Pennsylvania Asphalt Pavement Association

IDEAL/TSR and SCB Smart Jigs
Bluetooth Enabled Asphalt Test Jigs
Overview

• Smart-Jigs (SCB & IDEAL-CT/TSR)
• Manufacturer Update
• HWT-Pro – Hamburg Verification/Calibration
The Balanced Mix Design
Cracking Tests

- **University of Illinois – Urbana Champaign Illinois Flexibility Index Test (I-FIT)**
  - Additional Sample Preparation
  - Analysis software
  - 1 notch depth, difficult to cut, tile saw width, 50mm/min

- **Louisiana State University-SCB**
  - Additional Sample Preparation
  - 3 notch depths, 3mm blade width
  - 0.5mm/min

- **IDEAL–CT**
  - Texas A&M – College Station, TX
  - Gaining most popularity
  - Least sample preparation
  - Uses AASHTO T283-style (TSR) Jig, 50mm/min
NO MORE CRACKING TESTS!
Older Loading Frames
InstroTek Smart Jigs

IDEAL-CT/TSR Jig

Smart-SCB
InstroTek Smart-Jig - Goal

- Our goal with the Smart-Jig is to minimize variance created by labs utilizing different manufacturer names with different data collection software. Smart-Jig setup is simple and allows all users/technicians to gather information the same way. Full support is offered and easy tablet software upgrades via Google Play store.
Smart-Jig Frame & Accessories

1. Jig w/ Bluetooth
2. USB Cable
3. Load Cell
4. Android Tablet
5. LVDT
6. Rod and Magnet
7. Power Cord
8. Lubricant
9. Analysis Software
“Smart-Jig”

- 2 Test in 1
  - IDEAL CT
  - Tensile Strength Test (TSR)
- Self contained system
- No need to replace old frames
- Actual displacement measured using LVDT
- Digital results
IDEAL/TSR & Smart-SCB Advantages

- Easy to use
- Give new life to older load frames
- Digital test results gathered with the same equipment
- No clerical errors
- Easy test set-up
- Automatically displays peak strength, average speed and all necessary data for IDEAL/TSR results
- Perform multiple tests
Current Round Robin/State Studies

- NCAT Round-Robin Phase 1 testing complete, Phase 2 data still being evaluated – Sample Preparation Training Key
- VAA Round Robin is currently on hold as they are waiting on funding approval from the procurement department at VDOT
- Florida is putting together a Round Robin to develop a specification for their state. Details are currently being worked out
- Texas DOT is establishing criteria for QC Labs to use IDEAL-CT index for verification of Overlay Test results established in mix design
NCAT Round Robin Summary –
Sample Preparation

The phase two results for the Ideal-CT have been received from all of the participating labs. In this phase, the between-lab mean CT Index was 103.7, the standard deviation was 11.5, and the COV was 11.1%. These results reveal how much effect sample fabrication has on variability. In the case of the Ideal-CT test, the COV was reduced from 33.3% to 11.1% from Phase 1 to Phase 2, indicating that differences in sample fabrication from lab to lab contributed to two-thirds of the overall between-lab variability of the test. This is an important finding that emphasizes the need for thorough hands-on training as part of implementation plans for performance tests used in mix design or production testing.
August 30, 2019 – “The Letter”

“ASTM D8225 Standard Test Method for Determination of Cracking Tolerance Index of Asphalt Mixture Using the Indirect Tensile Cracking Test at Intermediate Temperature, Section 6.1.1 says that the “[the axial loading device] shall be capable of maintaining a constant deformation rate of 50 ± 2.0 mm/min.”

Pine has come to understand that its Pine 850T Test Press does not meet this requirement when testing an asphalt specimen and we don’t currently have a solution that will make it meet the requirement. Note that the system does still comply with AASHTO T245 and T283.”
Dear all,

In last several weeks there have been some concerns on the results of Pine screw machine. To address the concerns, we tested 5 mixes with a servo-hydraulic machine manufactured by TestQuip and one screw machine produced by Pine, although this work is not in the scope of NCHRP implementation project. We also conducted some statistical analyses.

My overall conclusions are:
1. There is NO statistically significant difference between these two machines
2. Pine screw machine in fact does not meet current ASTM D8225-19. It MAY be necessary to change the tolerance of 50+-2mm/min.
Test results: between machines – “The Data”

CT\text{Index}: No statistical difference between machines
4.1 A cylindrical specimen is centered in the fixture. The load is applied such that a constant load-line displacement (LLD) rate of 50.0 +/- 2.0 mm/min is obtained and maintained for the duration of the test.
Proposed Changes

4.1 A cylindrical specimen is centered in the fixture. The load is applied such that a constant load-line displacement (LLD) rate of 50.0 +/- 3.0 mm/min is obtained and averaged throughout the duration of the test.
# SmartLoader Software Output

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Value 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Load (Stability)</td>
<td>15.3914 kN</td>
<td>3460.12 lbf</td>
<td>Diameter</td>
</tr>
<tr>
<td>IDT Strength</td>
<td>1176.993 kPa</td>
<td>170.708 PSI</td>
<td>Thickness</td>
</tr>
<tr>
<td>Peak Displacement</td>
<td>3.81 mm</td>
<td>0.150 in.</td>
<td>Max SG</td>
</tr>
<tr>
<td>Flow</td>
<td>15.01</td>
<td>0.01 in. units</td>
<td>Voids</td>
</tr>
<tr>
<td>Total Energy</td>
<td>86.07 Joules</td>
<td></td>
<td>% AC</td>
</tr>
<tr>
<td>Energy to Peak</td>
<td>40.55 Joules</td>
<td></td>
<td>Temperature</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Displacement of the Peak Load after the Peak</th>
<th>IDEAL-CT Index</th>
<th>Post-Peak Slope at 75%</th>
<th>Average Speed</th>
<th>Average Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>at 85% 5.426 mm</td>
<td>0.214 in.</td>
<td>-4640.589 N/mm</td>
<td>50.0 mm/Min</td>
<td></td>
</tr>
<tr>
<td>at 75% 5.789 mm</td>
<td>0.228 in.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 65% 6.087 mm</td>
<td>0.240 in.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SmartLoader Software Output

Show File: jig 205 test 5 8.0 pine TSR_HT 1-7-2020 3:27:28 PM.csv

Peak Load (Stability): 15.70 kN
Displacement: 3.41 mm
Smart-SCB

- Performs data collection for both IFIT and LSU Test Protocols
- Self contained system
- No need to replace old load frames
- Actual displacement measured using LVDT
- Digital test results
Purpose of HWT-Pro

- Verify Requirements of AASHTO T324 for Hamburg Wheel Trackers (HWT)
  - Rut Depth (Height)
  - Weight
  - Waveform
  - Temperature
- Allow calibration of HWTs
Designed Uses

- Designed to work with SmarTracker, PMW, Cox and Sons, PTI units
- Can be used to adjust dead load on wheels
- Verification of sine wave
- Calibrate LVDTs
  - InstroTek SmarTracker
  - Troxler(PMW)/Cox and Sons
### AASHTO T 324 Requirements

<table>
<thead>
<tr>
<th>Description</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load (lbf)</td>
<td>158 ± 1.0</td>
</tr>
<tr>
<td>Speed (ft/s)</td>
<td>1.00 ± 0.066</td>
</tr>
<tr>
<td>Center of Waveform</td>
<td>± 0.5 inch of center of specimens</td>
</tr>
<tr>
<td>Rut depth error</td>
<td>0.15 mm / 20 mm</td>
</tr>
<tr>
<td>Temperature</td>
<td>± 1.0 C</td>
</tr>
</tbody>
</table>
Waveform Verification

- Relative location of center of waveform in tray
- Speed of wheel at center
- Length of wheel path
- Passes/minute
- RMSE of waveform compared to sine wave
Reports

Verification

Calibration
Questions?

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