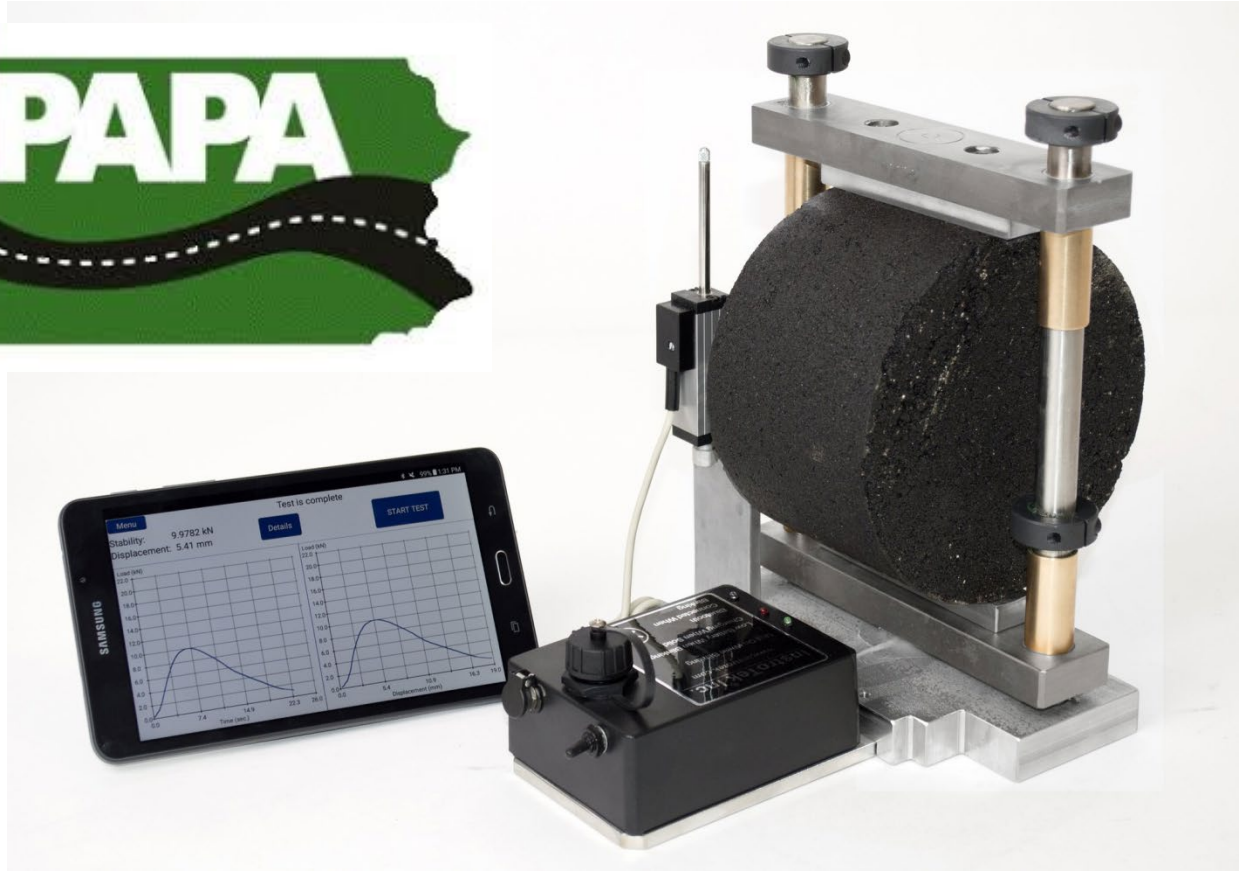
Pennsylvania Asphalt Pavement Association



IDEAL/TSR and SCB Smart Jigs

Bluetooth Enabled Asphalt Test Jigs

InstroTek® Inc.

INSTROTEK® COMPANIES

INSTROTEK • CPN • HMA • RAINHART

Overview

- Smart-Jigs (SCB & IDEAL-CT/TSR)
- Manufacturer Update
- HWT-Pro – Hamburg Verification/Calibration

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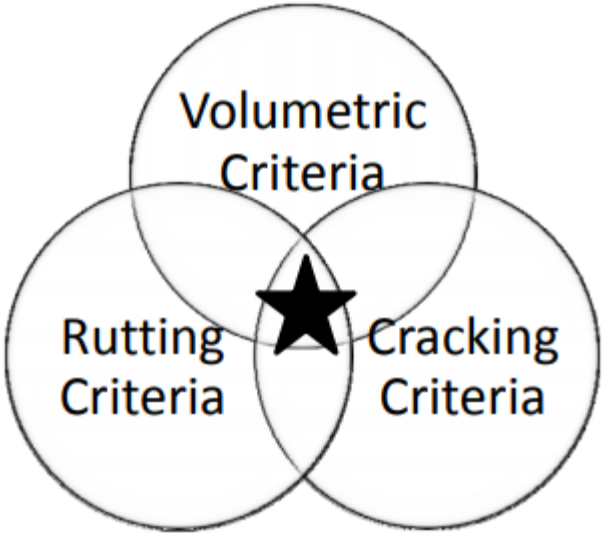
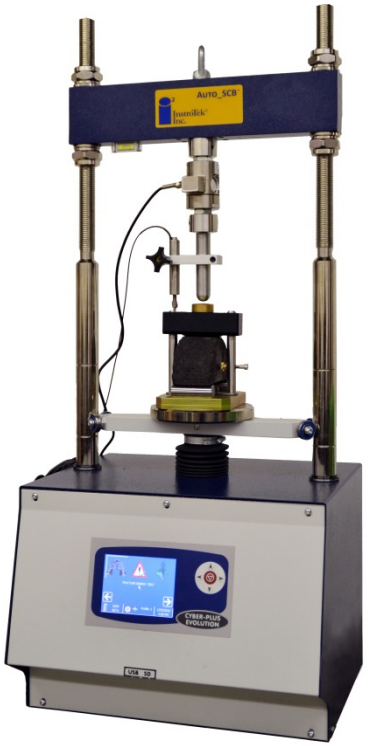
The Balanced Mix Design





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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!

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Older Loading Frames

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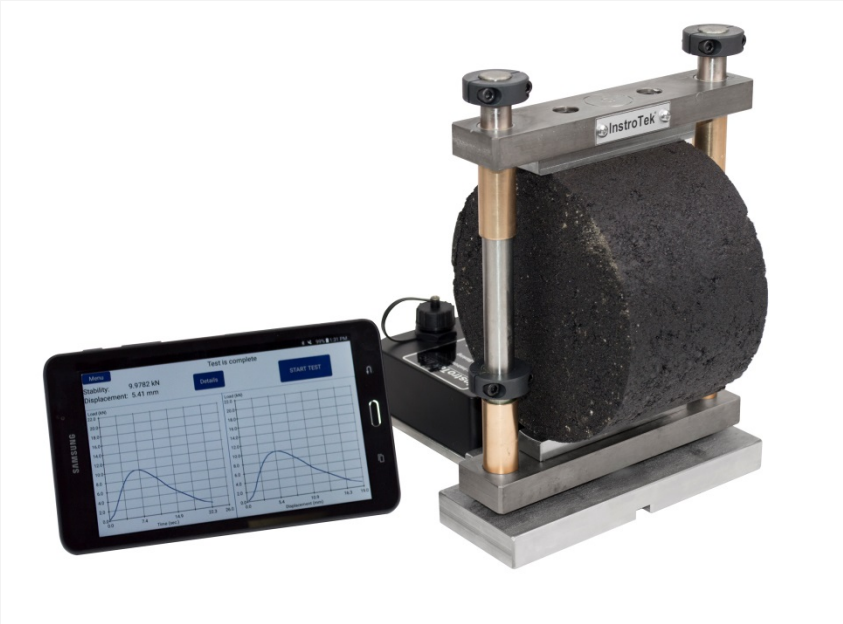
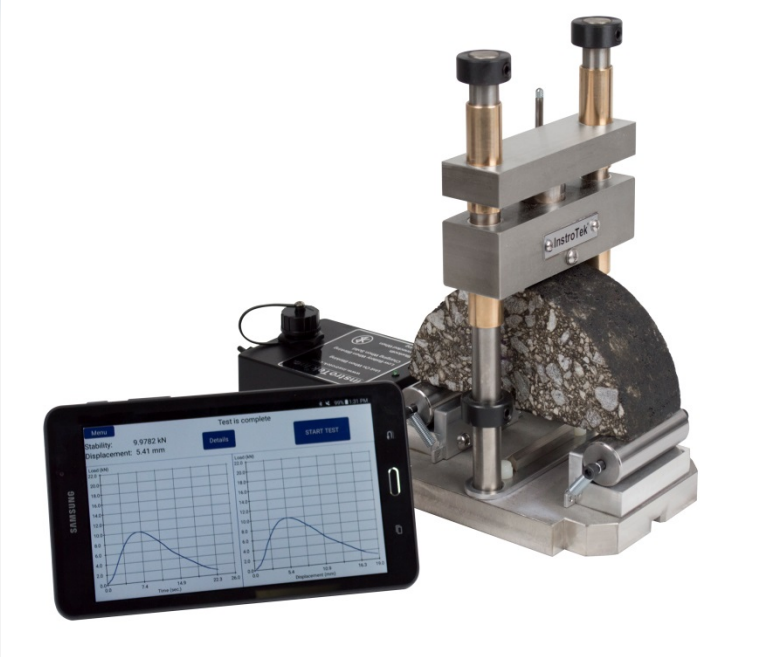
InstroTek Smart Jigs



IDEAL-CT/TSR Jig



Smart-SCB

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InstroTek Smart-Jig - Goal

- Our goal with the Smart-Jig is to minimize variance created by labs utilizing different manufacturer fames with different data collection software. Smart-Jig set up 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

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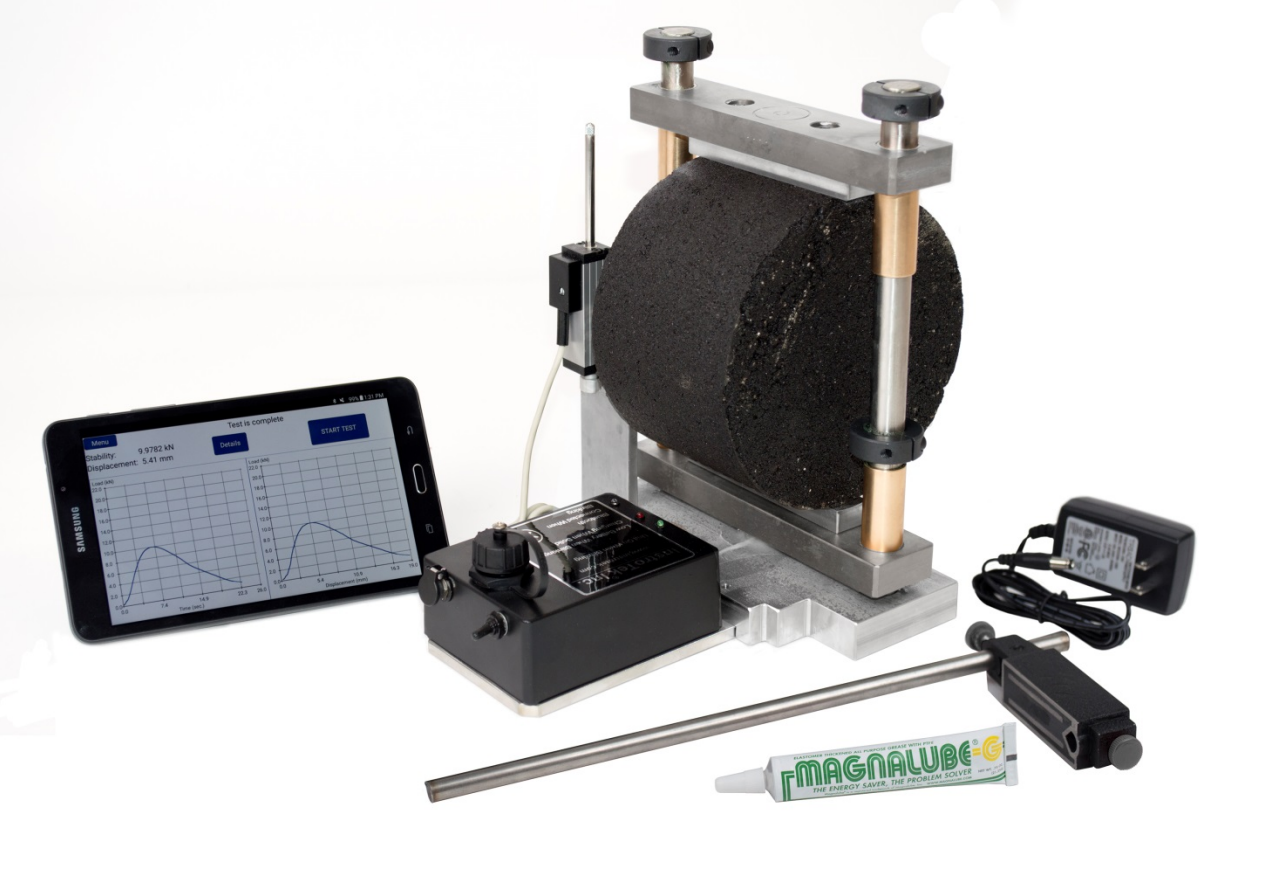
Smart-Jig Frame & Accessories



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

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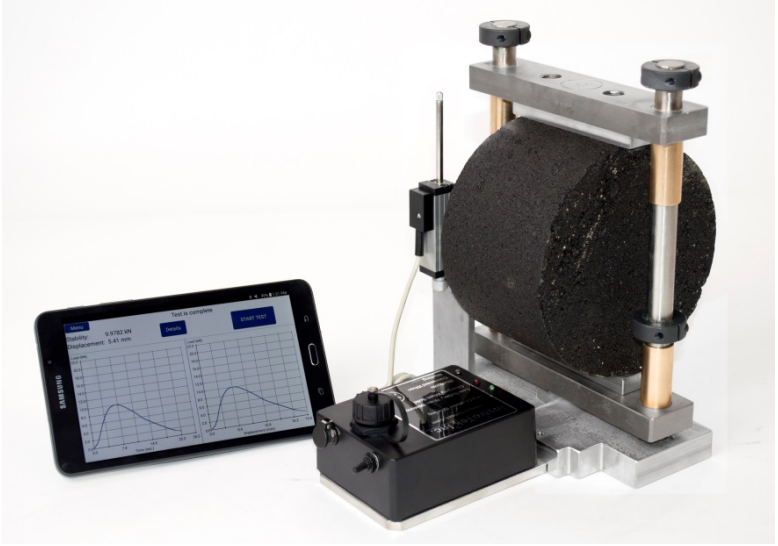
“Smart-Jig”



- 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

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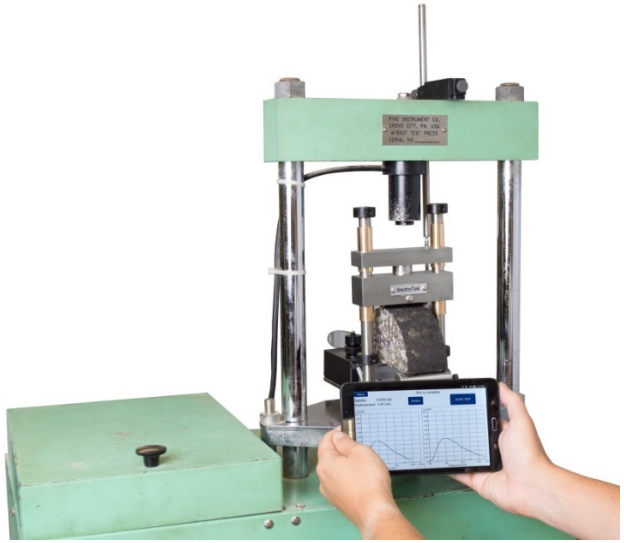
IDEAL/TSR & Smart-SCB Advantages

- 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



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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.

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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."

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September 27, 2019 – "The Response"

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.

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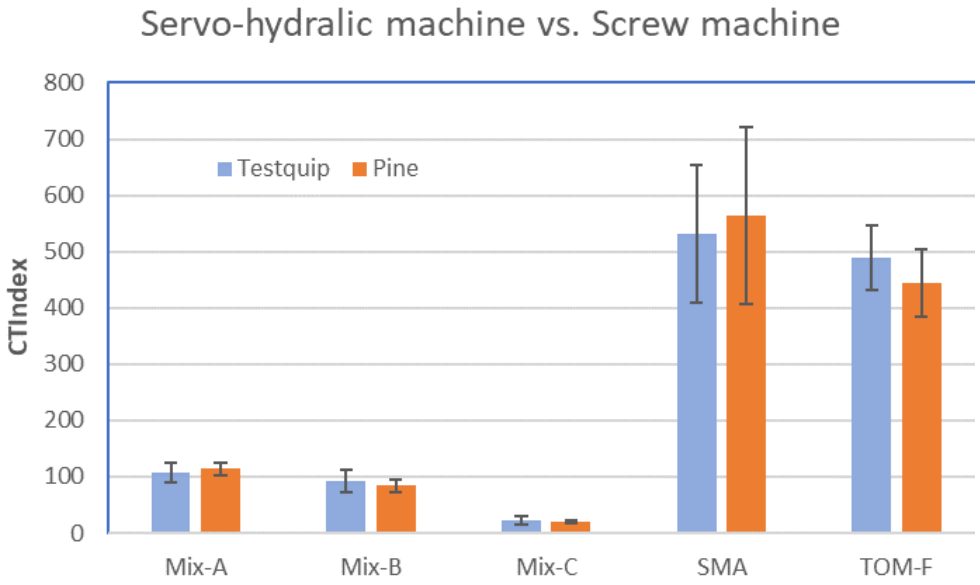
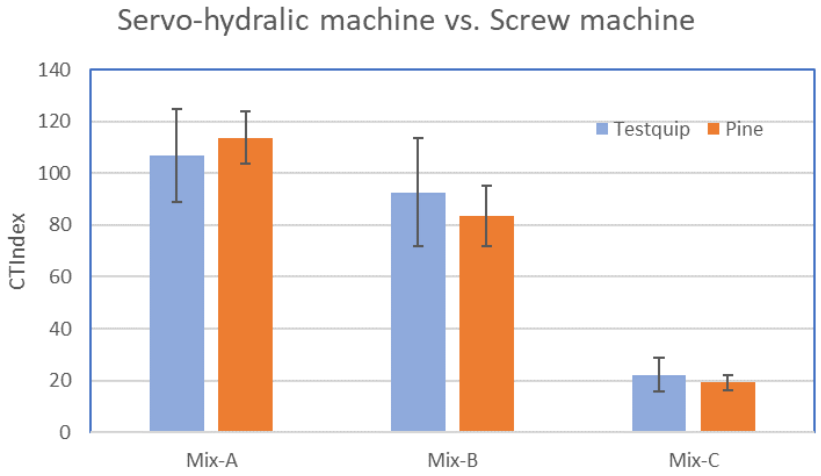
Test results: between machines – "The Data"





CT_{Index}: No statistical difference between machines

Current Info – “The Specification”

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.

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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.

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SmartLoader Software Output

Peak Load (Stability)	15.3914 kN	3460.12 lbf	Diameter	150 mm
IDT Strength	1176.993 kPa	170.708 PSI	Thickness	55.5 mm
Peak Displacement	3.81 mm	0.150 in.	Max SG	
Flow	15.01	0.01 in. units	Voids	
Total Energy	86.07	Joules	% AC	
Energy to Peak	40.55	Joules	Temperature	25

Displacement of the Peak Load after the Peak			IDEAL-CT Index	76.967
at 85%	5.426 mm	0.214 in.	Post-Peak Slope at 75%	-4640.589 N/mm
at 75%	5.789 mm	0.228 in.	Average Speed	50.0 mm/Min
at 65%	6.087 mm	0.240 in.		

Back

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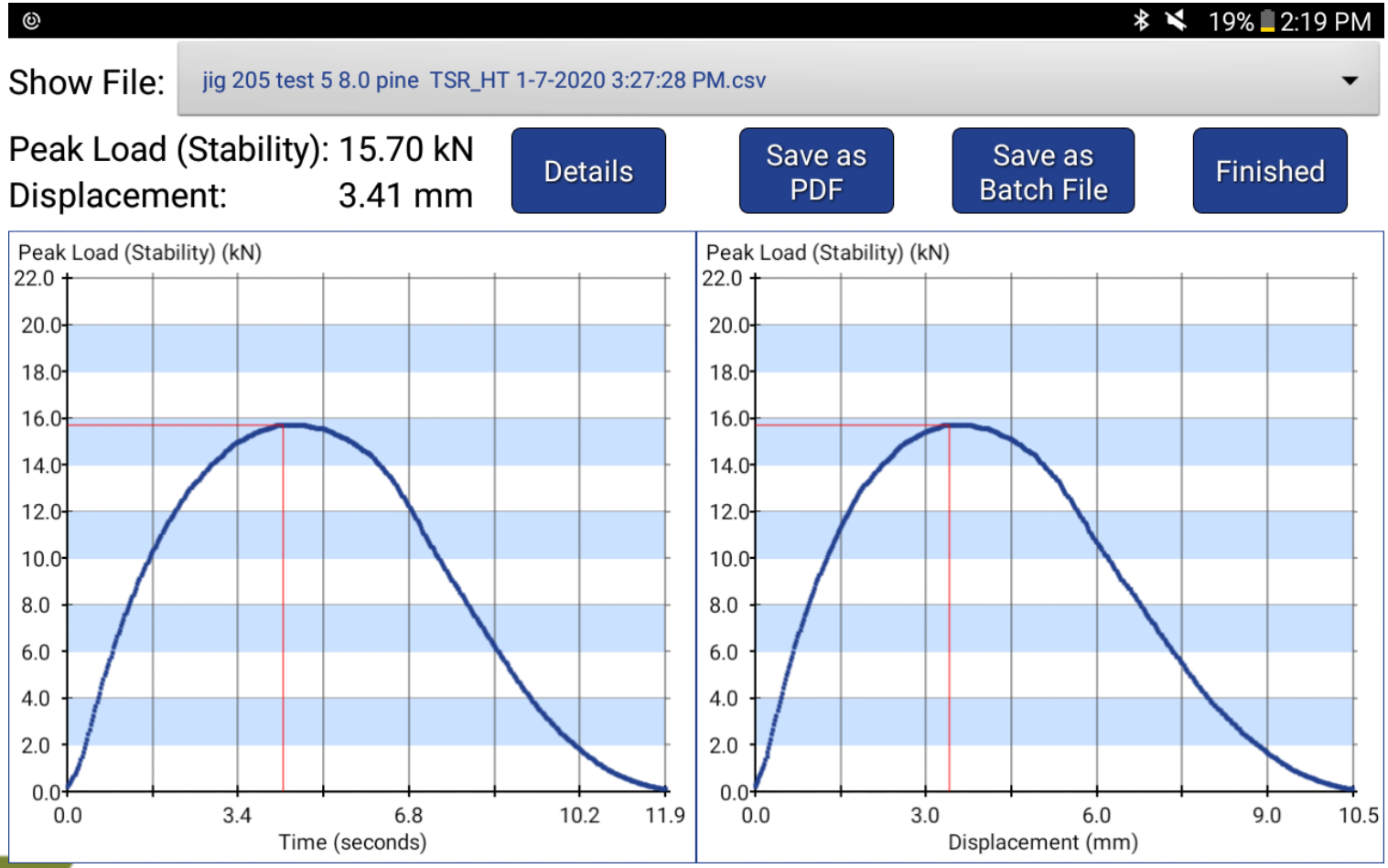
SmartLoader Software Output



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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

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HWT-Pro

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Purpose of HWT-Pro

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

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Designed Uses

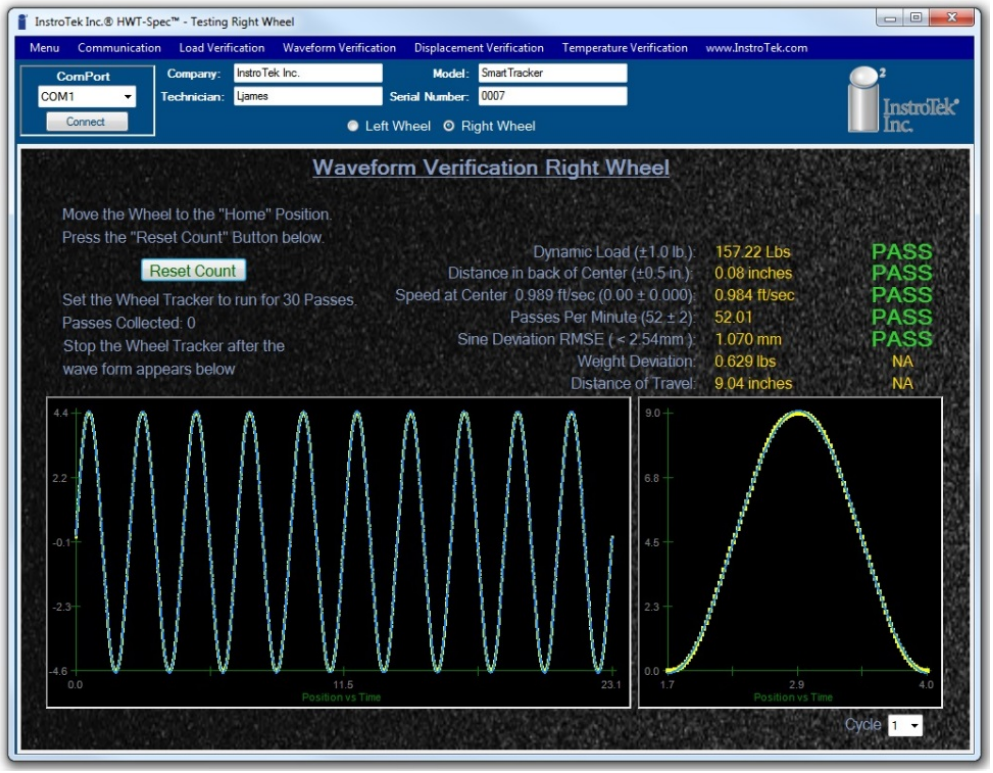
- Designed to work with SmarTracker, PMW, Cox and Sons, PTI units
- Can be used to adjust dead load on wheels
- Verification of sine wave
- Calibrate LVDTs
  - InstroTek SmarTracker
  - Troxler(PMW)/Cox and Sons

AASHTO T 324 Requirements

Description	Requirement
Load (lbf)	158 ± 1.0
Speed (ft/s)	1.00 ± 0.066
Center of Waveform	± 0.5 inch of center of specimens
Rut depth error	0.15 mm / 20 mm
Temperature	± 1.0 C

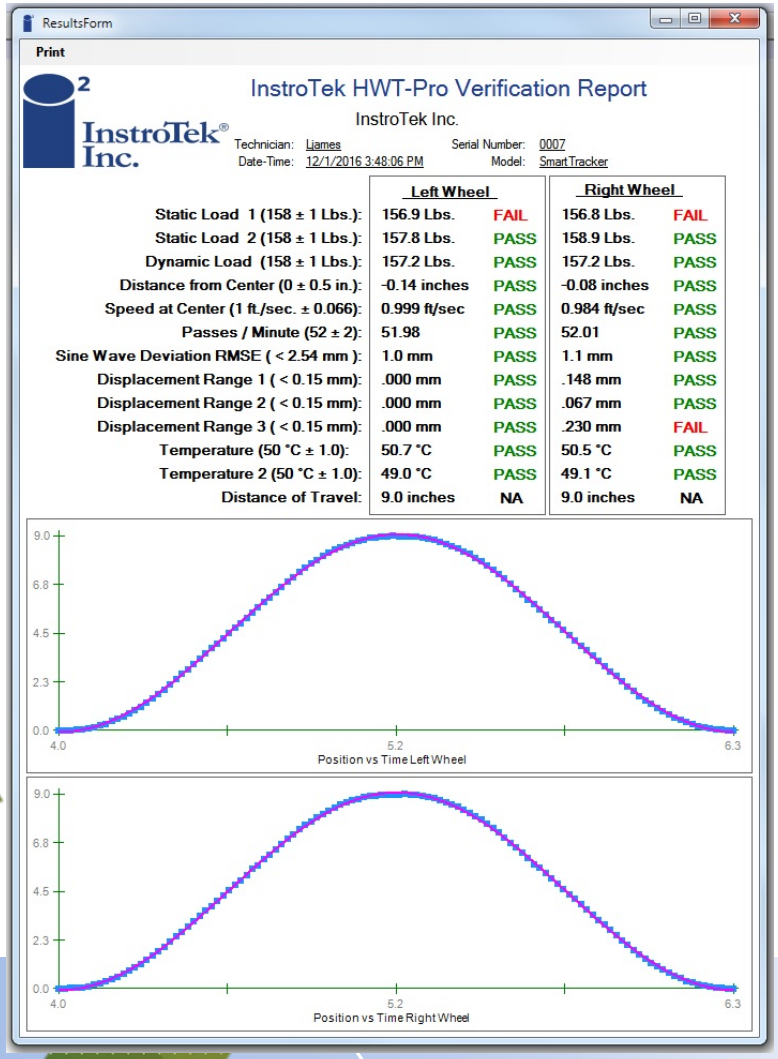
Waveform Verification

- 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


ResultsForm

Print

InstroTek HWT-Pro Verification Report

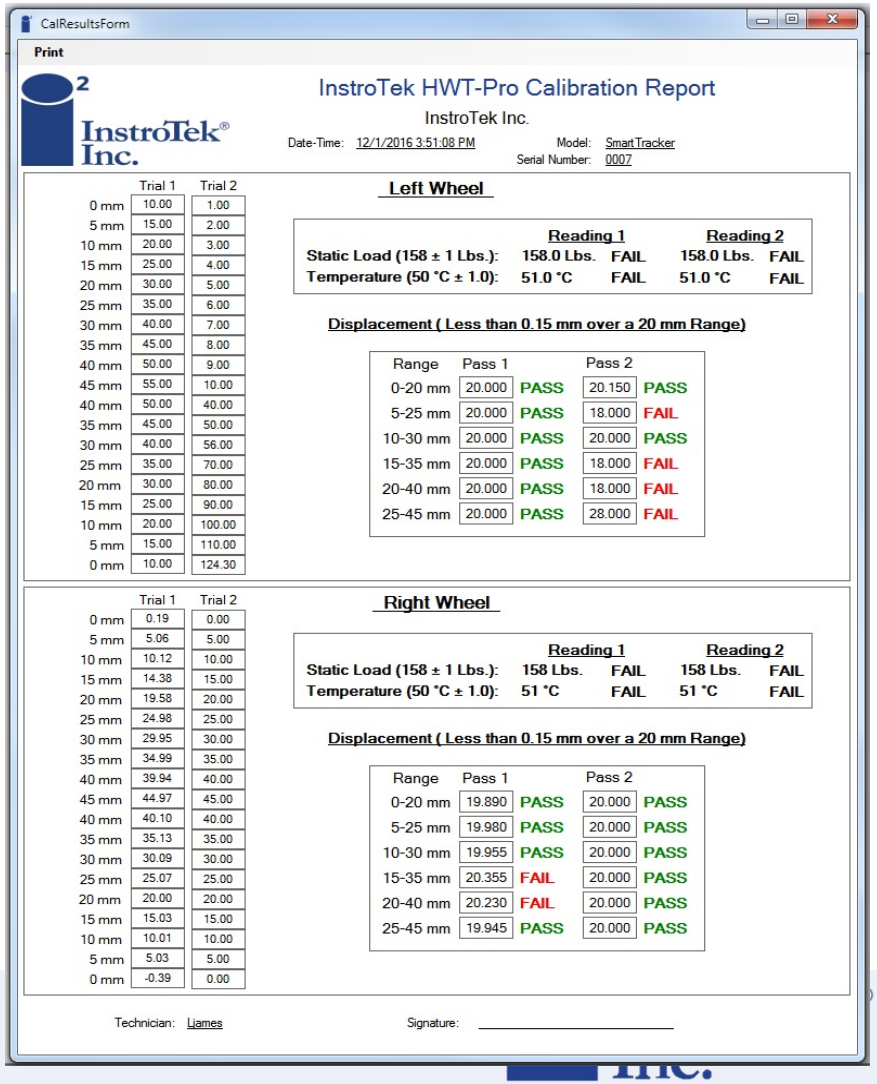
InstroTek Inc.

Technician: Llames Serial Number: 0007

Date-Time: 12/1/2016 3:48:06 PM Model: SmartTracker

	Left Wheel		Right Wheel	
Static Load 1 (158 ± 1 Lbs.):	156.9 Lbs.	FAIL	156.8 Lbs.	FAIL
Static Load 2 (158 ± 1 Lbs.):	157.8 Lbs.	PASS	158.9 Lbs.	PASS
Dynamic Load (158 ± 1 Lbs.):	157.2 Lbs.	PASS	157.2 Lbs.	PASS
Distance from Center (0 ± 0.5 in.):	-0.14 inches	PASS	-0.08 inches	PASS
Speed at Center (1 ft./sec. ± 0.066):	0.999 ft/sec	PASS	0.984 ft/sec	PASS
Passes / Minute (52 ± 2):	51.98	PASS	52.01	PASS
Sine Wave Deviation RMSE (< 2.54 mm):	1.0 mm	PASS	1.1 mm	PASS
Displacement Range 1 (< 0.15 mm):	.000 mm	PASS	.148 mm	PASS
Displacement Range 2 (< 0.15 mm):	.000 mm	PASS	.067 mm	PASS
Displacement Range 3 (< 0.15 mm):	.000 mm	PASS	.230 mm	FAIL
Temperature (50 °C ± 1.0):	50.7 °C	PASS	50.5 °C	PASS
Temperature 2 (50 °C ± 1.0):	49.0 °C	PASS	49.1 °C	PASS
Distance of Travel:	9.0 inches	NA	9.0 inches	NA

Calibration


CalResultsForm

Print

InstroTek HWT-Pro Calibration Report

InstroTek Inc.

Date-Time: 12/1/2016 3:51:08 PM Model: SmartTracker

Serial Number: 0007

Left Wheel

	Trial 1	Trial 2
0 mm	10.00	1.00
5 mm	15.00	2.00
10 mm	20.00	3.00
15 mm	25.00	4.00
20 mm	30.00	5.00
25 mm	35.00	6.00
30 mm	40.00	7.00
35 mm	45.00	8.00
40 mm	50.00	9.00
45 mm	55.00	10.00
40 mm	50.00	40.00
35 mm	45.00	50.00
30 mm	40.00	56.00
25 mm	35.00	70.00
20 mm	30.00	80.00
15 mm	25.00	90.00
10 mm	20.00	100.00
5 mm	15.00	110.00
0 mm	10.00	124.30

	Reading 1		Reading 2	
Static Load (158 ± 1 Lbs.):	158.0 Lbs.	FAIL	158.0 Lbs.	FAIL
Temperature (50 °C ± 1.0):	51.0 °C	FAIL	51.0 °C	FAIL

Displacement (Less than 0.15 mm over a 20 mm Range)

Range	Pass 1		Pass 2	
0-20 mm	20.000	PASS	20.150	PASS
5-25 mm	20.000	PASS	18.000	FAIL
10-30 mm	20.000	PASS	20.000	PASS
15-35 mm	20.000	PASS	18.000	FAIL
20-40 mm	20.000	PASS	18.000	FAIL
25-45 mm	20.000	PASS	28.000	FAIL

Right Wheel

	Trial 1	Trial 2
0 mm	0.19	0.00
5 mm	5.06	5.00
10 mm	10.12	10.00
15 mm	14.38	15.00
20 mm	19.58	20.00
25 mm	24.98	25.00
30 mm	29.95	30.00
35 mm	34.99	35.00
40 mm	39.94	40.00
45 mm	44.97	45.00
40 mm	40.10	40.00
35 mm	35.13	35.00
30 mm	30.09	30.00
25 mm	25.07	25.00
20 mm	20.00	20.00
15 mm	15.03	15.00
10 mm	10.01	10.00
5 mm	5.03	5.00
0 mm	-0.39	0.00

	Reading 1		Reading 2	
Static Load (158 ± 1 Lbs.):	158 Lbs.	FAIL	158 Lbs.	FAIL
Temperature (50 °C ± 1.0):	51 °C	FAIL	51 °C	FAIL

Displacement (Less than 0.15 mm over a 20 mm Range)

Range	Pass 1		Pass 2	
0-20 mm	19.890	PASS	20.000	PASS
5-25 mm	19.980	PASS	20.000	PASS
10-30 mm	19.955	PASS	20.000	PASS
15-35 mm	20.355	FAIL	20.000	PASS
20-40 mm	20.230	FAIL	20.000	PASS
25-45 mm	19.945	PASS	20.000	PASS

Technician: Llames Signature: _____

Questions?

Brian O'Toole
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botoole@instrotek.com

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