PAVEMENT TESTING AND ASSET MANAGEMENT

2023 PAPA ANNUAL CONFERENCE

HALLEY COLE P.E.

pennsylvania
DEPARTMENT OF TRANSPORTATION

ORGANIZATION

Bureau of Operations

- Previously a part of the Bureau of Maintenance and Operations

Asset Management Division

Pavement Testing and Asset Management Section

PennDOT Annex

- Previously the BOMO Annex

ROUGHNESS (IRI) TESTING

Fleet Includes:

- 3 Highspeed Profilers
- 2 Lightweight Profilers
- 1 Walking Profiler

IRI Categories	Interstate Routes	NHS Non-Interstate Routes	Non-NHS Routes with ADT ≥ 2000	Non-NHS Routes with ADT < 2000
≤ 70	Excellent	Excellent	Excellent	Excellent
71-75	Good	Excellent	Excellent	Excellent
76-100	Good	Good	Excellent	Excellent
101-120	Fair	Good	Good	Excellent
121-150	Fair	Fair	Good	Good
151-170	Poor	Fair	Fair	Good
171-195	Poor	Poor	Fair	Fair
196-220	Poor	Poor	Poor	Fair
> 220	Poor	Poor	Poor	Poor

HIGHSPEED PROFILERS

- Tests are performed at traffic speeds up to 65 mph

- 3 lasers mounted in the bumper

- Two people perform this test
  - One to drive the vehicle
  - One to operate the testing equipment

- Testing occurs during the months of March - November, can vary depending on weather

LIGHTWEIGHT PROFILERS

- Tests are performed by one person both driving and operating the testing equipment

- Due to their limited size and weight, LWP's can be used within the confines of construction projects.

- Lasers also mounted on the bumper

- Monitor and operator controls located near the driver seat and computer and printer located in the back

- Testing can occur throughout the year, as long as the pavement is clear or debris and snow- colder temperatures may inaccurately reflect a rougher pavement

LIGHTWEIGHT PROGRAM

LIGHT WEIGHT PROFILING SYSTEM

Calibration Verification & Operator
Certification Program Manual

DEPARTMENT OF TRANSPORTATION
BUREAU OF MAINTENANCE AND OPERATIONS
ASSET MANAGEMENT DIVISION
ROADWAY INVENTORY AND TESTING UNIT

pennsylvania
DEPARTMENT OF TRANSPORTATION

PUB 589 (5-21)

- PTM #428, defines the method in which to measure pavement profile and determine pavement ride quality for acceptance and payment using an LWP device

- Publication 589, "Lightweight Profiling System Calibration Verification & Operator Certification Manual" outlines the program to verify calibration of all lightweights used on PennDOT jobs and the Operator Certification Process

- PennDOT wants to be assured that each individual LWP device is operated proficiently and provides accurate and precise results, and not make "blanket approvals" based on type. Because of this, a program has been developed to verify that all LWP devices are calibrated and operating properly.

LIGHTWEIGHT PROGRAM

FRICTION TESTING

Fleet Includes:

- 3 Locked-Wheel Skid Testers

Used For:

- Wet Pavement Accident Clusters
- High Friction Surface Treatment Testing
- Research Testing
- Special Request Testing

FRICTION TESTING

- Friction Testing is probably the most requested type of pavement testing.

- These devices are specially equipped pickup trucks with custom two-wheel trailers. The pickup truck is equipped with a 300 - 600-gallon water tank (located in the bed), a water pump, and computer system to control the testing and record the measurements.

- Tests are performed with a two-person crew, an operator and a driver. Tests are conducted at speeds ranging between 25-50 mph when the temperature is above 32 degrees.

- To perform a test, water is sprayed immediately ahead of the trailer tire. The tire is locked and skids for a short period of time. A test cycle takes approximately 2.5 seconds. Smooth tires are usually used to create the worst-case condition.

- The computer system is used to calculate a skid number, and the data is reported to the district to determine a course of action. The higher the skid number the more friction and the lower the skid number… the less the friction.

Fleet Includes:

- 2 Falling Weight Deflectometer Units

Used for:

- Basin Testing

- Load Transfer

- Void Detection

FALLING WEIGHT DEFLECTOMETER (FWD) TESTING

- FWDs are designed to simulate deflection of a pavement surface caused by traffic.

- FWD testing is a static test which requires traffic control. One person is needed to perform the testing.

- Tests are initiated when the operator presses a button. The sensors that are mounted on a bar are lowered onto the pavement. The FWD then drops a predetermined weight onto a load plate positioned on the pavement surface. The sensors measure the deflection of the pavement, and the computer records the measurements.

- Our FWDs are capable of testing with weights between 1,500 – 27,000 pounds.

- Deflection is measured in "mils," which are thousandths of an inch.

- Results are used to estimate the stiffness of the pavement.

FWD CALIBRATIONS

- Fun Fact:

    The center for the North Atlantic Region is located at the PennDOT BOO Annex and has been in operation since 1992. Twenty to thirty calibrations are performed at the center annually, for State and Federal agencies, as well as private vendors, some travel from as far as North Carolina and Canada to have FWD devices calibrated at this facility. Devices are typically calibrated on an annual basis.

Reference Calibration of Load Cell

VIDEO LOG TESTING

Fleet Includes:

- 2 Video Log Vans

Used For:

- Video Log QA
- Warranty Projects
- Special Requests

VIDEO LOG TESTING

- PennDOT currently owns 2 video log imaging vans. Each van is equipped with lasers that are mounted in the bumper and can measure IRI.

- The video log system uses high speed cameras, custom optics and laser line projectors to acquire both 2D images and high-resolution 3D profiles of the road. It can collect data at speeds up to 65 mph.

- A ladybug camera on the roof and can collect 360-degree high resolution images. The Laser Crack Measurement System II (LCMS 2), two lasers, are mounted in the rear of the vehicle.

- The LCMS 2 collects 3D images of the pavement allowing us to detect cracking, rutting, texture, potholes, shoving, raveling and roughness. Pavement distresses can be measured with 1mm resolution.

- An operator and a driver are needed to conduct video log testing.

TESTING REQUESTS

Testing Request Forms can be accessed using the RITU intranet website:

https://dot.state.pa.us/penndot/Bureaus/Intranet/BOMOintra.nsf/infoRMRIhome?OpenForm

FUGRO

- Fugro Data collection

  - Collect all PennDOT miles – almost 40,000 segment miles

  - Collect Business Plan Networks 1 (interstate) and 2 (National Highway System - NHS) **Annually**

  - Collect Business Plan Networks 3 (Non-NHS >2000 ADT) and 4 (Non-NHS <2000 ADT) **Every other year**

  - Collect IRI, OPI, and 18 other pavement Distresses

  - Report to FHWA though HPMS (Highway Performance Monitoring System)

ROADWAY MANAGEMENT SYSTEM

- RMS is the system of record for our roadways;
  - Maintains an inventory of the roadway features, conditions, and characteristics

  - Provides decision-makers with the information necessary for funding, business planning, project design, maintenance programming, and information for the annual allocation of maintenance funding

  - Data stored and managed in RMS includes;

• Geometry information	• Roadside features
• Traffic information	• Structure locations
• Pavement and shoulder history	• Railroad crossings information
• Maintenance history	• Pavement testing
• Municipal and legislative boundaries	• Condition survey information (including guiderail and drainage)
• Intersections	• Posting/bonding information

RMS STRAIGHT LINE DIAGRAM

- One of the most important aspects of RMS is having a viewable representation of a state road (SR).

- This is accomplished with a graphical diagram called a straight-line diagram (SLD).

- PennDOT produces electronic versions of the SLD for every state road, in every county, annually.

Many other PennDOT computer systems depend on data from RMS

D196 REPORTS

- State-wide pavement data collected by Fugro

- Internally facing information

- D196 comes in a variety of reports;
  - Each business plan network
  - International Roughness Index (IRI) Median and Miles reports
  - Overall Pavement Index (OPI) Median and Miles reports

PAVEMENT HISTORY

- Pavement History is the documented layers of pavement entered into RMS by the Districts
- Both internally and externally facing
- Link to Pavement History: https://gis.penndot.gov/PavementHistory/

PAVEMENT HISTORY

Total pavement width

24

Pavement History Layer Type Code

2017
SPAV,WMA WRG,64-22,12.5MM,E / Depth: 2 (in.) / Year: 2017
MILLING (AVERAGE DEPTH) / Depth: -2 (in.) / Year: 2017

2012
SPAV,HMA WRG,64-22, 9.5M...
MILLING (AVERAGE DEPTH...

2010
SURFACE TREATMENT - RALUMAC / Depth: .63 (in.) / Year: 2010

1998
ASPHLT MX HMA WEARING, 19 MM / Depth: 1.5 (in.) / Year: 1998
HEAVY DUTY BINDER COURSE ID2 / Depth: 2 (in.) / Year: 1998
SCRATCH BIT WEAR COURSE ID-2 / Depth: .62 (in.) / Year: 1998
CONC PVMT RESTORATION (CPR) / Depth: 0 (in.) / Year: 1998

1972
RCCP 46.5 (ft.) JNT SPACING/DOWEL / Depth: 10 (in.) / Year: 1972

- Record of existing pavement layers, those which have been reconstructed are no longer listed

- Each line includes some or all of the following information:
  - PG, Aggregate size, SRL, Material type, depth, milling depth, or time of placement

- Scale at the top denotes where the material was placed or removed within the segment

VIDEOLOG

- VideoLog is the term used to describe the automated collection of pavement conditions and roadway imagery.

- VideoLog data is collected on all state-owned asphalt and jointed concrete pavements by a vehicle called a VideoLog Van or Video Van.

  - Data collected is a series of individual pictures set in intervals that are sequenced together

- VideoLog is both internally and externally facing

- Link to VideoLog: https://gis.penndot.gov/videolog/

VIDEOLOG

VIDEOLOG BENEFITS

- There are two key benefits gained with VideoLogging;
  - Safety:
    - Conducting manual pavement surveys can present hazards for PennDOT personnel because the process involves traveling on the roadway shoulder at slow speeds. VideoLogging replaces the need for frequent manual survey, so it is much safer.
  - Efficiency:
    - VideoLogging provides panoramic images for personnel to view, instead of having to physically travel to a location to view pavement conditions.

VIDEOLOG

Historical Data available through "Show Historical VideoLog" check box

SR 83 in Dauphin County
2017 vs 2021

PDIF

- Penndot Data Integration Facility (PDIF) – Internal Facing

- Applications: Road Management for BOMO (ROAD)

- Reports:
  - Roadway Management
  - Pavement History
  - Posted and Bonded
  - STAMPP

PENNDOT ONE MAP

PAMS

- Pavement Asset Management System (PAMS) is an asset management solution that assists with strategic planning with maintenance operations and capital investment decision making

- Project optimization based on funding

- Future prediction of deterioration and benefits from proposed projects

- Bring together data from multiple systems for analysis and reporting

- PAMS connects to other PennDOT systems (legacy and updated systems) to ensure smart project recommendations
    - Planning information comes from MPMS
    - Historical information and past treatments and condition
       data from RMS
    - Maintenance from SAP
    - Construction projects and costs from ECMS
    - Mapping from GIS

TRANSPORTATION ASSET MANAGEMENT PLAN (TAMP)

- MAP-21 and the FAST Act require each state department of transportation to develop and implement a risk-based asset management plan in accordance with 23 U.S.C. 119

- The intent is to encourage states to achieve and sustain a state of good repair over the life cycle of transportation assets—regardless of ownership—and to preserve or improve the condition of the NHS.

- The Pennsylvania Transportation Asset Management Plan (TAMP) 2019:

- A recent TAMP submission was made the end of 2022, FHWA has 90 to review and approve the submission
  - Establishes targets for pavement and bridge condition
  - Summarizes Pennsylvania's inventory of pavement and bridge assets by structure type, class, owner, and condition
  - Forecasts asset condition by year for at least a 12-year planning horizon at current funding levels
  - Outlines PennDOT's asset management practices, which are integrated into long-range planning, project programming, financial planning, and risk assessment processes

QUESTIONS?

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