Shenton III, H.W. (1999), *Closure to the Discussion of "Comparison of the Static and Dynamic Response of Timber Shear Walls," ASCE, Journal of Structural Engineering*. Vol. 125, No. 7, 797797.
3. Shenton III, H.W. and Jones, N.P. (1993) *Closure to the Discussion of "Base Excitation of Rigid Bodies I: Formulation", ASCE Journal of Engineering Mechanics*, Vol. 119, No. 10, 21402141.

4. Shenton III, H.W. and Jones, N.P. (1993) *Closure to the Discussion of "Base Excitation of Rigid Bodies. II: Periodic SlideRock Response,"* ASCE, Journal of Engineering Mechanics, Vol. 119, No. 1, Jan., 193.

## **CONFERENCE PUBLICATIONS**

1. Al-Khateeb, H., Natalicchio, C., Shenton III, H., and Chajes, M.J. (2017), "Automated bridge model calibration using SHM controlled load test data," Proceedings of the 8th International Conference on Structural Health Monitoring of Intelligent Infrastructure, Brisbane, Australia, December, 2017
2. Wu, Z.Y., Zhou, K., Shenton, H.W., and Chajes, M.J. (2017), "Validating strain gauge placement methods for structural health monitoring of large cable support bridge" Proceedings of the 8th International Conference on Structural Health Monitoring of Intelligent Infrastructure, Brisbane, Australia, December, 2017
3. Al-Khateeb, H., Chajes, M. and Shenton, H. (2017) "Using SHM data to determine continuous load ratings for a cable-stayed bridge," Proceedings of the 8th International Conference on Structural Health Monitoring of Intelligent Infrastructure, Brisbane, Australia, December, 2017
4. Wells, A., Shenton, H., Manahiloh, K. N., Wenczel, G., (2017) "Experimental Evaluation of Dynamic Amplification Factor for Box Culverts." Proceedings of the Transportation Research Board (TRB) 2017 Annual Conference, Washington, D.C., January 8-12, 2017.
5. Wells, A., Shenton, H., Manahiloh, K. N., (2016) "Parametric Investigation of Factors Influencing the Dynamic Response of Buried Reinforced Concrete Culverts." Proceedings of the 2016 Geo-Structures Congress, Phoenix, AZ, February 14-17, 2016.
6. Shenton H., Fernandez, M., Ramanna, N., Chajes, M., Wenczel, G., and Al-Khateeb, H. (2015) "Structural Health Monitoring of a Cable-Stayed Bridge: Using Tiltmeter Data to Determine Edge Girder Deflections," Proceedings of the 7th International Conference on Structural Health Monitoring of Intelligent Infrastructure, Torino, Italy, July, 2015
7. Chajes, M., Shenton H., Al-Khateeb, H., Wenczel, G. and Ramanna, N. (2015), "Structural Health Monitoring of the Indian River Inlet Bridge: Results from Controlled Load Tests Conducted Over the First Two Years of Service", Proceedings of the 7th International Conference on Structural Health Monitoring of Intelligent Infrastructure, Torino, Italy, July, 2015

8. Shenton III, H.W., Chajes, M.J., Wenczel, G., Ramanna, N., Al-Khateeb, H., Davidson, K., and Marquez, P., (2014) "Structural health monitoring of Delaware's Indian River Inlet Bridge: year one update," Proceedings of the 2014 Structures Congress, American Society of Civil Engineers, Reston, VA 20191-4400, pp 345-355
9. Shenton III, H.W., Conte, P.R., Bonzella, J., (2014) "A first course in BIM for civil engineering majors" Proceedings of the 2014 Structures Congress, American Society of Civil Engineers, Reston, VA 20191-4400, pp 1097-1105
10. Shenton, H.W, Chajes, M.J., Wenczel, G. and K. Davidson, K. (2013), "Lessons learned in construction and early experience with the Indian River Inlet Bridge SHM system," Proceedings of the 6th International Conference on Structural Health Monitoring of Intelligent Infrastructure, Hong Kong, PRC, December 9-11, 2013
11. Marquez, P, Chajes, M, Shenton, H., Al-khateeb, H., Wenczel, G. and Cardinal, J. (2013) "Structural health monitoring: establishing the "baseline" performance of Delaware's Indian River Inlet Bridge," Proceedings of the 6th International Conference on Structural Health Monitoring of Intelligent Infrastructure, Hong Kong, PRC, December 9-11, 2013
12. Shenton III, H.W., and Connor, K. S. (2012) "Comparison of Historical In-Service Monitoring Data for Improved Maintenance and Management of Typical Bridges," Civil Structural Health Monitoring – 4, Berlin, Germany, November 6-8, 2012.
13. Shenton III, H.W., Carson, P.D., Wenczel, G.R., and Chajes, M.J. (2011) "Structural health monitoring of the Indian River Inlet Bridge," 5th International Conference on Structural Health Monitoring of Intelligent Infrastructure (SHMII-5), December 11-15, 2011, Cancun, Mexico
14. Shenton III, H.W., Carson, P.D., and Chajes, M.J. (2011), "Plan for structural health monitoring of Delaware's Indian River Inlet Bridge," International Workshop on Structural health Monitoring and Damage Assessment, NCREE, Taipei, Taiwan, ROC, June 9-10, 2011.
15. Shenton III, H.W., Connor, K, Chajes, M.J., Rakowski, M., Brookes, B. (2010) "Analysis of In-Service Data Collected During Biennial Inspections on Typical Bridges," Bridge Maintenance, Safety, Management and Life-cycle Optimization, Ed. Frangopol, D., Sause, R., and Kusko, C., CRC Press, 2010.
16. McConnell, J., Chajes, M., Shenton III, H., Michaud, K., Russo, C., and Ross, J. (2010), "Destructive test of a steel slab-on-girder bridge," Bridge Maintenance, Safety, Management and Life-cycle Optimization, Ed. Frangopol, D., Sause, R., and Kusko, C., CRC Press, 2010.



17. Shenton III, H.W., Chajes, M.J., and Finch, W.F. (2010), "Diagnostic load testing and in-service monitoring for assessment and preservation of historic truss bridges," Civil Structural Health Monitoring – 3, a Workshop, Ottawa, CA, August 11-13, 2010.
18. Carson, P.D., Shenton III, H.W., and Chajes, M.J., (2010), "Plan for structural health monitoring of the Indian River Inlet Bridge," NDE/NDT for Highways and Bridges: Structural Materials Technology (SMT), The American Society for Nondestructive Testing, Columbus, Ohio.
19. Rakowski, M., Shenton III, H.W. and Chajes, M.J. (2009) "In-Service and Weigh-In-Motion Monitoring of Typical Highway Bridges," Proceedings of the CSHM2 Workshop "Civil Structural Health Monitoring 2", Taormina, Sicily, Italy, Sep. 28-Oct 1, 2008.
20. Shenton III, H.W. (2009), "Diagnostic Testing and In-Service Monitoring as a Means of Health Monitoring of Typical Highway Bridges," International Symposium on Structural Health Monitoring, Retrofit and Vibration Control, National Chung Hsing University, Taichung, Taiwan, ROC, March 30, 2009
21. Shenton III, H.W. and Chajes, M.J., (2009), "Experiences in testing and modeling for bridge maintenance and rehabilitation," Proceedings of the 2009 Structures Congress, Austin, TX, April 30-May 2, 2009, American Society of Civil Engineers, Reston, VA.
22. Rakowski, M., Brookes, B., Chajes, M.J., and Shenton III, H.W. (2008), "Results of In-Service Monitoring of a Sample of Typical Highway Bridges," Crossing Borders: Proceedings of the 2008 Structures Congress, Vancouver, BC, April 24-28, 2008, American Society of Civil Engineers, Reston, VA.
23. Huang, J., and Shenton III, H.W. (2008), "Experimentally Determined Continuous Displacement Influence Lines for Bridges," Crossing Borders: Proceedings of the 2008 Structures Congress, Vancouver, BC, April 24-28, 2008, American Society of Civil Engineers, Reston, VA.
24. Strickland, T., and Shenton III, H.W., (2008), "Thermal and Creep Characteristics of Bio-Based Composite Beams," Crossing Borders: Proceedings of the 2008 Structures Congress, Vancouver, BC, April 24-28, 2008, American Society of Civil Engineers, Reston, VA.
25. Reader, N.E., Shenton, H.W., and Chajes, M.J. (2007) "Design, Installation, and Operation of a Monitoring System for an Interstate Highway Bridge," Paper 169, Proceedings of the 3rd International Conference on Structural Health Monitoring of Intelligent Infrastructure, Vancouver, British Columbia, Canada, November 13-16, 2007, International Society for Structural Health Monitoring of Intelligent Infrastructure.

26. Weston, D.F., Stuffle, T.J., West, J., Shenton III, H.W., and Chajes, M.J., (2006) "Plan for Structural Health Monitoring of the Indian River Inlet Bridge," Proceedings of the 2006 ASCE Structures Congress, St Louis, Missouri, Ed. Cross, B., and Finke, J., American Society of Civil Engineers, Reston, VA
27. Shenton III, H.W., Chajes, M.J., Finch, W.W., Chasten, C.P., and Chu, C-M (2006) "Field Test/Fatigue Investigation of the Summit Bridge," Proceedings of the 2006 ASCE Structures Congress, St Louis, Missouri, Ed. Cross, B., and Finke, J., American Society of Civil Engineers, Reston, VA
28. Shenton III, H.W., Conklin, A., Hu, B., and Wool, R.P. (2006) "Bio-composite structural panels for low rise construction," Proceedings of Structural Faults and Repair 2006, Ed. Forde, M., Engineering Technics Press, Edinburgh, Scotland.
29. Shenton III, H.W., Dawson, M., and Chavez, A. (2006) "Evaluation and rating of damaged steel I-girders," Bridge Maintenance, Safety, Management, Life-Cycle Performance and Cost, Ed., Cruz, Frangopol and Neves, Taylor & Francis Group, London
30. Chajes, M.J., Shenton, H.W., Weston, D.F., Stuffle, T.J., and West, J. (2006), "Structural health monitoring of Delaware's Indian River Inlet Bridge," Bridge Maintenance, Safety, Management, Life-Cycle Performance and Cost, Ed., Cruz, Frangopol and Neves, Taylor & Francis Group, London
31. D.A. Howell and H.W. Shenton III (2005) "A System for In-Service Strain Monitoring of Ordinary Bridges", Proceedings of the 2005 ASCE Structures Congress, New York, April, 2005
32. Chajes, M.J., and Shenton III, H.W., (2005) "Using Diagnostic Load Tests for Accurate Load Rating of Typical Bridges," Proceedings of the 2005 ASCE Structures Congress, New York, April, 2005
33. Dinehart, D. W., Shenton III, H. W., and Carlson, S. (2004) "Stiffness and Energy Degradation of Walls Constructed with Green Lumber", Proceedings of the 8th World Conference on Timber Engineering, Lahti, Finland, June.
34. A. M. Aktan, D. M. Frangopol, H. Ghasemi, H. W. Shenton III, M. Shinozuka, S. Madanat, (2004) "A network of field test sites as a platform for research on engineering and management of the highway transportation infrastructure," Proceedings of SPIE: Nondestructive Detection and Measurement for Homeland Security II, Ed. S. Doctor, Y. Bar-Cohen, A. Aktan and H. Wu, Vol. 5395, pp. 128-133.

35. Shenton III, H.W. and Wool, R.P. (2004), "Bio-based composite materials for whole house design: potential applications and research needs," Proceedings of the NSF-PATH Housing Research Agenda Workshop, Vol. II, pp. 327-333.
36. Shenton III, H.W., Jones, R. and Howell, D. A. (2004) "A Web-Based System for Measuring Live Load Strain in Bridges" Structural Materials Technology VI: An NDT Conference, Buffalo, NY, Sept. 2004, pp. 339-346, The American Society for Nondestructive Testing, Columbus, Ohio, Ed. S. Alampalli and G. Washer.
37. Shenton III, H.W., Gallagher, K. and Chajes, M.J. (2004) "Applicability of the ASTM hole-drilling method for measuring dead load stresses" Structural Materials Technology VI: An NDT Conference, Buffalo, NY, Sept. 2004, pp. 212-218, The American Society for Nondestructive Testing, Columbus, Ohio, Ed. S. Alampalli and G. Washer.
38. Shenton III, H.W., Chajes, M.J., Finch, W.W., Rzuclidlo, M.C., Carrigan-Laning, J., Chasten, C.P., (2003) "Field Test of a Fatigue Prone Steel Tied Arch," Proceedings of the 2003 ASCE Structures Congress, Seattle, Washington, May 29-31.
39. Shenton III, H.W. and Zhao, L (2003), "Dead load redistribution due to damage in a large moment frame," Structural Health Monitoring 2003: From Diagnostics and Prognostics to Structural Health Management, Proceedings of the 4th International Workshop on Structural Health Monitoring, Stanford, CA., Ed. F.K Chang
40. Hu, X. and Shenton III, H.W., (2003) "Damage Identification in a two-span continuous beam," Structural Health Monitoring and Intelligent Infrastructure, Proceedings of the First International Conference on Structural Health Monitoring and Intelligent Infrastructure, November 13-15, 2003, Tokyo, Japan, pp. 1103-1108.
41. Howell, D.A. and Shenton III, H.W., (2003) "An in-service bridge monitoring system" Structural Health Monitoring and Intelligent Infrastructure, Proceedings of the First International Conference on Structural Health Monitoring and Intelligent Infrastructure, November 13-15, 2003, Tokyo, Japan, pp.431-436.
42. Zhao, L. and Shenton III, H.W., (2003) "A best approximation method for damage identification in frame type structures," Structural Health Monitoring and Intelligent Infrastructure, Proceedings of the First International Conference on Structural Health Monitoring and Intelligent Infrastructure, November 13-15, 2003, Tokyo, Japan, pp.409-414.

43. Shenton III, H.W., Huff, S.E., and Chajes, M.J. (2002), "Field Test and Load Rating of a Concrete Encased Steel Girder Bridge," Proceedings of the 2002 ASCE Structures Congress, Denver, Colorado, April 4-6, 2002.
44. Shenton III, H.W., Zhao, L. and Hu, X. (2002) "Dead Load Redistribution as a Means for Damage Identification in Large Civil Structures" Proceedings of the Third World Conference on Structural Control, Como, Italy, April 7-12, 2002.
45. Hite, M., and Shenton III, H.W., (2002) "Modeling the Nonlinear Behavior of Wood Frame Shear Walls," Proceedings of the 15th ASCE Engineering Mechanics Conference, June 2-5, 2002, Columbia University, New York, NY.
46. Hu, X. and Shenton III, H.W., (2002) "Structural Damage Identification Using Static Dead Load Strain Measurements," Proceedings of the 15th ASCE Engineering Mechanics Conference, June 2-5, 2002, Columbia University, New York, NY.
47. Zhao, L. and Shenton III, H.W., (2002) "Direct Identification of Damage in Beam Structures Using Dead Load Measurements" Proceedings of the 15th ASCE Engineering Mechanics Conference, June 2-5, 2002, Columbia University, New York, NY.
48. Shenton III, H.W., Chajes, M.J., Finch, W.W., and Sivakumar, B (2002) "Long-Term Monitoring of the Newburgh-Beacon Bridge," Structural Materials Technology V: An NDT Conference, September 10-13, 2002, Cincinnati, Ohio.
49. Shenton III, H.W., Wool, R. P., Hu, B., O'Donnell, A., Bonnaillie, L., Can, E., Chapas, R. and Hong, C., (2002) "An All-Natural Composite Material Roof System for Residential Construction," Proceedings of the International Conference on Advances in Building Technology Conference, Hong Kong, December 4-6, 2002.
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53. Shenton III, H.W., Chajes, M.J., Mertz, D.R. and Gillespie, J.W., (2000) "Continuous, Long-Term Monitoring of Two Advanced Polymer Composite Bridges," Proceedings of the ASCE Structures Congress 2000, Philadelphia, PA, May.
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55. Chajes, M.J., Gillespie, J.W., Mertz, D.R., Shenton III, H.W. and Eckel II, D.A., (2000) "Delaware's First All-Composite Bridge", Proceedings of the ASCE Structures Congress 2000, Philadelphia, PA, May.
56. Shenton III, H.W., Chajes, M.J., and Holloway, E.S., (2000) "A System for Monitoring Live Load Strain in Bridges," Structural Materials Technology IV: An NDT Conference, Atlantic City, NJ, Feb.28 – Mar. 3, 2000, Ed. Alampalli, Technomic Publishing Co., Lancaster PA., pp. 89-94.
57. Chajes, M.J., Shenton III, H.W., and O'Shea, D., (2000) "Assessing Bridge Capacity Using NDE Methods," Structural Materials Technology IV: An NDT Conference, Atlantic City, New Jersey, February 28 – March 3, 2000, Ed. Alampalli, Technomic Publishing Co., Lancaster PA., pp. 117-122
58. Li, D., Chajes, M.J., and Shenton H.W., Richardson, D., Wenczel, G., Soneji, J., and Folliard, K., (2000). "Delaware's High Performance Concrete Bridge Showcase: A Case Study," PCI/FHWA/FIB International Symposium on High Performance Concrete, PCI, Orlando, FL, 677-686.
59. Chajes, M.J., Shenton, H.W., O'Shea, D. (1999). "Use of Field Testing in Delaware's Bridge Management Program," 8th International Bridge Management Conference, TRB, National Research Council, Denver, Colorado, Vol I, B4, 16.
60. Shenton III, H.W. and Elliott, T.E. (1999) "A Model for the Dynamic Analysis of Sheathing-to-Stud Connections," Proceedings of the 13th ASCE Engineering Mechanics Conference, Baltimore, MD, June 1316.
61. Dinehart, D.W. and Shenton III, H.W. (1999) "Modeling the Dynamic Behavior of Wood Shear Walls," Proceedings of the 13th ASCE Engineering Mechanics Conference, Baltimore, MD, June 1316.
62. Shenton III, H.W. and Chajes, M.J (1999) "LongTerm Health Monitoring of an Advanced Polymer Composite Bridge," Proceedings of the SPIE 6th Annual International Symposium on Smart Structures and Materials, Newport Beach, CA, March 15.

63. Dinehart, D.W. and Shenton III, H.W. (1998) "Comparison of the Response of Timber Shear Walls With and Without Passive Dampers," Proceedings of the First Structural Engineers World Congress, San Francisco, California, July 1923, 1998.
64. Shenton III, H.W. (1998) "Analysis of Dual Beams Coupled by a Continuous Elastic Layer," Proceedings of the 12th ASCE Engineering Mechanics Conference, San Diego, California, May 1720, 1998.
65. Hampton, F.P. and Shenton III, H.W. (1998) "Analysis of Seismically Isolated Elevated Water Tanks," Proceedings of the 6th U.S. National Conference on Earthquake Engineering, Seattle, Washington, May 31/June 4, 1998.
66. Chajes, M.J., Mertz, D.R., Gillespie Jr., J.W. and Shenton III, H.W. (1998) "Advanced Composite Bridges in Delaware," Proceedings of ICCI '98, Tucson, Arizona, January 57, 1998.
67. Shenton III, H.W. and Zhang, L. (1997) "Distribution of Local Extrema for Use in System Identification," Proceedings of the 8th U.S. National Conference on Wind Engineering, The Johns Hopkins University, Baltimore, MD., June 57, 1997.
68. Chajes, M.J., Shenton III, H.W., Gillespie Jr., J.W. and Mertz, D.R. (1997) "Load Testing and Long Term Monitoring of Advanced Composite Bridges," Proceedings of Structural Faults and Repair 97: 7th International Conference and Exhibition, Edinburgh, Scotland, July 810, 1997.
69. Chajes, M.J., Shenton III, H.W., Gillespie Jr., J.W., and Mertz, D.R. (1997) "Structural Monitoring of an Advanced Composite Bridge," Proceedings of U.S./Canada/Europe Workshop on Bridge Engineering, Zurich, Switzerland, July 1415, 1997.
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71. Shenton III, H.W., Taylor, A.W. and Lew, H.S. (1995) "Test Requirements for Base Isolation," Wind and Seismic Effects, Proceedings of the 27th Joint Meeting of the U.S./Japan Cooperative Program in Natural Resources, Panel on Wind and Seismic Effects, May 1619, 1995, Public Works Research Institute, Technical Memorandum No. 3387, Tsukuba, Japan, pp. 8187.
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73. Shenton III, H.W. and Chung, R.M. (1994) "Standards for Testing and Evaluation of Structural Control Systems," Proceedings of the First World Conference on Structural Control, August 35, Los Angeles, California.
74. Shenton III, H.W., (1994) "Development of Guidelines for Testing of Seismic Isolation Systems," Proceedings of the Fifth U.S. National Conference on Earthquake Engineering, Chicago, Illinois, July 10-14.
75. Shenton III, H.W. (1994) "Guidelines for PreQualification, Prototype, and Quality Control Testing of Seismic Isolation Systems," Proceedings of the Third U.S.-Japan Workshop on Earthquake Protective Systems for Bridges, I. Buckle and I. Friedland, Ed., National Center for Earthquake Engineering Research, Technical Report, NCEER940009.
76. Shenton III, H.W. (1994) "Standard Test Procedures for Seismic Isolation Systems," Wind and Seismic Effects, Proceedings of the 26th Joint Meeting of the U.S.-Japan Cooperative Program in Natural Resources Panel on Wind and Seismic Effects, N. Raufaste Ed., National Institute of Standards and Technology, Gaithersburg, Maryland, Special Publication, SP 871.
77. Shenton III, H.W. (1994) "The NIST Draft Guidelines for Testing Seismic Isolation Systems: Application to Bridges," Proceedings of the 10th U.S.-Japan Bridge Engineering Workshop, May 10-11, 1994, Lake Tahoe, Nevada.
78. Shenton, H.W., (1993) "NIST Efforts in Natural Hazard Mitigation: Current Programs and Future Opportunities in Structural Control," Proceedings of the International Workshop on Structural Control, Honolulu, Hawaii, Aug.
79. Shenton, H.W., (1993) "Seismic Isolation in UBC Zones 1 and 2," Proceedings of the 1993 National Earthquake Conference, Memphis, Tennessee, May.
80. Shenton III, H.W. and Jones, N.P. (1993) "Response of Building Contents to Earthquake Excitations," Proceedings of the 1993 National Earthquake Conference, Memphis, Tennessee, May.
81. Shenton, H.W., (1993) "Draft Guidelines for Testing and Evaluation of Seismic Isolation Systems," ATC 171, Proceedings of Seminar on Seismic Isolation, Passive Energy Dissipation, and Active Control, San Francisco, California, Mar.
82. Shenton III, H.W. and Jones, N.P., (1992) "Multiple Modes of Steady State Slide/Rock Response," Proceedings, 9th ASCE Engineering Mechanics Conference, College Station, Texas, May 24-27.
83. Shenton III, H.W. and Jones, N.P., (1992) "Effect of Friction and Restitution on Rocking Response," Proceedings, Tenth World Conference on Earthquake Engineering, July 1992, Madrid, Spain.

84. Shenton III, H.W., Lin, A.N. and Lew, H.S., (1992) "Relative Performance of Fixed and Isolated Structures," Proceedings, Tenth World Conference on Earthquake Engineering, July 1924, Madrid, Spain.
85. Shenton III, H.W. (1992) "Design Criteria for Base Isolation of Buildings," Wind and Seismic Effects, Proceedings of the 24th Joint Meeting of the U.S.-Japan Cooperative Program in Natural Resources Panel on Wind and Seismic Effects, N. Raufaste Ed., National Institute of Standards and Technology, Gaithersburg, Maryland, Special Publication, SP 843.
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87. Jones, N.P. and Shenton III, H.W. (1988) "The Rocking and Sliding Response of Rigid Structures," Proceedings, 7th ASCE EMD Specialty Conference, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, May 2325.
88. Kerr, A.D. and Shenton III, H.W. (1985) "On the Reduced Area Method for Calculating the Vertical Track Modulus," Proc. AREA, Vol 86.

## **RESEARCH AND TECHNICAL REPORTS**

1. Shenton, H., Mertz, D., and Weykamp, P. (2016), "Guidelines for Maintaining Small Movement Bridge Expansion Joints, Final Report (Part 1)," Final report of project NCHRP12-100, Transportation Research Board, National Cooperative Highway Research Program, Washington, DC.
2. Shenton, H., Mertz, D., and Weykamp, P. (2016), "Guidelines for Maintaining Small Movement Bridge Expansion Joints, Final Report (Part 2)," Final report of project NCHRP12-100, Transportation Research Board, National Cooperative Highway Research Program, Washington, DC.
3. Shenton, H.W. III, Chajes, M.J., Wenczel, G., and Al-Khateeb, H., (2016), "Load Tests of the Charles W. Cullen Bridge at Indian River Inlet", Delaware Transportation Institute, Report 254, University of Delaware, Newark, DE 19716
4. Milner, M. and Shenton III, H.W. (2014) "Survey of Past Experience and State-of-the-Practice in the Design and Maintenance of Small Movement



Expansion Joints in the Northeast," Delaware Transportation Institute, Report 242, University of Delaware, Newark, DE 19716

5. Shenton, H.W., Chajes, M.J., Wenczel, G., and Cardinal, J. (2013), "Inaugural Load Test of the Charles W. Cullen Bridge at Indian River Inlet", Delaware Transportation Institute, Report 238, University of Delaware, Newark, DE 19716
6. Shenton, H.W., Chajes, M.J. , Kucz, D., Quigley, J., and Soto Fuentes, J. (2012), "Testing and Analysis of the Route 141 Newport Viaduct: Fatigue Evaluation", Delaware Transportation Institute, Report 227, University of Delaware, Newark, DE 19716
7. Shenton, H.W., and Connor, K.S., (2012), "In-Service Monitoring for Improved Maintenance and Management of DelDOT's Bridges", Delaware Transportation Institute, Report 223, University of Delaware, Newark, DE 19716
8. Shenton H.W. and Jones, B.P., (2012), "Effective Width of Concrete Slab Bridges in Delaware", Delaware Transportation Institute, Report 208, University of Delaware, Newark, DE 19716
9. Shenton, H.W., Chajes, M.J., and Huang, J., (2007), "Load Rating of Bridges without Plans", Delaware Transportation Institute, Report 195, University of Delaware, Newark, DE 19716
10. Reader, N., Chajes, M.J., and Shenton, H.W., (2007), "Development of Delaware's First "Smart Bridge"", Delaware Transportation Institute, Report 194, University of Delaware, Newark, DE 19716
11. Shenton, H.W., Chajes, M.W., and Brooks, B.O. (2007), "Load Rating Using an In-Service Monitoring System," Delaware Transportation Institute, Report 190, University of Delaware, Newark, DE 19716
12. Chajes, M.J. and Shenton, H.W., (2004), "Evaluating the Load Carrying Capacity of Bridges Without Plans Using Field Test Results", Delaware Transportation Institute, Report 157, University of Delaware, Newark, DE 19716
13. Shenton, H.W. and Howell, D. (2003) "Second Generation In-Service Bridge Monitoring System", Delaware Transportation Institute, Report 156, University of Delaware, Newark, DE 19716
14. Chajes, M.J., Shenton, H.W. and Mertz, D.R. (2003) "High Performance Concrete for Bridge 8F in Frederica", Delaware Transportation Institute, Report 155, University of Delaware, Newark, DE 19716

15. Chajes, M.J., Mertz, D.R., Shenton, H.W. and Kaliakin, V. (2002) "Experimental Load Rating of Posted Bridges", Delaware Transportation Institute, Report 141, University of Delaware, Newark, DE 19716
16. Shenton, H.W., and Charles, D. N. (2012), "Testing and Operation of Delaware's First Permanently Instrumented "Smart" Bridge", Delaware Transportation Institute, Report 225, University of Delaware, Newark, DE 19716
17. Shenton III, H.W., Chajes, M.J. and Holloway, E.S., (2001), "A System for Long-Term Monitoring of Live Load Strain in Bridges," Delaware Transportation Institute, Report 123, University of Delaware, Newark, DE 19716
18. Shenton III, H.W., (1996) "Guidelines for Prequalification, Prototype and Quality Control Testing of Seismic Isolation Systems," NISTIR 5800, 1996, National Institute of Standards and Technology, Gaithersburg, Maryland.
19. Shenton III, H.W., (1996) "Summary and Results of the NIST Workshop on Proposed Guidelines for Testing and Evaluation of Seismic Isolation Systems, July 25, 1994, San Francisco, California," NISTIR 5785, January 1996, National Institute of Standards and Technology, Gaithersburg, Maryland.
20. Shenton III, H.W. and Cassidy, M.M. (1995) "Field Evaluation of the System for Calibration of the Marshall Compaction Hammer," NISTIR 5553, February 1995, National Institute of Standards and Technology, Gaithersburg, Maryland.
21. Shenton III, H.W., (1994) "Draft Guidelines for Prequalification and Prototype Testing of Seismic Isolation Systems," NISTIR 5359, March 1994, National Institute of Standards and Technology, Gaithersburg, Maryland.
22. Shenton III, H.W., (1994) "Draft Guidelines for Quality Control Testing of Elastomeric Seismic Isolation Systems," NISTIR 5345, February 1994, National Institute of Standards and Technology, Gaithersburg, Maryland.
23. Shenton III, H.W., (1994) "Draft Guidelines for Quality Control Testing of Sliding Seismic Isolation Systems," NISTIR 5371, March 1994, National Institute of Standards and Technology, Gaithersburg, Maryland.
24. Shenton III, H.W., Cassidy, M.M., Spellerberg, P.A., Savage, D.A., (1994) "A System for Calibration of the Marshall Compaction Hammer," NISTIR 5338, January 1994, National Institute of Standards and Technology, Gaithersburg, Maryland.

25. Shenton III., H.W., Anderson, E.D., Gross, J.L, and Marshall, R.D., (1992)  
"The NIST Impact Test Facility," NISTIR 4896, January 1992, National  
Institute of Standards and Technology, Gaithersburg, Maryland.

### **INVITED PRESENTATIONS AND LECTURES**

1. "Structural Health Monitoring: Case of the Indian River Inlet Bridge,"  
Columbia University, Civil Engineering and Engineering Mechanics  
Department, November 28, 2017
2. "Structural Health Monitoring: Case of the Indian River Inlet Bridge,"  
Northeastern University, Department of Civil and Environmental Engineering,  
Distinguished Lecture Series, October 24, 2016
3. "Structural Health Monitoring and Advanced Analysis of Bridges: A Pathway  
to Improved Performance," The Year in Infrastructure Conference 2016,  
London, England, November 2, 2016.
4. "Diagnostic Testing and In-Service Monitoring as a Means of Health  
Monitoring of Typical Highway Bridges," International Symposium on  
Structural Health Monitoring, Retrofit and Vibration Control National Chung  
Hsing University, Taichung, Taiwan, ROC, March 30, 2009

### **SPONSORED RESEARCH**

- "On-going Evaluation and Maintenance of the Indian River Inlet Bridge Structural Health  
Monitoring System," Center for Innovative Bridge Engineering (Delaware Department  
of Transportation) (5/5/14-9/30/16) \$62,500, PI - Michael J. Chajes, Co-PI Harry W.  
Shenton III.
- "Field Measurement of the Dynamic Impact Factor for Buried Culverts," Center for  
Innovative Bridge Engineering (Delaware Department of Transportation)  
(5/5/14-9/30/16) \$74,135, PI-K. Manahiloh, Co-PI- Harry W. Shenton III.
- "Guidelines for maintaining small movement bridge expansion joints," National Academy  
of Sciences, (7/16/15-1/16/16), \$150,000, PI – Harry W. Shenton III, Co-PI's D.  
Mertz and P. Weykamp.
- "Impact factor for buried culverts," Center for Innovative Bridge Engineering (Delaware  
Department of Transportation) (12/16/14-12/15/15) \$66,848, PI- Harry W. Shenton  
III, Co-PI K. Manahiloh.
- "State-of-the-practice and performance of small movement expansion joints in the  
northeast," Michigan State University, (5/1/13-4/30/14), \$7,500, PI – Harry W.  
Shenton III.
- "Evaluation of unpainted weathering-steel highway bridge performance," Federal Highway  
Administration (sub-award through Rutgers University), (10/1/11-9/30/13),  
\$333,432, PI – Harry W. Shenton III, Co-PI's D. Mertz and J. McConnell.

- "GAANN: Research and Teaching Training in Transportation Infrastructure Engineering – an Area of National Need," U.S. Department of Education, (8/15/09-8/14/12) \$653,280, PI- Harry W. Shenton III, Co-PI Sue McNeil.
- "Field Testing and FEM of the Rt. 141 Newport Viaduct," Center for Innovative Bridge Engineering (Delaware Department of Transportation) (3/09-12/10) \$175,412, PI - Michael J. Chajes, Co-PI- Harry W. Shenton III, Co-PI Dennis R. Mertz, Co-PI Jennifer McConnell
- "Testing and Operation of Delaware's First "Smart Bridge","Center for Innovative Bridge Engineering (Delaware Department of Transportation) (9/09-8/11) \$56,646, PI- Harry W. Shenton III, Co-PI Michael J. Chajes.
- "Instrumentation and monitoring of the Indian River Inlet Bridge," Delaware Department of Transportation, (8/12/09-6/30/14), \$1,917,671, PI- Harry W. Shenton III, Co-PI Michael J. Chajes.
- "In-service monitoring for improved maintenance and management of DelDOT bridges (Phase III)," Center for Innovative Bridge Engineering (Delaware Department of Transportation) (9/09-8/11) \$49,862, PI- Harry W. Shenton III
- "Historic Resiliency of Bridges on the BOSFOLK Corridor," University Transportation Center (9/09-8/10) \$33,160, PI - Harry W. Shenton III.
- "Bridge Management Using I-Service Data (Phase II)," Center for Innovative Bridge Engineering (Delaware Department of Transportation) (7/07-6/08) \$53,908, PI- Harry W. Shenton III, Co-PI Michael J. Chajes.
- "Calibrated Video System for Traffic Speed and Vehicle Identification," Delaware Center for Transportation (Delaware Department of Transportation) (7/07-6/08) \$20,000, PI- Jack Puleo, Co-PI - Harry W. Shenton III.
- "Bridge Management Using In-Service Data," Center for Innovative Bridge Engineering (Delaware Department of Transportation) (7/05-6/07) \$58,229, PI- Michael J. Chajes, Co-PI Harry W. Shenton III.
- "Instrumentation and Monitoring of the Indian River Inlet Bridge: Phase I" Delaware Department of Transportation (9/05-8/07) PI – Michael Chajes, Co-PI Dov Leshchinsky, and Co-Inv. Harry Shenton III
- "Development of a Comprehensive Workplan for FHWA's Long-Term Bridge Performance (LTBP) Program" (7/05-6/09) \$330,000 PI - Michael Chajes , Co-PI Dennis Mertz, Co-Inv. Nii Attoh-Okine, Co-Inv. Sue McNeil, Co-Inv. Jennifer Righman, and Co-Inv. Harry Shenton III
- "Bio-based Composite Panels For Residential Construction," National Science Foundation, (9/03-8/06) \$299,698, PI- Harry W. Shenton III, Co-PI Richard P. Wool.
- "Using Viscoelastic Material to Reduce the Dynamic Response of Woodframe Structures," National Science Foundation (sub-award through Villanova Univ.) (6/03-5/06) \$85,103, PI- Harry W. Shenton III.
- "Load Rating of Bridges Without Plans: Phase II," Center for Innovative Bridge Engineering (Delaware Department of Transportation) (9/02-8/04) \$40,000, PI- Harry W. Shenton III, Co-PI Michael J. Chajes.

- "MMFX Rebar Evaluation for I-95 Service Road Bridge 1-712-B," Center for Innovative Bridge Engineering (Delaware Department of Transportation) (9/02-8/04) \$99,286, PI- Michael J. Chajes, Co-PI's Harry W. Shenton III and R. Hunsperger.
- "Development of Delaware's First "Smart Bridge," Center for Innovative Bridge Engineering (Delaware Department of Transportation) (9/02-8/04) \$78,306, PI – Michael J. Chajes, Co-PI's, Harry W Shenton III, B. Bhattacharya and J. Sun.
- "Stainless Clad Rebar and CFRP Rehab Evaluation for Bridge 1-119," Center for Innovative Bridge Engineering (Delaware Department of Transportation) (9/02-8/04) \$59,140, PI- Michael J. Chajes, Co-PI's Harry W. Shenton III, B. Bhattacharya and R. Hunsperger.
- "Travel Grant to Attend the Advances in Building Technology Conference," National Science Foundation (09/02-06/03) \$24,100. PI – Harry W. Shenton III
- "An Advanced All Natural Composite Roof for Residential Construction," National Science Foundation (10/01-9/04) \$150,000, PI- Harry W. Shenton III, Co-PI Richard P. Wool.
- "Load Testing and Post-Repair Evaluation of CFRP Repaired Bridge 1-026", Delaware Transportation Institute (Delaware Department of Transportation) (2001-2003) \$28,658, PI – Michael J. Chajes, Co-PI Harry W. Shenton III.
- "Affect of Vertical Load on the Cyclic Lateral Load Response of Wood Frame Shear Walls," U.S. Department of Agriculture (12/00-11/03) \$95,429, PI- Harry W. Shenton III.
- "Structural Health Monitoring for Delaware's Transportation Infrastructure," Delaware Department of Transportation (9/00-8/02) \$25,000, PI- Harry W. Shenton III.
- "Newark Airport Monorail," HDR Consulting Engineers, (5/00-12/00) \$224,499, PI's - Michael J. Chajes and Dennis R. Mertz, Co-PI Harry W. Shenton III.
- "NSF CAREER: New Concepts in Long-Term Structural Health Monitoring," National Science Foundation (7/99-6/04) \$225,000, PI- Harry W. Shenton III.
- "High-Performance Concrete for Bridge 8F in Frederica, Delaware," Federal Highway Administration (7/99-6/02) \$99,969, PI's - Kevin J. Folliard and Michael J. Chajes, Co-PI's Harry W. Shenton III, Dennis R. Mertz and Jack Gillespie.
- "Load Rating of Arches," Delaware Transportation Institute (Delaware Department of Transportation) (7/99-6/01) \$37,721, Co-PI's Michael J. Chajes and Harry W. Shenton III.
- "A System for Long-Term Monitoring of an Advanced Polymer Composite Bridge," National Science Foundation (1/99-1/00) \$60,640, PI- Harry W. Shenton III, Co-PI's Michael J. Chajes, Dennis R. Mertz and Jack Gillespie.
- "Bridge Load Testing," Delaware Transportation Institute (Delaware Department of Transportation) (11/98-6/00) \$41,544, Co-PI's Michael J. Chajes and Harry W. Shenton III.
- "Field Implementation of a System for Long-Term Monitoring of Bridges," Delaware Transportation Institute (Delaware Department of Transportation) (7/98-6/00) \$34,472, PI- Harry W. Shenton III, Co-PI Michael J. Chajes.
- "Non-destructive Evaluation of Bridges Through Long-Term Monitoring," Delaware Transportation Institute (Delaware Department of Transportation) (7/97-6/99) \$36,955, PI- Harry W. Shenton III, Co-PI Michael J. Chajes.

- "Load Rating Bridges That Have No Structural Plans and Bridges That Are Highly Skewed," Delaware Transportation Institute (Delaware Department of Transportation) (7/96-6/98) \$38,672, Co-PI's Michael Chajes and Harry W. Shenton III.
- "Proposal to the Bridge Grid Manufacturer's Association," sponsored by IKG Industries and the Delaware Research Partnership (7/96-6/99) \$200,000, PI's - Dennis R. Mertz and Michael J. Chajes, Co-PI's Victor Kaliakin and Harry W. Shenton III.
- "Proposal to Monitor the Magazine Ditch and New Castle Avenue Bridges," Delaware Department of Transportation and the Federal Highway Administration, \$100,000, Co-PI's Michael Chajes, Jack Gillespie, Dennis Mertz and Harry W. Shenton III.
- "System Identification Based on Distribution of Extrema," University of Delaware Research Foundation (7/96-6/97) \$29,970, PI- Harry W. Shenton III.
- "Passive Energy Dissipation Systems in Wood Frames Structures for Improved Seismic and Wind Response," U.S. Department of Agriculture NRICGP (9/95-8/98) \$102,000, PI- Harry W. Shenton III.
- "Experimental Load Rating of Bridges," Delaware Transportation Institute (Delaware Department of Transportation) (7/95-6/97) \$37,474, PI - Michael J. Chajes, Co-PI's Dennis R. Mertz, Victor Kaliakin and Harry W. Shenton III.
- "Development of Guidelines for Testing Seismic Isolation Systems," National Institute of Standards and Technology (12/94-7/96) \$18,230, PI- Harry W. Shenton III.

## **RESEARCH SUPERVISION**

### *Doctoral Students:*

David D. Dinehart, *The Dynamic Behavior of Wood-Framed Shear Walls with Passive Energy Dissipation Devices*, Summer 1998

Xiaofeng Hu, *Structural Damage Identification Based on Static Dead Load Strain Measurements*, Fall 2002

Ling Zhao, *Structural Health Monitoring and Damage Identification Using Best Approximation Dead Load Stress Redistribution*, Fall 2004

Bo Hu, *Bio-based Composite Sandwich Panel for Residential Construction*, Spring 2006

Jun Huang, *Evaluating Bridge Performance: Load Rating Bridges Without Plans and Experimental Displacement Influences Lines*, Winter 2007

Patrick Carson, *Evolving and Confirming Estimated Parameters Based on Structural Health Monitoring Data*, Spring, 2011

Hadi Al-Khateeb, *Structural Health Monitoring of the Indian River Inlet Bridge*, co-advise with M. Chajes, Summer 2016.

### *Masters Students:*

Francis P. Hampton, *Analysis of Isolated Elevated Water Tanks*, Summer 1998

Timothy Elliott, *A Viscoelastic Model for the Cyclic Response of Nailed Wood Connections*, Spring 1999

Eric Holloway, *A System for Long-Term Monitoring of Bridges*, co-adviser, Spring 1999

Haoxiong Huang, *Analysis and Testing of a Highly Skewed Bridge*, co-adviser, Spring 1999

Eric Thompson, *Evaluating the Load Carrying Capacity of Bridges Without Plans Using Field Test Results*, co-adviser, Fall 1999

Degang Li, *Evaluating the Performance of an HPC Bridge*, co-advisor, Summer 2001

William L. Johnson, IV, *Long-term Structural Health Monitoring of Polymer Composite Bridges*, co-advisor, Summer 2001,

Monique C. Hite, *Modeling the Nonlinear Behavior of Wood Frame Shear Walls*, Spring 2002

Daniel A. Howell, *Development of a Wireless In-service Bridge Monitoring System*, Spring 2003

Adrienne R. Johnston, *Response of Wood Frame Shear Walls with Applied Lateral Load*, Spring 2005

Brianna Brookes, *Bridge Management Using In-Service Data*, co-advisor, Spring 2007

Michael Rakowski, *Bridge Evaluation Using In-Service and Weigh-In-Motion Data*, co-advisor, Spring 2008

Robert Natalie, *Further Development of Delaware's First Permanently Instrumented Bridge*, Spring 2008

Daniel Kucz, *Analysis of Distortion-Induced Fatigue Cracking in a Steel Trapezoidal Box Girder Bridge*, Spring 2009

James Quigley, *Analysis of Distortion Induced Fatigue Cracking of a Trapezoidal Steel Box Girder Bridge Including Retrofit Investigation*, Spring 2009

Kevin Connor, *Comparison of Historical In-Service Monitoring Data for Improved Maintenance and Management of Bridges*, Spring, 2011

Douglas N. Charles, *Testing and Operation of Delaware's First Permanently Instrumented "Smart" Bridge*, Spring 2011

Brian P. Jones, *Evaluation of the AASHTO Effective Width Equation in Concrete Slab Bridges in Delaware*, Summer, 2011

Jose Soto Fuentes, *Fatigue life Analysis of a Steel Trapezoidal Box Girder Bridge Using Measured Strains*, Spring 2011

Kent Davidson, *Estimation of Tension in Stay Cables at the Indian River Inlet Bridge Using Frequency Based Methods*, Summer 2013.

Mathew Sparacino, *The Tensile Performance of Closed Cell Foam Expansion Joints: A Study of the Deleterious Effects of Compression Set*, Spring 2016

Andrew Wells, *Analytical and Experimental Investigation of Dynamic Amplification Factor for the Load Rating of Reinforced Concrete Box Culverts*, May 2016.

Shaymaa Khudhair Obayes, *The Indian River Inlet Cable Stayed Bridge: The Effect of Wind Speed and Direction on Estimates of Stay Cable Forces*, Summer 2017

*Undergraduate Senior Theses:*

Peter K. Dean, *Experimental Investigation of the Effect of Vertical Load on the Capacity of Wood Frame Shear Walls*, Spring 2003

Andrew Conklin, *Testing and Analysis of Bio-Based Composite Panels*, Spring 2005

Timothy Strickland, *Thermal and Creep Behavior of Bio-based Composites*, Spring 2007

**COURSES TAUGHT**

<b>Term</b>	<b>Course Number</b>	<b>Course Title</b>
Fall 1994	CIEG311	Dynamics
Spring 1995	CIEG667	Experimental Methods in Structural Dynamics
Fall 1995	CIEG311	Dynamics
	CIEG411/611	Structural Dynamics Design
Spring 1996	CIEG811	Advanced Structural Dynamics Design
Fall 1996	CIEG311	Dynamics
	CIEG411/611	Structural Dynamics Design
Spring 1997	CIEG667	Experimental Methods in Structural Dynamics
Fall 1997	CIEG311	Dynamics
	CIEG411/611	Structural Dynamics Design
Spring 1998	CIEG213	Strength of Materials Laboratory
	CIEG212	Strength of Materials (co-taught w/V. Kaliakin)
Fall 1998	CIEG311	Dynamics
Spring 1999	CIEG213	Strength of Materials Laboratory
	CIEG667	Advanced Mechanics of Materials
Fall 1999	CIEG311	Dynamics
	CIEG411/611	Structural Dynamics Design



Spring 2000	CIEG667 CIEG611??	Advanced Mechanics of Materials Structural Dynamics Design ??
Fall 2000	CIEG311	Dynamics
Spring 2001	CIEG612	Advanced Mechanics of Materials
Fall 2001	CIEG311	Dynamics
	CIEG411/611	Structural Dynamics Design
Spring 2002	CIEG212	Solid Mechanics
Fall 2002	CIEG612	Advanced Mechanics of Materials
Spring 2003	CIEG311	Dynamics
Fall 2003	CIEG411/611	Structural Dynamics Design
Spring 2004	CIEG311	Dynamics
	CIEG811	Advanced Structural Dynamics Design
Fall 2004	Sabbatical	
Spring 2005	CIEG311	Dynamics
Fall 2005	CIEG411/611	Structural Dynamics Design
Spring 2006	CIEG311	Dynamics
Fall 2006	CIEG611	Structural Dynamics Design (distance)
	CIEG612	Advanced Mechanics of Materials
Winter 2007	CIEG212	Solid Mechanics
Spring 2007	CIEG311	Dynamics
Fall 2007	CIEG611	Structural Dynamics Design
Winter 2008	CIEG611 CIEG212	Structural Dynamics Design Solid Mechanics (study abroad)
Spring 2008	CIEG167 CIEG311 CIEG612	Freshman Design (co-taught) Dynamics Advanced Mechanics of Materials (distance)
	CIEG865	Seminar
Fall 2008	CIEG612 CIEG865	Advanced Mechanics of Materials Seminar
Winter 2009	CIEG212	Solid Mechanics (study abroad)
Spring 2009	CIEG311 CIEG865	Dynamics Seminar

Fall 2009	CIEG611	Structural Dynamics Design
Spring 2010	CIEG311 CIEG865	Dynamics Seminar
Fall 2010	CIEG612 EGGG101 CIEG611	Advanced Mechanics of Materials Introduction to Engineering Structural Dynamics Design (distance)
Spring 2011	CIEG311	Dynamics
Fall 2011	CIEG611 EGGG101	Structural Dynamics Design Introduction to Engineering (CEE coordinator)
Spring 2011	CIEG311	Dynamics
Fall 2011	CIEG611	Structural Dynamics Design
Spring 2012	CIEG311 CIEG612  CIEG865	Dynamics Advanced Mechanics of Materials (distance) Seminar – Research Methods
Fall 2012	CIEG811	Advanced Structural Dynamics
Spring 2013	CIEG311	Dynamics
Fall 2013	CIEG612 CIEG865	Advanced Mechanics of Materials Seminar – Research Methods
Spring 2014	CIEG311	Dynamics
Fall 2014	CIEG611	Structural Dynamics Design
Spring 2015	CIEG311	Dynamics
Fall 2015	CIEG612	Advanced Mechanics of Materials
Spring 2016	CIEG311	Dynamics
Fall 2016	CIEG611	Structural Dynamics Design
Spring 2017	CIEG311	Dynamics
Fall 2017	CIEG612	Advanced Mechanics of Materials

## **OTHER TEACHING ACTIVITIES**

*Judge, Mechanical Engineering Senior Design Course, 2014, 2016*

*Judge, Bentley Systems Inc, Student Design Competition, 2013*

*Course Instructor, "Maintaining our Nation's Bridge Inventory: A Short Course on Diagnostic Bridge Testing," Chicago, Illinois, March, 2012*

*Coordinator and Instructor, "Maintaining our Nation's Bridge Inventory: A Short Course on Diagnostic Bridge Testing,"* Vancouver, BC, April 2008  
*Faculty Director – Study Abroad, Greece CIEG2008 & CIEG2009,* Developed and directed the first ever study abroad program out of CEE in Winter 2008, teaching CIEG212 in Greece. Taught it for the second time in 2009.  
*Instructor, The Johns Hopkins University, Part Time Programs in Engineering and Applied Science*  
*Fellow, University Institute for Transforming Undergraduate Education (1997, 2001)*  
*Instructor, EIT Review Session sponsored by Chi Epsilon*  
*Participant, John Wiley and Sons focus group on software materials as teaching aides*  
*Consultant, civil engineering application material for Physics, by Ohanian, Norton Publishing.*  
*Speaker, Engineering Concepts to Enhance High School Curricula*  
*Participant, National Conference on Outcomes Assessment for Engineering Education*

## **PROFESSIONAL COMMITTEES/SERVICE**

*Judge, ACEC Engineering Excellence Awards, 2018*  
*Judge, ACEC Competition for Outstanding Delaware Projects, 2009*  
*Member, Executive Committee, Technical Activities Division, Structural Engineering Institute, ASCE (Oct 2016 – present)*  
*Member, ASCE Structural Engineering Institute, Congress Committee (June 2016 – present)*  
*External Evaluator, University of Massachusetts Lowell, Department of Civil Engineering, 2015*  
*Member, Federal Highway Administration, Bridge Preservation Expert Task Group, (2016 – present)*  
*Member, Federal Highway Administration, Virtual Team on Structural Health Monitoring of Bridges '04*  
*Academic Director, TSP2 Northeast Bridge Preservation Partnership (2011 – present)*  
*Member, Journal of Civil Structural Health Monitoring Mufti Best Paper Award Selection Committee, 2013 & 2017*  
*Member, International Scientific Committee – 7<sup>th</sup> International Conference on Structural Health Monitoring of Intelligent Infrastructure, Torino, Italy, Jul 1-3, 2015*  
*Member, Conference Organizing Committee – Structural Materials Technology (SMT): NDE/NDT for Highways and Bridges 2006*  
*Member, Conference Organizing Committee – Structural Materials Technology (SMT): NDE/NDT for Highways and Bridges 2004*

*Council Member*, International Society for Structural Health Monitoring of Intelligent Infrastructure '04, (*Chair, working group on Technology Transfer*)

*Member*, North American Organizing Committee, ISHMII-2 Conference

*Organizer*, ISHMII Short Course on Structural Health Monitoring, November 15, 2005, Shenzhen, China

*Chairman*, ASCE Standards Committee for Testing of Base Isolation Systems

*Chair*, ASCE Technical Administrative Committee on Performance of Structures (2012-2015)

*Chair*, ASCE Committee on Methods of Monitoring Structural Performance (2008-2011)

*Member*, ASCE Committee on Methods of Monitoring Structural Performance (1999-2007)

*Member*, ASCE Dynamics Committee (Engineering Mechanics Division) (1993 )

*Member*, ASCE Committee on Seismic Effects (Structural Division) (1993-1999)

*Secretary*, ASCE Task Committee on Seismic Isolation (Seismic Effects Committee)

*Member*, Villanova University, Dept. of Civil Engineering External Advisory Committee (2001...-2013)

*Conference Chair*, 17<sup>th</sup> ASCE Engineering Mechanics Conference, Newark, Delaware, June 13-16, 2004

*Reviewer for the following journals*

Bulletin of the Seismological Society of America

Earthquake Engineering and Structural Dynamics

Earthquake Spectra

Engineering Structures

International Journal for Numerical and Analytical Methods in Geomechanics

International Journal of Soil Dynamics and Earthquake Engineering

International Journal of Structural Engineering and Mechanics

Journal of Architectural Engineering

Journal of Bridge Engineering

Journal of Bridge Structures

Journal of Computer-Aided Civil and Infrastructure Engineering

Journal of Engineering Mechanics

Journal of Fluids and Structures

Journal of Sandwich Structures and Materials

Journal of Sound and Vibration

Journal of Structural Engineering

Journal of Thermoplastic Composite Materials

Nuclear Engineering and Design

Smart Structures and Systems

Structural Health Monitoring: an International Journal

Transportation Research Record

Structure and Infrastructure Engineering

Structural Engineering and Mechanics – An International Journal

*Proposal Reviewer for*

National Science Foundation  
Israel Science Foundation  
U.S. Department of Agriculture, National Research Initiative Competitive  
Grants Program  
Villanova University Office of Sponsored Research

*Panel Reviewer for*

National Science Foundation  
U.S. Dept. of Agriculture

*Associate Editor, Earthquake Engineering Research Institute (EERI) Newsletter*  
(1992-1996)

## **UNIVERSITY SERVICE**

### Department

ABET Coordinator, Civil Engineering Degree '03,'04,'05  
Chair, CEE Undergraduate Curriculum Committee '99,'00,'03  
Co-Chair, CEE Undergraduate Affairs Committee '01,'02,??  
Chair, Department Ad Hoc Strategic Planning Committee (2006)  
Member, Faculty Search Committee (1997,1998, 1999,  
'00,'01,'03,'04,'05X,X,X,X, 2016)  
Member, Staff Search Committee (1999, X,X,X,X, 2016)  
Member, ABET Committee '00,'01  
Co-Chair, ABET subcommittee '02  
Member, Promotion and Tenure Committee (2000-)  
Member, CEE Chair review committee  
Member, Undergraduate recruitment and scholarship committee  
( '95,'96,'97,'98,'99  
Faculty Advisor, Tau Beta Pi (1995-2002)  
Faculty Advisor, ASCE Student Chapter (2000-?)  
Department Coordinator, Governor's School of Excellence  
Department Representative, Delaware Decision Days  
Department Representative, Order of the Engineer Ceremony

### College

Member, staff search committee (2015, 2016)  
Chair, mechanical engineering chair search committee, 2012  
Educational Activities Committee (1997, 1998, 2007)  
Member, Elections Committee '96  
Member, Honors Selection Committee '96  
College ABET Committee (2001-2007)

Faculty Advisor, National Society of Professional Engineers Student Chapter  
(1995-2002)

Laird Fellowship Selection Committee (1995, 2007, 2013)

#### University

Co-Chair, University Strategic Plan "Resource Analysis" Working Group,  
2014-2015

Member, University Research Council, 2015

Member, Vice-Provost's Ad Hoc Cost Containment and Benefits Committee,  
2013-2014

Member, FP&C Director search committee, 2012

Member, Chair's Caucus

Member, University Undergraduate Studies Committee (1998, 1999, 2000,  
2001, 2002)

Member, Distinguished Scholars Selection Committee (2006, 2007, 2008, 2009)

Member, UD Assessment Council (2005, 2006, 2007)

Member, College Merit Award Selection Committee (2002)

Speaker, University "Bright Minds" program

#### **HONORS AND AWARDS**

2006 College of Engineering, Slocomb Excellence in Teaching Award

2001 College of Engineering, Excellence in Teaching Award

NSF *Career* Award (1999-2003)

1993, Zone 1, ASCE Young Government Civil Engineer of the Year

Meyerhoff Fellowship, The Johns Hopkins University, 1986

U.S. Army Ballistics Research Laboratory, Service Award, 1986

Davis Fellowship, University of Delaware, 1983

#### **OTHER EXPERIENCE**

*Interim Director*, Delaware Transportation Institute, Newark, Delaware; September  
1999-May 2001.

*Consultant* to Forensic Technologies Inc., Annapolis, Maryland

*Visiting Professor*, Department of Mechanical Engineering, U.S. Naval Academy,  
Annapolis, Maryland; 1989-1990.

*Instructor*, EIT/PE review course, The Engineering Society of Baltimore; 1990,  
1991.

*Research Assistant*, Dept. of Civil Eng., The Johns Hopkins University; 1986-1990.

*Research Assistant*, Dept. of Civil Eng., The University of Delaware; 1982-1984.

## **LICENSE**

Engineer in Training, Delaware (1982).