A COMPARISON STUDY OF TRAFFIC SPEED DEFLECTOMETER AND FALLING WEIGHT DEFLECTOMETER ON TEXAS ROADS

Feng Hong, PhD, PE
John Bilyeu, PE
Jenny Li, PhD, PE
Outline

- Introduction
- Testing routes in Texas
- Testing Devices
- Data Components
  - Subsurface
  - Surface
- Analysis
- Summary
Introduction

- Transportation pool fund study 385
  - Project: Pavement Structural Evaluation with Traffic Speed Deflection Devices (TSDDs)
  - Objective: establish a research consortium focused on providing participating agencies guidelines on how to specify collection and use data collected with TSDDs for network- and project-level (if feasible) pavement management applications.
    - Led by Virginia DOT
  - TxDOT: Pilot road testing conducted in 2019
  - Ongoing study
TSD Routes in Texas

All Routes

- Primary Routes in Yellow
- Connecting Routes in Blue

<table>
<thead>
<tr>
<th>Route</th>
<th>Total Mileage</th>
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<tbody>
<tr>
<td>All routes</td>
<td>757</td>
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<tr>
<td>Primary routes</td>
<td>362</td>
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<tr>
<td>Connecting routes</td>
<td>395</td>
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</tbody>
</table>
TSD Device

iPAVe Data Collection

Video Cameras

Inertial Profiler

Traffic Speed Deflectometer

Laser Crack Measurement System (LCMS)
How the High Speed Deflectograph works:

Position of the Doppler sensors, distance from the axle:
- 10 cm
- 20 cm
- 30 cm
- 5.6 m from the axle

Measurement:
The speed of the road deflection

Axle load:
10 t

Speed:
50 - 80 km/h

Photography: Susanne Baltzer, Graphics: Ditte Kilsgaard Møller (dkm@vd.dk), The Danish Road Institute
GPR Data Collection

- TxDOT 1 GHz air-launched GPR
Deflection: FWD vs TSD Sampling

FWD/TSD (0.5mi)

FWD/TSD (0.1mi)

FWD/TSD (nearest )
Deflection: Correlation between FWD and TSD Sampling

Corr. FWD vs TSD Sampling Interval

Correlation Coef. vs TSD Sampling Interval

- 0.5 mile
- 0.1 mile
- Nearest

Correlation Coefficient Values:
- 0.68
- 0.7
- 0.72
- 0.74
- 0.76
- 0.78
- 0.8
- 0.82
- 0.84
Deflection: FWD vs TSD, Highway specific

FWD/TSD Comparison, SH55

FWD/TSD Comparison, FM140

<table>
<thead>
<tr>
<th></th>
<th>FWD stats</th>
<th>TSD stats</th>
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<tbody>
<tr>
<td>AVG</td>
<td>29.570</td>
<td>23.800</td>
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<tr>
<td>STDEV</td>
<td>15.377</td>
<td>12.984</td>
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<tr>
<td>COV</td>
<td>0.520</td>
<td>0.546</td>
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<tr>
<td>MAX</td>
<td>123.329</td>
<td>68.050</td>
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<tr>
<td>MIN</td>
<td>2.917</td>
<td>3.750</td>
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<tr>
<td>CORR</td>
<td>0.793</td>
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<table>
<thead>
<tr>
<th></th>
<th>FWD stats</th>
<th>TSD stats</th>
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<tbody>
<tr>
<td>AVG</td>
<td>25.381</td>
<td>23.317</td>
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<tr>
<td>STDEV</td>
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<td>16.050</td>
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<tr>
<td>COV</td>
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<td>0.688</td>
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<tr>
<td>MAX</td>
<td>134.800</td>
<td>190.700</td>
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<td>MIN</td>
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<tr>
<td>CORR</td>
<td>0.842</td>
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Deflection on SH55: TSD vs FWD

The graph compares deflection in mils against distance in miles for TSD and FWD. The data shows a trend where the deflection for both TSD and FWD increases as the distance increases, with TSD generally showing a higher deflection than FWD. The blue circle highlights a specific section of the graph, indicating a region of interest for further analysis.
Deflection on FM140: TSD vs FWD
More In-Depth Study: FM969

- Length about 22 miles
- Pavement:
  - Flexible pavement
  - Structure varies
- Dataset
  - Surface condition data
  - Subsurface
    - TSD deflection
    - FWD deflection
    - GPR imaging
FM969: Surface Condition Evaluation

Distance (mi)

- Blk_Crk
- Alli_Crk
- Long_Crk
- Trans_Crk
- Rut_Shallow
- Rut_Deep
- Rut_Severe
- CS
- DS
FM969: Subsurface Condition
FM969: Pavement structure

The graph illustrates the thickness of pavement layers (surface and base) along a distance of 25 miles. The y-axis represents the thickness in inches, while the x-axis shows the distance in miles. The data shows variability in thickness across different segments of the pavement.
FM969: Load bearing capacity

![Graph showing deflection vs distance](image-url)

- **Deflection (mil)**
- **Distance (mi.)**

- TSD
- FWD
FM969: TSD deflection vs pavement scores

<table>
<thead>
<tr>
<th></th>
<th>CORR</th>
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<tbody>
<tr>
<td>DS vs Deflection</td>
<td>-0.64</td>
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<tr>
<td>CS vs Deflection</td>
<td>-0.58</td>
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Summary

- A preliminary study was done to evaluate pavements structural capacity under Transportation Pool fund study 385

Data focus
- Traffic speed deflectometer
- Falling weight deflectometer
- Ground penetrating radar
- Pavement surface conditions

Analysis approaches
- Visual comparison
- Statistics