PUNYASLOK RATH

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EDUCATION

Ph.D. in Civil Engineering — **December 2020**
University of Missouri (MU) at Columbia, MO

M.S. in Civil and Environmental Engineering — **August 2017**
University of Illinois at Urbana-Champaign (UIUC), IL

B.Tech. in Civil Engineering — **May 2014**
Biju Patnaik University of Technology, INDIA

PROFESSIONAL EXPERIENCE

Assistant Research Professor — **April 2023 – Present**
University of Missouri (MU) at Columbia, MO

Member, Office of Strategic Pursuits — **April 2023 – Present**
Missouri Center for Transportation Innovation (MCTI)
University of Missouri

Research Scientist — **January 2021 – May 2023**
University of Missouri (MU) at Columbia, MO

Graduate Research Assistant (Ph.D.) — **June 2018 – December 2020**
University of Missouri (MU) at Columbia, MO

Graduate Research Assistant (Ph.D. and M.S.) — **January 2016 – May 2018**
University of Illinois at Urbana-Champaign (UIUC), IL

Site Intern — **May 2012 – July 2012**
Lucknow Development Authority, INDIA

LEADERSHIP & PROFESISONAL DEVELOPMENT

- Editorial Board Member, Road Materials and Pavement Design (RMPD), 2025 – Present
- Handling Editor (Editorial Board), Transportation Research Record: Journal of Transportation Research Board, 2021 – Present
- Co-Leader for Technical Group 2 for Technical Committee 323 – Alternative Paving Materials. International Union of Laboratories and Experts in Construction Materials, Systems and Structures (RILEM), 2024 – Present
- Member, AKM10 Standing Committee on Production and Use of Asphalt, 2025 – 2025

- Chair and Past Chair, Newer Members Committee, Association of Asphalt Paving Technologists (AAPT), 2022-2024
- Appointed and Voting Member, Association of Modified Asphalt Producers (AMAP) PCR Taskforce, 2023 – Present
- Voting Member, American Society for Testing and Materials (ASTM) D04.96 Subcommittee on Resilience, 2024 – Present
- Merit Reviewer for REMADE Institute's fourth Request for Proposals (RFP) submitted for up to 2 million USD funding per project, 2021

Reviewer (Select Journals)

- Journal of Road Materials and Pavement Design (RMPD), Taylor & Francis
- Journal of Traffic and Transportation Engineering (English Edition)
- Transportation Research Record: Journal of the Transportation Research Board
- ASTM Journal of Testing and Evaluation
- MDPI Journals (Sustainability, Infrastructure, Materials)
- Materials and Structures (Springer)
- Advances in Civil Engineering (Hindwai Publications)
- Environmental Engineering Sciences
- Association of Asphalt Paving Technologists (AAPT)
- Journal of Transportation Engineering, Part B: Pavements
- European Journal of Environmental and Civil Engineering
- Journal of Materials in Civil Engineering
- Advances in Materials and Processing Technologies (Taylor & Francis)

HONORS AND AWARDS

- Technical Innovation Award from the Kansas City Metro Chapter of the American Public Works Association for demonstration of recycled polymers on residential streets of Kansas City, MO, 2025
- Chairman's Award in recognition of service as the Chair for the Newer Members Committee in the Association of Asphalt Paving Technologists, 2024
- State Department of Transportation Research: Supplemental Research Award Winner at the Transportation Research Board Annual Meeting, 2024
- Best Poster Presentation award at the Transportation Research Board Annual Meeting, 2022
- Recipient of the Ward K. Parr award and scholarship for outstanding research scholar in early Ph.D. category, sponsored by Association of Asphalt Paving Technologists (AAPT), 2019

PUBLICATIONS & PRESENTATIONS

Journal Publications

- (Pending) Leodarta, H., N. Gettu, A. Dolatabad, P. Rath, F. Xiao, W. Buttlar. Evaluation of Soft Waste Plastic Additive in Asphalt: Mixture Performance, PFAS Contamination, and Life Cycle Assessment. Road Materials and Pavement Design, 2025.
- (Pending) Gettu, N., A.I.H. Mohamed, A. Behzadian, P. Rath, W. Buttlar. Comparing Virgin Polymer-Modified to Recycled Polymer-Modified Asphalt Mixtures: Laboratory and Field Performance Analyses and Environmental Impact Assessment. Construction and Building Materials, 2025.
- Leodarta, H., A.S. El-Ashwah, P. Rath, M. Abdelrahman, W. Buttlar. Utilization of FTIR-ATR for material characterization and forensic analysis. Construction and Building Materials, Vol. 482, 2025.
- Gettu, N., Ahmed Hassanin Mohamed, P. Rath, W. Buttlar. Mechanical Performance and Environmental Impact Analyses of Missouri Stone Mastic Asphalt Mixtures Incorporated with Recycled Materials. Transportation Research Record: Journal of Transportation Research Board, 2025.
- Mohamed, A.I.H., Oliver Giraldo-Londoño, Baolin Deng, Zhen Chen, Punyaslok Rath, William G Buttlar. Preliminary study on multi-scale modeling of asphalt materials: evaluation of material behavior through an RVE-based approach. Materials, Vol. 17, 2024.
- Ding, X., F. Huang, P. Rath, Z. Ye, W.G. Buttlar, T. Ma. Comparative fracture resistance assessment of rubber-modified asphalt mortar based on meso-and macro-mechanical analysis. International Journal of Pavement Engineering, Vol. 24, 2023.
- Majidifard, H., P. Rath, B. Jahangiri, and W. Buttlar. Application of Balanced Mix Design Strategies to Missouri Dense-Graded Asphalt Mixtures. Transportation Research Record: Journal of Transportation Research Board, 2023.
- Rath, P., J. Meister, B. Jahangiri, and W. Buttlar. Demonstration Project for Ground Tire Rubber and Post-Consumer Recycled Plastic Modified Asphalt Mixtures. Transportation Research Record: Journal of Transportation Research Board, 2022.
- Ding, X., P. Rath, O. Giraldo, W.G. Buttlar, T. Ma. Fracture modeling of rubber-modified binder based on Discrete Element Method. Journal of Cleaner Production, Volume 380, Part 2, 2022.
- Rath, P., L. Urra, B. Jahangiri, H. Majidifard, W. Buttlar. Performance Grade of Asphalt Mixtures Based on Mixture Performance Test Thresholds. Journal of Construction and Building Materials, Vol. 302, 2021.
- Rath, P., N. Gettu, S. Chen, W. Buttlar. Investigation of Cracking Mechanisms in Rubber-Modified Asphalt through Fracture Testing of Mastic Specimens. Road Materials and Pavement Design, 2021.
- Rath, P., H. Majidifard, B. Jahangiri, W. Buttlar. Laboratory and Field Evaluation of Pre-Treated Dry-Process Rubber Modified Asphalt Binder and Dense-Graded Mixtures. Transportation Research Record: Journal of Transportation Research Board, 2021.
- Rath, P., J. Meister, B. Jahangiri, and W. Buttlar. Evaluation of the Effects of Engineered Crumb Rubber (ECR) on Asphalt Mixture Characteristics. ASTM Journal of Testing and Evaluation (in production), 2021.
- Jahangiri, B., P. Rath, H. Majidifard, L. Urra, W. Buttlar. Investigation of Recycled Asphalt Mixtures in Missouri: Laboratory, Field, and ILLI-TC Modeling. Road Materials and Pavement Design, 2021.

- Majidifard, H., B. Jahangiri, P. Rath, W. Buttlar, A. Alavi. Developing and Prediction Model for Rutting Depth of Asphalt Mixtures Using Gene Expression Programming. Construction and Building Materials, 2021.
- Wang, He, P. Rath, and W. G. Buttlar. Recycled Asphalt Shingle Modified Asphalt Mixture Design and Performance Evaluation. Journal of Traffic and Transportation Engineering (English Edition) 7 (2), pp. 205–14, 2020.
- Majidifard, H., B. Jahangiri, P. Rath, W. Buttlar. Development of a Balanced Cracking Index for Asphalt Mixtures Tested in Semi-Circular Bending with Load-LLD Measurements. Measurement, 2020.
- Rath, P., J. Love, W. G. Buttlar, H. Reis. Performance Analysis of Asphalt Mixtures Modified with Ground Tire Rubber and Recycled Materials. Sustainability 11 (MDPI), No. 6, 2019.
- Rath, P., S. Mondal. Optimization of Waste Materials for Sub-Base Layer of Flexible Pavements. International Journal of Emerging Technology and Advanced Engineering, December 2014.

Invited Presentations and Other Publications

- [PUB] A. Falchetto, F. Yin, M. Cavalli, S. Mangiafico, K. Biligiri, J. Cantot, P. Rath, A. Singh, M. Elwardany, D. Wang, C. Chen, J. Grenfell, F. Zhang, Y. Sun, K. Krayushkina. On the New RILEM Technical Committee TC APD: Alternative Paving Materials–Design and Performance. RILEM Technical Letters, Vol. 9, 2024.
- [PPT] Towards Sustainable Asphalt Pavements Through Use of Recycled Materials. Missouri Products Stewardship Council. March 2025.
- [PPT] Evaluation of Leaching Potential of 6PPD-Q from Rubber Modified Asphalt. 9th Tire Recycling Conference, Atlanta, Georgia. May 16, 2024.
- [PPT] Waste Plastics Resue in Roads. Recycling Ambassadors, City of Columbia. January 20, 2024.
- [PPT] City of Columbia Project on stadium Blvd. Update and Update on Waste Plastics and I155 Test Sections. 2023 Missouri Asphalt Conference, Rolla, MO. November 28, 2023.
- [PPT] Collaborative Efforts and National Impact of NRRA's MnROAD Reflective Cracking Challenge. MnDOT Conference, Minneapolis, MN. May 2023.
- [PPT] Introduction to Dry Process Rubber Asphalt: Performance, Production, and Economics. American Public Works Association (Missouri Chapter) Fall Conference, St. Louis. November, 2022.
- [PPT] Modern, Dry Process Rubber Modified Asphalt. National webinar organized by the Association of Asphalt Paving Technologists. November, 2022.
- [PPT] Dry Process Rubber and Plastics Case Study: Stadium Blvd., Columbia, MO. North-Central Asphalt Users Producers Group (NCAUPG) Hot Mix Asphalt Conference, Indianapolis, IN. September, 2022.
- [PPT] Recent Advances in Rubber Modification of Asphalt Mixtures. Traction Summit, Charlotte, NC. July, 2022.
- [PPT] Rubber and Waste Plastic Recycling in Asphalt and its Implications to Balanced Mix Design. Association of Modified Asphalt Producers Annual Meeting, February 2022.

    - Same presentation was made at the Asphalt Pavement and Materials Technical Feedback Group meeting organized by the FHWA, June 2021.

- [PPT] Missouri BMD Research Update. FHWA BMD Case Studies Virtual Workshop (Virtual), January 2022.
- [PPT] Rubber Asphalt and Its Role in Pavement Management Systems. Presentation for Colorado LTAP Training Sessions- Providing Solutions for Road Pavement Repair and Construction with Tire Derived Materials (jointly sponsored by FHWA and Colorado Department of Public Health and Environment), October 2019.
- [PUB] Buttlar, W.G., P. Rath, E. Dave, H. Majidifard, H. Wang. Relating DC(T) Fracture Energy to Field Cracking Observations and Recommended Specification Thresholds for Performance-Engineered Mix Design. Transportation Research E-Circular, Issue No. E-C251, pp. 51-71, 2018.
- [PUB] Buttlar, W. G., B. Jahangiri, P. Rath, H. Majidifard. Asphalt Parking Lot Guide. Missouri Asphalt Pavement Association, 2020.

Selected Conference Proceedings and Presentations

- A. Behzadian, A.I.H. Mohamed, P. Rath, W. Buttlar. Integrated Pavement Evaluation Using the SSI Inertial Profiler: A Case Study in Columbia, Missouri. Airfield and Highway Pavements 2025.
- H. Leodarta, A.I.H. Mohamed, N. Gettu, A. Owor, P. Rath, W. Buttlar. Field Demo of Waste Plastic, Crumb Rubber, and Plastic-Rubber Hybrid Additives in Kansas City, Missouri. Airfield and Highway Pavements 2025.
- Rath, P., and W. Buttlar. State of Knowledge on Rubber Modified Asphalt. 100th Annual Meeting of the Association of Asphalt Paving Technologists (AAPT), Chicago, IL. September 2024.
- Rath, P., H. Majidifard, P. Beckemeyer, J. Meister, and W. G. Buttlar. Post-Production and Field Evaluation of Demonstration Project for Ground Tire Rubber and Post-Consumer Recycled Plastic Modified Asphalt Mixtures. Conference Proceedings at the Annual Meeting of Association of Asphalt Paving Technologists (AAPT), San Antonio, Texas. September, 2022.
- W.G. Buttlar, O. Giraldo-Loñdono, P. Rath, R. Muñeton, Lopez. Investigating the Effects of Circular Materials on Reflective Cracking in Asphalt Pavements Through Demonstration Projects and High-fidelity Fracture Modeling. 16th International Symposium on Functionally Graded Materials, Hartford, Connecticut, USA. August, 2022.
- Schuwer, N., P. Rath, L.A. de Leon, S. Megert, W. Buttlar, and R. Clark. Dry-Process Rubberized Asphalt Using Engineered Crumb Rubber: Field Performance in USA and in Europe. RAR Conference, Malaga, Spain. June 2022.
- Rath, P., R. Clark, D. Zuberer, and W. Buttlar. Advances in Pavement Performance Enhancement with Dry Process Engineered Ground Tire Rubber. ASCE International Airfield & Highway Pavements Conference, June 2021.
- Rath, P., J. Meister, B. Jahangiri, H. Majidifard, W. Buttlar. Evaluation of Engineered Crumb Rubber (ECR) Characteristics, Including Warm-Mix Equivalence, Draindown Prevention, and Release Enhancement. Conference Proceedings of International Symposium on Bituminous Materials, Lyon, France (Online), December 2020.

- Ding, X., P. Rath, W. Buttlar. Discrete Fracture Modelling of Rubber-Modified Binder. Advances in Materials and Pavement Performance Prediction. Advances in Materials and Pavement Performance Prediction, August 2020.
- Rath, P., H. Majidifard, B. Jahangiri, S. Chen, W. Buttlar. Laboratory and Field Investigation of Engineered Crumb Rubber (ECR) Modified Asphalt Binders and Mixtures. Conference Proceedings on Petersen Asphalt Research Conference (Virtual), July 2020.
- Rath, P., H. Majidifard, B. Jahangiri, W. G. Buttlar. Recent Advances in Ground Tire Rubber Recycling in Midwest Pavements. Conference Proceedings at the 94th Annual Meeting of Association of Asphalt Paving Technologists (AAPT), Fort Worth, Texas, 2019.
- Jahangiri, B., P. Rath, L. Urra, J. Benkhe, R. Bentsen, W. Buttlar. Asphalt Mixture Performance Grading and Application to Illinois Tollway Performance Design. Conference Proceedings at the 95th Annual Meeting of Association of Asphalt Paving Technologists (AAPT) (Online), September 2020.

Selected Reports

- Buttlar, W., P. Rath, J. Meister, K. Distelrath. Evaluation of Stripping Tests for Asphalt Mixtures to Replace AASHTO T283 Method in Missouri. Missouri Department of Transportation. May 2025.
- Kevern, J., William Buttlar, Punyaslok Rath, Nandita Gettu, Iain Blair. A Roadmap for Missouri: Assessing Needs an Implementation Framework for Incorporating Environmental Product Declarations. Missouri Department of Transportation. February 2025.
- Buttlar, W., P. Rath, J. Meister, A.I.H. Mohamed, H. Leodarta, K. Distelrath. Implementation of Balanced Mixture Design in Missouri Test Sections with Modifiers. Missouri Department of Transportation. January 2025.
- Buttlar, W., M. Abdelrahman, P. Rath, J. Meister, N. Gettu, A. El-Ashwah. Evaluation of Recycled Components in Stone Matrix Asphalt Mixes. Missouri Department of Transportation. December 2023.
- Buttlar, W., P. Rath, J. Meister, P. Beckemeyer, N. Gettu, H. Leodarta. Field Demonstration of Post-Consumer Waste Plastics and Ground Tire Rubber in Columbia, Missouri. Missouri Department of Transportation. April 2023.
- Buttlar, W., P. Rath. State of Knowledge Report on Rubber-Modified Asphalt. US Tires Manufacturers Association (USTMA), May 2021.
- Buttlar, W., B. Jahangiri, P. Rath, H. Majidifard, L. Urra, J. Meister, H. Brown. Development of a Performance-Related Asphalt Mix Design Specification for the Illinois Tollway. Illinois State Toll Highway Authority, 2020.
- Buttlar, W. G., L. Urra, B. Jahangiri, P. Rath, H. Majidifard. Support for Balanced Asphalt Mixture Design Specification Development in Missouri. Missouri Department of Transportation, 2020.
- Buttlar, W. G, J. Meister, B. Jahangiri, H. Majidifard, P. Rath. Performance Characteristics of Modern Recycled Asphalt Mixes in Missouri, Including Ground Tire Rubber, Recycled Roofing Shingles, and Rejuvenators. Project no. TR201712, MoDOT Research Report No. cmr 19-002, 2019.
- Buttlar, W.G., P. Rath. Illinois Tollway I-88 Ground Tire Rubber Test Sections: Laboratory Mix Designs & Performance Testing. Report submitted to Illinois Tollway, September 2017.

Selected Media Coverage

- Interview aired as part of a video package at the launch of "Power the Roar", a $2 billion comprehensive campaign by the University of Missouri to fuel their land-grant mission and create meaningful impact for generations.
- Media coverage on demonstration projects for waste plastics and ground tire rubber in Missouri:
    - Here's how much recyclable material is in Interstate 155 project and not in rivers, oceans. Yahoo News. July 19, 2023.
    - Single-Use Plastic Used To Make Longer-Lasting Asphalt In Missouri. Forbes. September 17, 2021.
    - Missouri engineers testing use of plastic waste in road pavement mixtures. Roads and Bridges. August 25, 2021.
    - Work continuing on Stadium Blvd. with the use of plastic waste in road pavement mixtures. ABC News. August 18, 2021.
- Other media coverage
    - (Interview) Mizzou lab studies and collects data on asphalt, potholes. KY3 News. August 22, 2023.
    - Federal money to analyze environmental impact of construction materials coming to Missouri. KBIA News. July 24, 2024.
    - (Podcast) A promising future for recycled, sustainable pavement. Missourinet. August 22, 2023.

SELECT RESEARCH PROJECTS

- Missouri I-155 Test Sections and Integrative Research for MnROAD Reflective Cracking Challenge. Funding Agency: National Road Research Alliance (NRRA, led by Minnesota DOT). April 1, 2025 – February 28, 2027. Project Budget: $400000. Punyaslok Rath (PI), William G. Buttlar (Co-PI), Oliver Giraldo-Londono (Co-PI).
- Phase II: Implementation of Balanced Mixture Design in Missouri Test Sections with Modifiers. Funding Agency: Missouri Department of Transportation. May 1, 2025 – March 31, 2027. Project Budget: $200,000. Punyaslok Rath (PI), William G. Buttlar (Co-PI).
- Evaluation of Stripping Tests for Asphalt Mixtures to Replace AASHTO T283 Method (Tensile Strength Ratio Test) in Missouri. Funding Agency: Missouri Department of Transportation. July 1, 2023 – December 31, 2024. Project Budget: $250,000. William G. Buttlar (PI), Punyaslok Rath (Co-PI)
- Investigation of the use of recycled polymers in P-401mixtures. Funding Agency: Federal Aviation Administration. Project Budget: $599,980. October 1, 2025 – September 30, 2027. William G. Buttlar (PI), Punyaslok Rath (Co-PI), Oliver Giraldo-Londono (Co-PI).
- Utilization of FTIR for Material Characterization and Forensic Analysis. Funding Agency: Illinois Tollway. Project Budget: $250,000. August 22, 2022 – August 21, 2024. William G. Buttlar (PI), Magdy Abdelrahman (Co-PI), Yaw Adu-Gyamfi (Co-PI), Punyaslok Rath (Key Personnel).

- Evaluation of Leaching Potential of 6PPD Quinone and Other Compounds in Rubber-Modified Asphalt. Funding Agency: US Tire Manufacturers Association (USTMA). Project Budget: $103,552. October 1, 2022 – August 31, 2023. William G. Buttlar (PI), Baolin Deng (Co-PI), Maryam Salehi (Co-PI), Punyaslok Rath (Key Personnel).
- A Roadmap for Missouri: Assessing Needs and Implementation Framework for Incorporating Environmental Product Declarations. Funding Agency: Federal Highways Administration (FHWA). February 1, 2023 – January 21, 2025. Project Budget (MU as sub-contractor): $195,000. William G. Buttlar (PI), Punyaslok Rath (Research Scientist).
- Implementation of Balanced Mixture Design in Missouri Test Sections with Modifiers. Funding Agency: Missouri Department of Transportation. May 1, 2023 – December 31, 2024. Project Budget: $250,000. William G. Buttlar (PI), Punyaslok Rath (Co-PI).
- (Awarded) Development of robust datasets to generate EPDs for the recycled tire rubber industry and support the advancement of a cradle-to-grave asphalt pavement PCR. Funding Agency: US Environmental Protection Agency. July 1, 2024 – June 30, 2027. Project Budget: $3,778,326. William G. Buttlar (PI), Punyaslok Rath (Co-PI).

Consulting/Technical Testing

- City of Kansas City: “Trash to Roads – Phase II” project demonstrating the use of recycled polymers in arterial road in Kansas City, MO. 2025
- ECore International: Evaluation of ground athletic mats for use in asphalt mixtures – Phase I. 2025
- Capital Paving: Development of HiMod asphalt mixtures for Missouri. 2025
- City of Kirksville: Development of asphalt mixture design for city roads. 2024
- Regen RBR: Evaluation of pre-treated rubber-plastic pellet for use in asphalt mixture modification via dry process. 2024
- City of Kansas City: “Trash to Roads – Phase I” project demonstrating the use of recycled polymers in residential streets in Kansas City, MO. 2024