

**NRRA 2020 Pavement Workshop**  
**ICT Team – Extended Project Update Minutes**  
**‘Seismic Approach to Quality Management of HMA’**

**September 3, 2020, 10:30am-11:40am CDT**

**Skype Meeting**

1. **Welcome** J. Richter
  
2. **Goal of Today’s Meeting** J. Richter
  - a. Introduce PI’s and provide project background.
  - b. PI’s to present project progress to date and goals going forward.
  - c. Allow for Q & A at end of presentation
  
3. **Project Presentation** C. Park, N. Ryden, J. Starkhammar
  
4. **Q & A**
  - a. Maser: Speed of data collection?
    - i. Ryden: No theoretical limit to speed but currently testing at 15mph (30kph). Data collection mostly related to wind noise and robustness of source. Data also collected at 50kph with no problems but 30kph preferred for testing purposes.
    - ii. Maser: How frequently does ball create impacts?
    - iii. Ryden: Impact distance approximately 1 foot which is shortest distance at testing speed. Need to balance weight of source, speed and surface roughness.
  - b. Hoegh: Elaborate on S:N effect when measuring at ‘higher’ temps.
    - i. Ryden: S:N also depends on source. Some S:N is so bad in warm conditions that surface wave is within noise level. For good data, S:N is factor of 5 to 10. Not huge. Challenging in warm conditions. Source is important.
    - ii. Richter: Would we use this device directly after paving (i.e., Is it critical to perform surface wave measurements at this stage?)
    - iii. Embacher: I don’t think so. Can acquire later but will want to collect when it’s somewhat warm to get an idea of real-time which can be helpful. For final acceptance measurements can be performed later.
    - iv. Turgeon: A matter of what the tool can do and where to apply it. May want to wait, measure and core. A limitation we prefer to not have.
    - v. Park: Agree with Turgeon.
    - vi. Ryden: Shear wave velocity very sensitive to temperature. Will be quite hard to perform measurements when don’t have consistent temperature such as after paving.
    - vii. Hoegh: Any thoughts to normalize to temp if can measure temp?
    - viii. Park: Referring to calibration?
    - ix. Hoegh: Yes. To eliminate temperature effect.
    - x. Park: This is something that we can take advantage of with this system once it is available. Currently, no theoretical relationship between specific shear wave velocity and temperature since it is dependent on material. Hope is that whoever uses system will establish empirical relationship.
    - xi. Ryden: Recording temperature but both temp and shear wave velocity will be

- useful to investigate relationship and to find anomalies. Can plot velocity versus temp if have homogeneous mix. Temp/velocity relationship will be unique for each mix which is what we're after.
- xii. Richter: What is the threshold temp where noise overwhelms accuracy of measurements?
  - xiii. Ryden: Highest temperature recorded during testing is 96 degrees F and have good S:N with new sources so, could go higher. 96 may not seem high but Sweden uses stiffer bit due to climate. So, asphalt is soft at that temp.
- c. Tompkins: Plan to test on distressed pavements?
    - i. Richter: At this point just addressing newly paved bit.
    - ii. Ryden: Surface roughness can affect source, bouncing and frequency content. Desire highest possible frequencies which is acquired from ball hitting stones but impacts on bit are lower frequency resulting in lower quality data. Cannot control what is impacted but can overcome it via data density. Will depend on roughness and surface texture which refers to stone presence at surface. Can see difference in testing.
    - iii. Richter: Tompkins question likely addressing scoping phase as opposed to construction phase. Focusing on new pavement.
  - d. Dunn: On new pavement, how differentiate between 2 lifts?
    - i. Ryden: Currently, don't differentiate but acquire average thickness from measured velocity. Theoretical possibilities to differentiate but too much processing required.
    - ii. Hoegh: How would temp gradient affect results, such as new lift on old one or surface temp affects?
    - iii. Ryden: Gradient can influence a lot. Best conditions for measurements is in the morning before sun creates gradient. Hasn't been tested. Frequencies are sensing different thickness but can lump them to get an average of full thickness that is affected by temp gradient since velocity will change with temp. Strong gradient can affect it a lot.
  - e. Holzbauer: GPS accuracy needed and can other units be swapped out?
    - i. Starkhammar: Current accuracy is 1m via ordinary GPS. Can be upgraded to better accuracy.
    - ii. Richter to Embacher: Most paving projects have a base station which can be accessed?
    - iii. Embacher: Yes. Local ground based network or virtual network (CORS) available.
    - iv. Starkhammar: System will be programmed to allow for other systems.
    - v. Embacher: Each state uses different networks.
    - vi. Richter: Most networks provide accuracy in inches?
    - vii. Embacher: Depends on network used and specifications of state.
    - viii. Angerhofer: Need cellular corrections rather than base stations?
    - ix. Snyder: Depends on size of project. Can go miles at a time with base station. CORS network has limitations. As long as device has flexibility to accept other GPS systems and networks then it will suit each state's needs. Sounds like this system will meet everyone's needs.

**Attendees:**

Not documented; up to 35 participants representing all teams within NRRRA

Presentation recorded and accessible at:

<https://www.youtube.com/watch?v=v9nHJsmwPPE>