

# 6<sup>th</sup> International Symposium on Pavement, Roadway, and Bridge Life Cycle Assessment

*Paving the Way to Sustainability and Bridging the Gaps in  
Life Cycle Assessment*

 June 6-8, 2024    Arlington, VA

## PROGRAM ORGANIZERS



# PROGRAM AT A GLANCE

Time	Thursday 6	Friday 7		Saturday 8			
7:30 AM - 8:30 AM		Registration		Registration			
8:00 AM - 8:30 AM		Plenary Session		Plenary Session			
8:30 AM - 9:00 AM							
9:00 AM - 9:30 AM							
9:30 AM - 10:00 AM							
10:00 AM - 10:15 AM		Coffee Break		Coffee Break			
10:15 AM - 10:45 AM		Concurrent Workshop Session	Concurrent Lectern Session	Concurrent Lectern Session	Concurrent Lectern Session		
10:45 AM - 11:30 AM							
11:30 AM - 12:00 PM							
12:00 PM - 12:30 PM	Registration	Lunch		Lunch			
12:30 PM - 1:00 PM							
1:00 PM - 1:30 PM	Plenary Opening Session	YMC Working Tables Session	Concurrent Lectern Session	Concurrent Lectern Session	Concurrent Lectern Session		
1:30 PM - 2:00 PM							
2:00 PM - 2:30 PM		Concurrent Lectern Session	Concurrent Lectern Session	Plenary Closeout Session and Awards	Plenary Closeout Session and Awards		
2:30 PM - 3:15 PM							
3:15 PM - 3:45 PM	Coffee Break	Coffee Break		Coffee Break			
3:45 PM - 4:30 PM	FHWA Plenary Session	Concurrent Lectern Session	Concurrent Lectern Session	Plenary Closeout Session and Awards			
4:30 PM - 5:00 PM							
5:00 PM - 5:30 PM	YMC Poster Session + Reception	Symposium Banquet					
5:30 PM - 6:00 PM							
6:00 PM - 6:30 PM							
6:30 PM - 7:00 PM							
7:00 PM - 7:30 PM		Symposium Banquet					
7:30 PM - 8:00 PM							
8:00 PM - 8:30 PM							
8:30 PM - 9:00 PM							
9:00 PM - 9:30 PM							
9:30 PM - 10:00 PM							

Rooms: Fitzgerald ABC Fitzgerald D Fitzgerald E

# DETAILED PROGRAM

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Thursday, June 6, 2024

12:00pm - 1:00pm	<b>Registration   Room – Pre-Function AB  </b> <ul style="list-style-type: none"> <li>• Nametags, Proceedings Book, Program</li> </ul>
1:00pm - 1:40pm	<b>1.1. Welcome–</b> VDOT/ VTRC, FHWA, RILEM   <b>Moderator: Gerardo Flintsch   Room – Fitzgerald ABC  </b>
1:40pm - 3:15pm	<b>1.2. Keynote Presentations</b> <ul style="list-style-type: none"> <li>• US Environmental Protection Agency Address – Peter Bacas</li> <li>• Social Life Cycle Assessment Methodology: Its Standardization and Application to Construction Sector – Marzia Traverso</li> </ul> <b>Panel Discussion</b>
3:15pm - 3:45pm	<b>Coffee Break   Room – Pre-Function ABC  </b>
3:45pm - 5:30pm	<b>1.3. Panel Session: FHWA Efforts on Setting GWP Thresholds: Current Status and Future Outlook   Moderator: Joep Meijer   Room – Fitzgerald ABC  </b> <p><b>Part A – Invited Presentations</b></p> <ul style="list-style-type: none"> <li>• FHWA – Migdalia Carrion /Brian Dabling</li> <li>• Asphalt – Joseph Shacat - NAPA</li> <li>• Concrete – Brian Killingsworth - NRMCA</li> <li>• Steel – Max Puchtel - AISC</li> <li>• Agency perspective – Hailey Goodale - CDOT</li> <li>• Academia – John Harvey - UC Davis</li> </ul> <p><b>Part B – Panel Discussion</b></p>

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6:00pm -  
8:00pm

## 1.4. Poster Session + Reception | Room – Fitzgerald ABC + Pre-Function CDE|

- LCA Perspective and Biogenic: A Comprehensive Analysis of Environmental Impact in Infrastructure Construction | **A-77** | *R. A. Mehraban, L. Tsantilis, P. P. Riviera and E. Santagata*
- The Use of Belitic Calcium Sulfoaluminate (BCSA) Cement as a Mineral Admixture in Portland Limestone Cement (PLC) | **A-78** | *Fabian Paniagua and Eric P. Bescher*
- From Road's End to Rebirth: Analyzing End-of-Life Allocation Approaches in Asphalt Mixtures | **A-96** | *P. D. R. Peguero, D. L. Presti and M. Traverso*
- Considering performance in cradle-to-gate LCA studies – Do reference service lives provide a good proxy or should predicted service lives be used instead? | **B-76** | *Ben Moins, David Hernando, Wim Van den Bergh and Amaryllis Audenaert*
- Sustainability-Informed Decision of Asphalt Pavement Overlay | **B-86** | *P. Xie and H. Wang*
- Incorporation of Embodied Carbon of Concrete into Durability Design of Concrete Bridge Deck | **B-90** | *J. Zhang and L. Ahmadi*
- Life Cycle Assessment of Pavement Preservation Techniques Using the LTPP Database | **B-91** | *Chukwunwike Okwuenu, M. Elwardany, H. Dylla, M. El-Hakim, A. Kelly and O. Elbagalati*
- Life-Cycle Assessment & Life-Cycle Cost Analysis of Heavy-Duty Trucks Using Alternative Fuels | **B-99** | *Q. Zhou, A. Khan, E. Okte, I. Al-Qadi*
- Quantitative Measures of Social Sustainability for Pavements | **C-73** | *E. Okte, J. Boakye and M. Behrend*
- Modern road infrastructures implications: case studies in Bari, Italy | **C-75** | *Stefano Coropulis*
- Towards the assessment of social sustainability – Identifying social hotspots for road pavement materials | **C-103** | *G. Buttitta, P. D. Rosario, D. L. Presti and M. Traverso*
- A Digital and Comprehensive Tool for Sustainable and Climate Resilient Transport Network | **D-79** | *Danilo Ebbinghaus, Koji Negishi, Renaud De Montaignac*
- Life Cycle Assessment of Coastal Pavements Incorporating Flood Responsive Maintenance Strategies | **D-88** | *W. Anwar, E. Dave and J. Sias*
- Optimizing Concrete Pavement Designs to Reduce LCCA and LCA | **E-74** | *T. Speakmon*
- Environmental Impacts of RAP Recycling in Asphalt Pavements Using Life Cycle Assessment: A Saudi Arabian Case Study | **E-80** | *I. Shatnawi and A. Ali*
- Sustainability-oriented business models for highway concessions in Brazil: a case study of maintenance strategies with reclaimed asphalt pavement | **E-81** | *M. R. Gracez, K. Y. Suzuki, S. M. Palu, C. Merighi, G. B. Colpo and L. A. T. Brito*
- Methods to Benchmark the Global Warming Potentials of Asphalt Mixes and Strategies to Reduce Carbon Footprint: A Life Cycle Assessment Case Study | **E-83** | *A. Gbolade, D. Vivanco and D. Mishra*
- Implementing Reduced Temperature Chemical Warm Mix Asphalt into Practice Can Lead to Reduced Environmental Impacts: A Claim Backed by Life Cycle Assessment | **E-84** | *A. Gbolade, R. Steger, J. Bausano and D. Mishra*
- Combined Implementation of Balanced Mix Design and Warm-Mix Technology: Impact Assessment Considering both Performance and Environmental Aspects | **E-85** | *A. R. Moshfeghi, A. Gbolade, D. Vivanco, R. Steger, J. Bausano and D. Mishra*
- Improving the Carbon Footprint of West Virginia Pavements | **E-89** | *Md Reasad Samrat, Jacob Kubasiak and James Bryce*
- Overcoming the Educational Barrier to Cement and Concrete Carbon Reduction | **E-92** | *S. Lopez, T. V. Dam, L. Sutter, R. D. Hooton, A. Innis and K. Senn*
- Life Cycle Assessment of Next-Generation Flexible Pavements at the FHWA Pavement Testing Facility | **E-93** | *Y. Zhao, J. A. Rivera, M. S. Sakhaeifar, A. Nadkarni and M. Carrion*
- Life Cycle Assessment of Asphalts Containing Recycled Marine Debris in Hawaii | **E-94** | *C. Megill and J. Lynch*

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Friday, June 7, 2024 - Full Day

7:30am - 8:30am	Registration   <a href="#">Room – Pre-Function AB</a>
8:30am - 10:15am	<b>2.1. Keynote Presentations   <a href="#">Moderator – Imad Al-Qadi</a>   <a href="#">Room – Fitzgerald ABC</a>  </b> Pathways for CO <sub>2</sub> Reduction from Cement-Based Materials until 2050 – <i>Karen Scrivener</i> The Real Potential of Biogenic Binders in Reducing CO <sub>2</sub> Emissions and Meeting Differing Expectations for LCA – <i>Erik Denneman</i> <b>Panel Discussion</b>
10:15am - 10:45am	Coffee Break   <a href="#">Room – Pre-Function ABC</a>
10:45am - 12:30pm	<b>2.2.1. Workshop Session   <a href="#">Moderator – Joseph Shacat</a>   <a href="#">Room – Fitzgerald D</a>  </b> Emerald Eco-Label EPD Simulator: A New Web-Based Software Tool for Research and Education Related to Asphalt Mixture EPDs – <i>Ben Ciavola</i> (Attendees are encouraged to bring laptops for a first-hand experience with the tool).
	<b>2.2.2. Lectern Session   <a href="#">Moderator – Austin Jarell</a>   <a href="#">Room – Fitzgerald E</a>  </b> <ul style="list-style-type: none"> <li>• Permeable Pavement Systems: Sustainable Case Studies   <i>I. Qamhia, I. L. Al-Qadi, H. Ozer and A. Golalipour</i></li> <li>• Towards The Assessment of Social Sustainability – Identifying Social Hotspots for Road Pavement Materials   <i>Pamela Del Rosario, G. Buttitta, D. L. Presti and M. Traverso</i></li> <li>• Quantitative Measures of Social Sustainability for Pavements   <i>E. Okte and J. Boakye</i></li> <li>• A Methodology for the Life Cycle Management of European Road Pavements   <i>Davide Lo Presti, A. J. D. B. Carrión, G. Buttitta, A. A. Butt and J. Harvey</i></li> </ul>
12:30pm - 1:30pm	Lunch   <a href="#">Room – Fitzgerald ABC</a>
1:30pm - 3:15pm	<b>2.3.1. Young Member Committee Working Tables Session   <a href="#">Moderator – Heather Dylla</a>   <a href="#">Room – Fitzgerald ABC</a>  </b> Discussion of Topics/Themes from Poster Session
	<b>2.3.2. Lectern Session   <a href="#">Moderator – Eugene Amarh</a>   <a href="#">Room – Fitzgerald D</a>  </b> <ul style="list-style-type: none"> <li>• Data Specificity of Concrete Mixture Environmental Product Declarations   <i>M. Cooper and A. Mukherjee</i></li> <li>• Study on the Mechanical Behavior and Environmental Product Declarations of Road Base Layers Incorporating Anhydrous Calcium Sulphate   <i>A. Serpi, J. Rombi, M. Coni and F. Maltinti</i></li> <li>• Environmental Product Declarations: Effects of Scope of Consideration and Design Approach on the Results of Life Cycle Assessments   <i>P. Schmitz and B. Gee</i></li> <li>• Recommended to Include Relevant Material Performance in the Construction Material Environmental Product Declarations   <i>A. A. Butt, R. Wu and J. Harvey</i></li> </ul>

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3:15am - 3:45pm	Coffee Break   <a href="#">Room – Pre-Function ABC</a>
3:45pm - 5:30pm	<b>2.4.1. Lectern Session   <a href="#">Moderator – Joao Santos</a>   <a href="#">Room – Fitzgerald D</a>  </b> <ul style="list-style-type: none"> <li>Life Cycle Cost and Environmental Impacts of Portland Limestone Cement and Calcium Sulfoaluminate Cement as alternative binders in Concrete   <i>I. Filani, A. A. Butt and J. Harvey</i></li> <li>Life Cycle Assessment of Continuously Reinforced Concrete Pavement Overlay of Jointed Plain Concrete Pavement   <i>H. Li, M. Zhang, H. Azarijafari and R. Kirchain</i></li> <li>Effect of Transportation on Environmental Burdens of Blended Cements Made with Imported and Domestic Supplementary Cementitious Materials   <i>A. A. Butt and S. Nassiri</i></li> <li>Capital Goods Data in Asphalt Products   <i>O. Tokede, S. Mahlan, R. Mankaa and M. Traverso</i></li> </ul>
	<b>2.4.2. Lectern Session   <a href="#">Moderator – Hasan Ozer</a>   <a href="#">Room – Fitzgerald E</a>  </b> <ul style="list-style-type: none"> <li>Assessing the Ecological Impact of Different Asphalt Mix Designs Following a Cradle to Gate Approach   <i>P. Schönauer, M. Gruber and B. Hofko</i></li> <li>Life Cycle Assessment of Rubber Modified Asphalt Pavement in Michigan: A Case Study   <i>K. Xin, D. Jin, Z. You and R. Handler</i></li> <li>Toward Sustainability – Life Cycle Perspective in Green Hydrogen and By-products Material in Asphalt Production: A Case Study for Road Pavement   <i>M. Shokri, M. Traverso and R. N. Mankaa</i></li> </ul>
7:00pm - 10:00pm	<b>2.5. Symposium Banquet   <a href="#">Room – Pre-Function ABC &amp; Fitzgerald ABC</a>  </b>

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7:30am - 8:30am	Registration   <a href="#">Room – Pre-Function AB</a>
8:30am - 10:15am	<b>3.1. Panel &amp; Plenary Session   <a href="#">Moderator – Amlan Mukherjee</a>   <a href="#">Room – Fitzgerald ABC</a>  </b> <ul style="list-style-type: none"> <li>Integrating LCA into a Future of Digital Innovation (or, where EDC-6 meets EDC-7) - Amlan Mukherjee</li> </ul> <b>Panel Discussion:</b> <ul style="list-style-type: none"> <li>CDOT – Hailey Goodale</li> <li>MN DOT – Emil Bautista</li> <li>AECOM – Jim Pappas</li> <li>NIST – Joshua Kneifel</li> </ul> <b>Plenary Session:</b> <ul style="list-style-type: none"> <li>Piloting Life Cycle Assessment: Experiences from Alabama, Louisiana, Mississippi, and Virginia Departments of Transportation Case Studies   <i>E. Amarh, B. Bowers, S. Cooper III, B. Diefenderfer, H. Dylla, G. Flintsch, S. Gatiganti, L. Mohammad and N. Tran</i></li> <li>Summary of the FHWA Climate Challenge or Symposium   <i>Brian Doblin</i></li> </ul>
10:15am - 10:45am	Coffee Break   <a href="#">Room – Pre-Function ABC</a>
10:45am - 12:30pm	<b>3.1.1. Lectern Session   <a href="#">Moderator – Davide Lo Presti</a>   <a href="#">Room – Fitzgerald D</a>  </b> <ul style="list-style-type: none"> <li>Life Cycle Assessment of Asphalt Concrete Construction Stage and Impacts of Construction Equipment Idling   <i>S. C. Gatiganti, B. Bowers and N. Tran</i></li> <li>LCA and LCCA for the Use of Low-Quality Local Aggregates in Stone Matrix Asphalt in Illinois   <i>L. Diab and I. Al-Qadi</i></li> <li>Renewable Fuel for Asphalt Concrete Production to Reduce Carbon Emissions   <i>E. Coleri, J. Hickey and Z. Heck</i></li> <li>A Graphene-Enhanced Recycled-Plastic Asphalt Mixture Modifier: Two Case Studies in the United Kingdom and the United States of America   <i>B. Allen, S. D. Diefenderfer, J. Habbouche, S. Eskandarsefat and L. Venturini</i></li> </ul> <b>3.1.2. Lectern Session   <a href="#">Moderator – Maria Mutuc</a>   <a href="#">Room – Fitzgerald E</a>  </b> <ul style="list-style-type: none"> <li>Case Study: Implementation of Buy Clean Colorado for I-76 Highway Construction Project   <i>D. Donado and C. Senseney</i></li> <li>Integrating Corporate GHG Protocols Scope 1, 2, and 3 into Product Life Cycle Assessments   <i>P. Bacas and H. Dylla</i></li> <li>Strategies for Reducing CO<sub>2</sub> Greenhouse Gas Emissions in Flexible Pavements Life Cycle   <i>A. Saeed, J. Tingle and C. Williams</i></li> <li>Rethinking Concrete Pavements with RAP Aggregates Based on Materials Performance and LCA   <i>Alex Brand</i></li> </ul>
12:30pm - 1:30pm	Lunch   <a href="#">Room – Pre-Function ABC</a>

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1:30pm - 3:15pm	<p><b>3.2.1. Lectern Session   Moderator – Ben Moins   Room – Fitzgerald D  </b></p> <ul style="list-style-type: none"> <li>• Evaluation of Life Cycle Assessment Tools for Road Construction and Operation Purposes: A Case Study in Nordic Europe   <i>T. D. Gebre, D. Wang, N. Eklöf and A. C. Falchetto</i></li> <li>• Updates and Demonstration of the FAA Airfield Life Cycle Assessment Tool: A Taxiway Case Study   <i>A. A. Butt, N. Titterton, J. Harvey, I. Filani and N. Garg</i></li> <li>• RolRoad – LCA: A Web-Based Application for Estimating the Excess Fuel Consumption and Environmental Impacts Due to the Rolling Resistance of Passenger Cars   <i>I. Uva, J. Santos, V. Cerezo and S. Miller</i></li> </ul> <p><b>3.2.2. Lectern Session   Moderator – Ali Rajab   Room – Fitzgerald E  </b></p> <ul style="list-style-type: none"> <li>• Assessment of Lifecycle Impacts of Steel and Fiber Reinforced Polymer Composite Infrastructure Components   <i>John Schweitzer</i></li> <li>• Evaluate and Document Production and Reduction Methods for CO<sub>2</sub> Greenhouse Gas Emissions in Flexible Pavements Life Cycle   <i>A. Saeed, J. Tingle and C. Williams</i></li> <li>• Optimizing Network-Level Pavement Treatment for Greenhouse Gas Emission Reduction   <i>M. Zhang, H. Li, H. Azarijafari and R. Kirchain</i></li> <li>• A Systematic Digitalization for Climate Mitigation and Adaptation Measures in Long-Term Road Planning   <i>K. Negishi, L. Fischer and R. D. Montaignac</i></li> </ul>
3:15pm - 3:45pm	<p><b>Coffee Break</b></p>
3:45pm - 5:30pm	<p><b>3.4. Panel Discussion   Moderator – John Harvey   Room – Fitzgerald ABC  </b></p> <p>Theme: Key Challenges &amp; Opportunities in Life Cycle Assessment in Two to Three Years</p> <ul style="list-style-type: none"> <li>• Daniel Hoenig – Climate Leadership Council (US)</li> <li>• Colleen K. Moss – ClearPath (US)</li> <li>• Monica Regina Garcez – UFRGS (Brazil)</li> <li>• Jieying Zhang – NRC (Canada)</li> <li>• Davide Lo Presti – University of Palermo (Italy)</li> </ul> <p><b>3.5. Awards + Closeout Session</b></p> <ul style="list-style-type: none"> <li>• Best Paper Award</li> <li>• Best Poster Award</li> </ul>

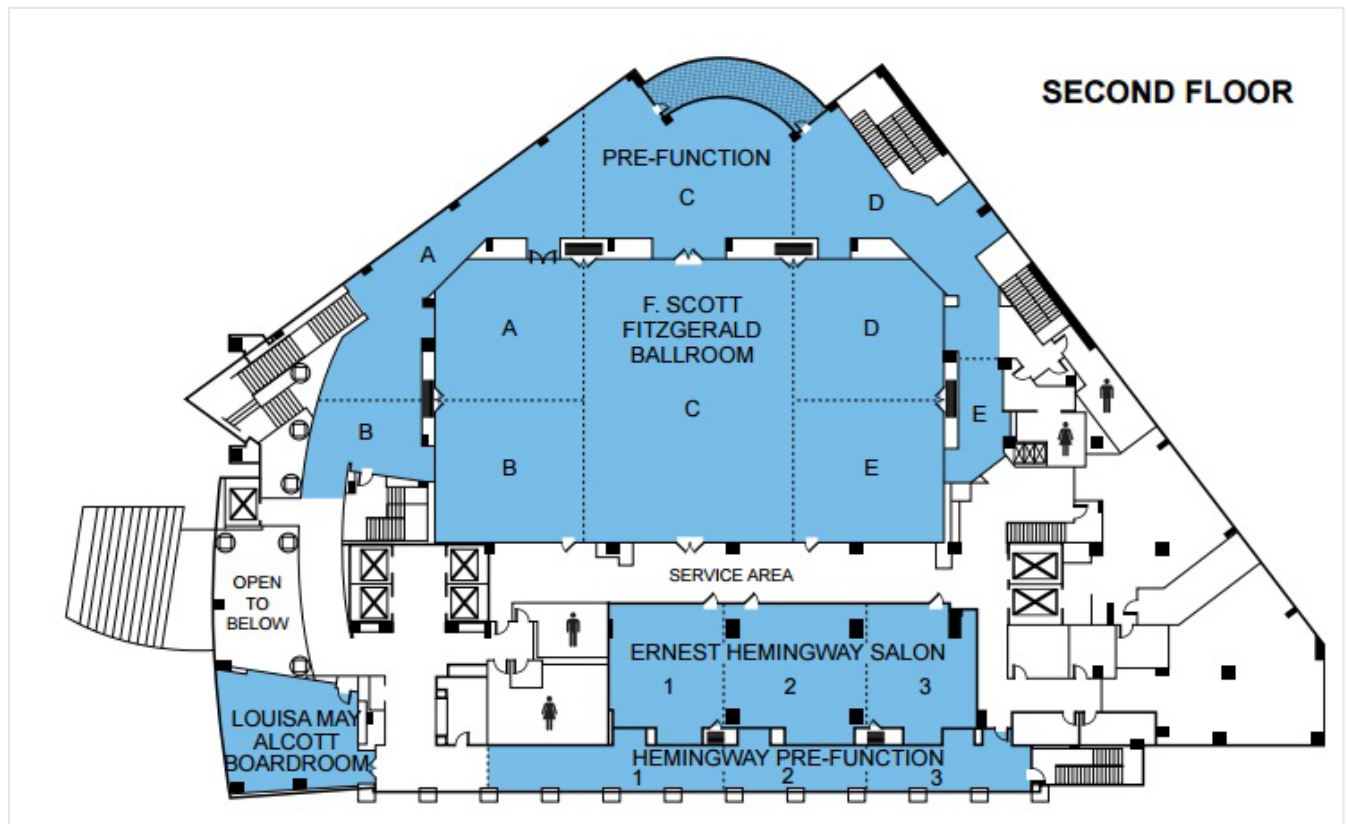
## COMMITTEE CHAIRS

Gerardo Flintsch | Virginia Polytechnic Institute and State University  
John Harvey | University of California, Davis  
Imad Al-Qadi | University of Illinois at Urbana-Champaign  
Hasan Ozer | Arizona State University  
Davide Lo Presti | Università degli Studi di Palermo

## ON-SITE ORGANIZING COMMITTEE

Eugene A. Amarth | Virginia Polytechnic Institute and State University  
Erich Sawyer | Virginia Polytechnic Institute and State University  
Jillian Waller | Virginia Polytechnic Institute and State University  
Heather Dylla | Construction Partners Inc.  
Brian Diefenderfer | Virginia Department of Transportation  
Maria Mutuc | Virginia Department of Transportation  
Brian Dobling | Federal Highway Administration  
Nadarajah Sivanewaran | Federal Highway Administration

## HOTEL MAP



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## FINANCIAL SPONSORSHIP



## ORGANIZATIONAL SUPPORT



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