## National Road Research Alliance Geotechnical Team May Meeting

#### Terry Beaudry Reclamation/Grading Engineer



- 1. Welcome and Introductions
- 2. General NRRA Update
- 3. Geotech Team Chair Discussion
- 4. Update Ongoing Research Projects
- 5. Brainstorming for upcoming Research Pays-Off Webinars
- 6. Update on Unsaturated Soil Mechanics Webinar
- 7. Questions/Requests

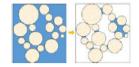
# **Update Research Projects**

Project	Team	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9
Determining Pavement Design Criteria for Recycled Aggregate Base and Large Stone Subbase <b>[80%]</b>	MSU/ISU /UWM							In progress		
Mechanistic Load Restriction Decision Platform for Pavement Systems Prone to Moisture Variations <b>[45%]</b>	UNH			TAP reviewing	In progress					
Environmental Impacts on the Performance of Pavement Foundation Layers [5%]	MSU		In progress	In progress						
Permeability of Base Aggregate and Sand [10%]	UWM	In progress	In progress							
Improve material inputs into mechanistic design properties for reclaimed HMA Roadways [5%]	MSU/ISU		In progress							
Subgrade Design for New and Reconstructed Roadways <b>[5%]</b>	SRF	In progress								

### Update on Unsaturated Soil Mechanics Webinar



Principles of Unsaturated Soil Mechanics and Its Application in Geotechnical and Pavement Engineering



Date: 9:00 AM - 11:30 AM (CT) Tuesday May 19, 2020

- Instructors: Prof.William J. Likos (UW-Madison), Prof. Bora Cetin (MSU), John Siekmeier (MnDOT), Raul Velasquez (MnDOT), and Terry Beaudry (MnDOT)
- Co-sponsors: TRB standing committee AKG40 Mechanics and Drainage of Saturated and Unsaturated Geomaterials
- 9:00 am Welcome Introduction T. Beaudry
- 9:05 am Why is Unsaturated Soil Mechanics Important? (30 min) W. Likos
  - What is unsaturated soil?
  - · Economic benefit from designing pavements accounting for unsaturated condition
  - What are the differences between saturated and unsaturated soil?

#### Fundamental Concepts in Unsaturated Soil

- Multiphase air-water-solid system
- · What is soil suction?
- · Importance of capillarity and surface tension
- · Additional concepts: meniscus, contact angle, relative humidity, cavitation

#### Stress State and Flow in Unsaturated Soil

- Importance of the Soil Water Characteristic Curve (SWCC) and the Air Entry Pressure (AEV)
- · Stress state, stiffness and strength
  - · Effective stress vs. Net normal stress vs. Suction stress vs. Matric suction
- · Steady and transient flow
  - · Pore water flow, pore airflow, capillary barriers, infiltration and evaporation

### Update on Unsaturated Soil Mechanics Webinar

9:35 am	<ul> <li>Measurement of Unsaturated Properties Pavement App. (25 min) – R. Velasquez</li> <li>Soil water characteristic curve <ul> <li>Tensiometer, hanging column, pressure plate, filter paper, psychrometer</li> <li>Unsaturated hydraulic conductivity (k-unsat)</li> <li>Common models for SWCC and k-unsat</li> </ul> </li> </ul>
10:00 am	Q&A - Fundamentals (10 min) – All
10:10 am	Break (10 min)
10:20 am	<ul> <li>Impact of Moisture on Pavement Foundation Materials (10 min) – B. Cetin</li> <li>Compaction density</li> <li>Stress-state, strength, stiffness, and flow</li> </ul>
10:30 am	<ul> <li>Importance and Integration of Unsaturated Soil Mechanics in Pavement M-E Design (20 min) – B. Cetin</li> <li>Impact of unsaturated conditions on M<sub>r</sub> of geomaterials</li> <li>How does Pavement-ME take unsaturated condition into account?</li> <li>Models used to calculate M<sub>r</sub> via taking the Matric Suction of soils into account</li> </ul>
10:50 am	Correlations between Unsaturated Soil Parameters and Pavement-ME Design Input (15 min) – B. Cetin • Relationship between Matric Suction-Water Content-M <sub>r</sub> • Prediction of Elastic Modulus via Matric Suction
11:05 am	<ul> <li>Use of Unsaturated Soil Mechanics by MnDOT (15 min) – J. Siekmeier</li> <li>Integration of Matric Suction parameter in MnPAVE</li> <li>Advantages and benefits for MnDOT</li> </ul>
11:20 am	Q&A (10 min) – All

11:30 am Closing Remarks - T. Beaudry