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

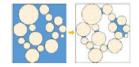
Update Research Projects

| 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 [80%] | MSU/ISU /UWM | | | | | | | In progress | | |
| Mechanistic Load Restriction Decision Platform for Pavement Systems Prone to Moisture Variations [45%] | 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 [5%] | 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 | 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