

**PAVEMENT TECHNOLOGY ADVISORY
- NON-DESTRUCTIVE TESTING WITH THE
FALLING WEIGHT DEFLECTOMETER -
PTA-T1**

THE FWD SYSTEM

The Falling Weight Deflectometer (FWD), shown in Figure 1, is a non-destructive pavement loading device capable of exerting a load impulse similar in magnitude and duration to moving truck and aircraft wheel loads.



Figure 1: Falling Weight Deflectometer

The FWD unit can produce loads from 1,500 to 25,000 pounds-force. The load is applied to a loading plate by dropping a weight package on a dampening system, as illustrated in Figure 2. The force applied to the loading plate is measured by a load cell. The resulting pavement deflection is measured by a series of seven seismic deflection sensors positioned along the pavement surface at pre-determined intervals from the loading plate.

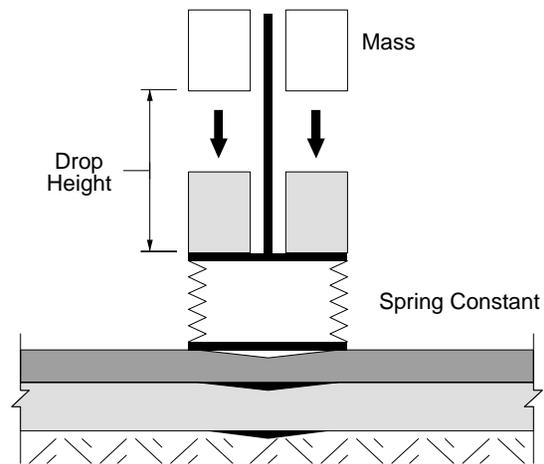


Figure 2: Load Applied to Pavement

Signals from the load cell and deflection sensors are fed into the system processor, which selects peak values and transfers this information to an onboard computer. A computerized system in the tow vehicle monitors and controls the testing cycle. A typical test sequence is approximately one minute long, so testing proceeds very rapidly down a street, highway, or airfield. The deflection data, as well as pavement stationing and operator comments are stored on a floppy disk for analysis after uploading to a personal computer.

DATA ANALYSIS

Deflection testing has numerous applications for the analysis and design of highway and airfield pavements. FWD data can be used to:

Rigid Pavements:

- Locate areas of poor support beneath jointed concrete pavements.
- Determine load transfer across transverse and longitudinal joints.
- Estimate subgrade and pavement layer elastic moduli values (E1, E2, etc.).
- Develop cost-effective maintenance and rehabilitation alternatives.

Flexible Pavements:

- Determine the structural adequacy of a pavement and identify causes of failure.
- Determine uniformity of support along a project and identify weak areas.
- Estimate subgrade and pavement layer elastic moduli values (E1, E2, etc.).
- Determine overlay thickness requirements.
- Develop cost-effective maintenance and rehabilitation alternatives.

OVERLAY DESIGN FOR FLEXIBLE PAVEMENTS

FWD data is frequently used to determine suitable overlay thicknesses for existing flexible pavements that need additional structural support. The existing pavement and subgrade support levels determined from FWD testing, along with traffic data, design loading, and design period, are used as inputs to determine an overlay thickness suiting the design conditions. Additional overlay thickness can be prescribed for localized weak areas identified using FWD data. Designs are possible for a variety of pavement types, from granular bases topped with a seal coat to full-depth hot-mix asphalt pavements.

TESTING REQUESTS

The Bureau of Materials and Physical Research (BMPR) is available to conduct a limited amount of FWD testing and data analysis for districts and local agencies. Testing is typically performed only during the period from April through October, due to weather constraints. If testing and analyses are desired, please prepare the following information and contact BMPR at the address below:

- Marked Route
- Contract and section number (if available)
- Location map (REQUIRED)
- Pavement type and thickness (cores may be needed to verify thickness of pavement layers)
- Name and telephone number of:
 - Test requester
 - Traffic control contact
- Type of investigation desired

For overlay design also include:

- Traffic data (including percentages of single-unit and multiple-unit trucks, if available)
- Design load (73,280 lbs. or 80,000 lbs.)
- Design period in years
- Deadline date

Please direct questions or requests to:

Pavement Technology Engineer
Bureau of Materials and
Physical Research
126 East Ash Street
Springfield, Illinois 62704-4766
(217) 782-7200

Note: Before submitting a request, please contact the Pavement Technology Engineer for testing availability. If testing is available, please submit the request as far in advance as possible to allow time for scheduling and data analysis.