

National Road Research Alliance Geotechnical Team May Meeting

**Terry Beaudry
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Agenda

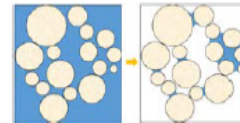
1. Welcome and Introductions
2. General NRRRA Update
3. Geotech Team Chair Discussion
4. Update Ongoing Research Projects
5. Brainstorming for upcoming Research Pays-Off Webinars
6. Update on Unsaturated Soil Mechanics Webinar
7. Questions/Requests

Update on Unsaturated Soil Mechanics Webinar



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