About File

PAVER™ Version 7.0

May 2013

NEW DIMENSTIONS IN PAVEMENT MAINTENANCE MANAGEMENT

US Army Corps of Engineers
Engineer Research and Development Center
Construction Engineering Research Laboratory

Sponsors

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- US Army
- US Navy

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- U.S. Army Corps of Engineers

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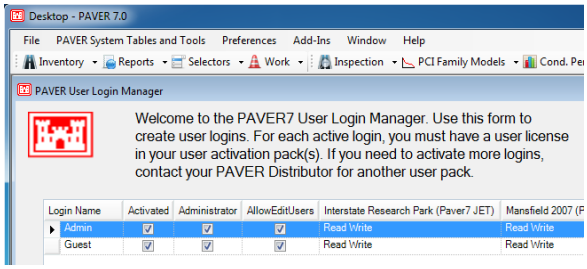
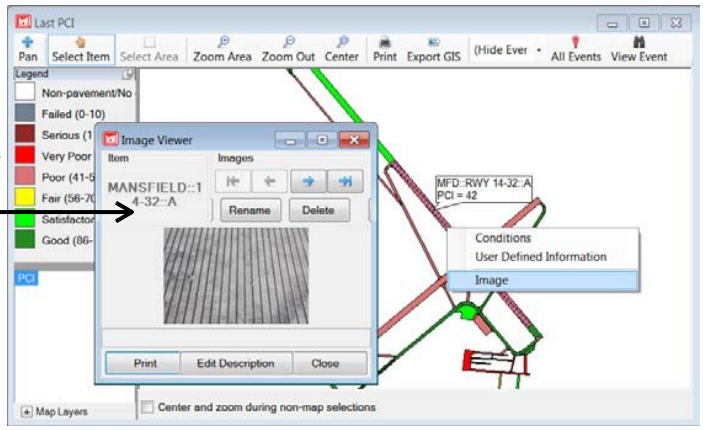
PAVER™ 7.0

Key Features



- Choice of Access and/or SQL database
- Database security options
- 32-bit install. In addition, a 64-bit version is installed on 64-bit computers
- PAVER™ International version for multiple languages
- Windows standard interface, drop down menu
- Inventory with private or shared system tables option
- Wizards for tabular creation and update of inventory and work history
- Wizard for creation and update of inspections
- XML import of inspection data
- GPS image to section assignment
- Improved GIS reporting and image viewing
- New Section Split Wizard
- New section history report
- Selection criteria available on export
- Optimized performance for large databases



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Background

PAVER™ is a pavement management system developed by the US Army Corps of Engineers, Construction Engineering Research Laboratory (CERL). PAVER™ development is supported by the following agencies: US Air Force, US Army, US Navy, Federal Aviation Administration, and the Federal Highway Administration.

PAVER™ provides pavement management capabilities to: (1) develop and organize the pavement inventory; (2) assess the current condition of pavements; (3) develop models to predict future conditions; (4) report on past and future pavement performance; (5) develop scenarios for M&R based on budget or condition requirements; and (6) plan projects.

The following is a brief overview of PAVER™ components and capabilities.

32 and 64 bit Installs

PAVER™ 7 can be installed on both 32- and 64-bit computers. On a 64-bit computer, it can be run in either 32- or 64-bit mode.

PAVER™ International version for multiple languages

PAVER™ 7 was developed with the ability to be used in languages other than English. The first language available is French with other languages currently in development.

Database Options and Security

PAVER™ 7 allows the user to create databases in Access and/or SQL Server (Express). A new feature allows users the option to create private or shared system tables. Security options include licensing and administrator controls for access to databases.

Inventory

PAVER™ inventory management is based on a hierarchical structure composed of networks, branches, and sections, with the section being the smallest managed unit. This structure allows users to easily organize their inventory while providing numerous fields and levels for storing pavement data.

Other features included in Inventory:

- User-defined Fields: In addition to the standard inventory information, users can define their own fields to meet their management requirements.
- Virtual Inventory: Allows the user to create virtual copies of the existing inventory and group sections for easy presentation.
- Surface Change: Automatically calculates and updates pavement surface based on work history information.
- Edit Historical Inventory: Easily edit historical inventory values associated with previous inspections.

Inspection

To assess pavement condition, PAVER™ uses the Pavement Condition Index (PCI) as its primary standard. The PCI measures pavement condition on a scale from 0 to 100. ASTM has adopted the PCI as standard practice for roads (D6433-11) and airfields (D5340-11). PAVER™ allows users to customize PCI condition rating categories, as shown in Figure 1. PAVER™ also provides the user an interface for recording the results of an inspection and an HTML distress user guide, as shown in Figure 2.

In addition to the PCI, PAVER™ allows managers to use and create other condition indices, including those based on PCI distresses. An interface easily imports inspection data from automated vehicle collection sources.

There is also a wizard for creating and updating inspections.

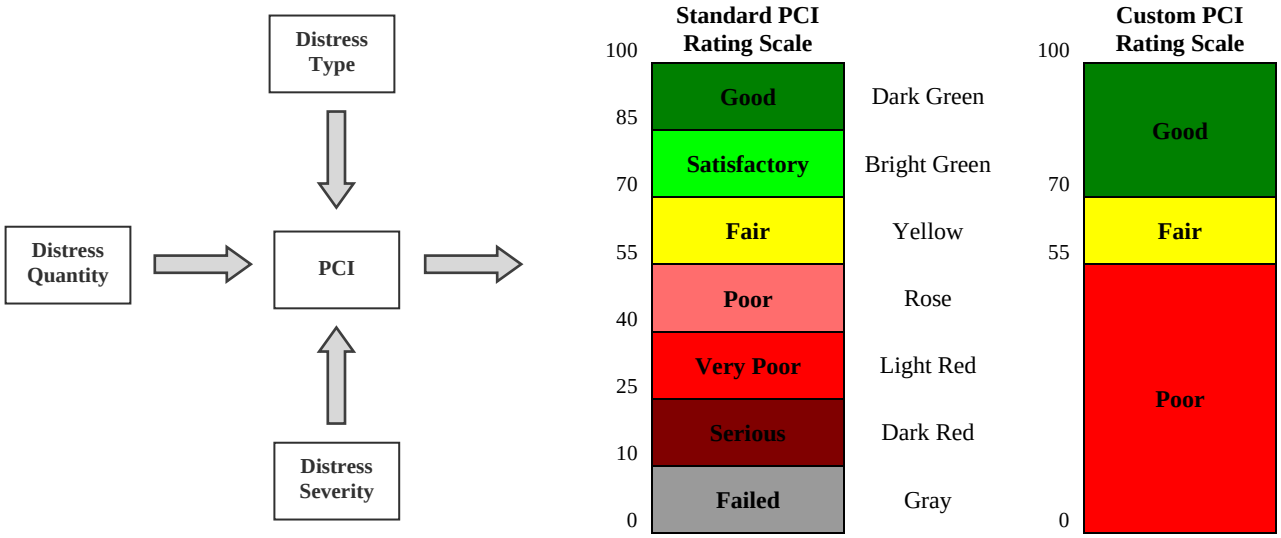

Figure 1: Pavement Condition Index (PCI) ranges may be customized and used for reporting analysis results.

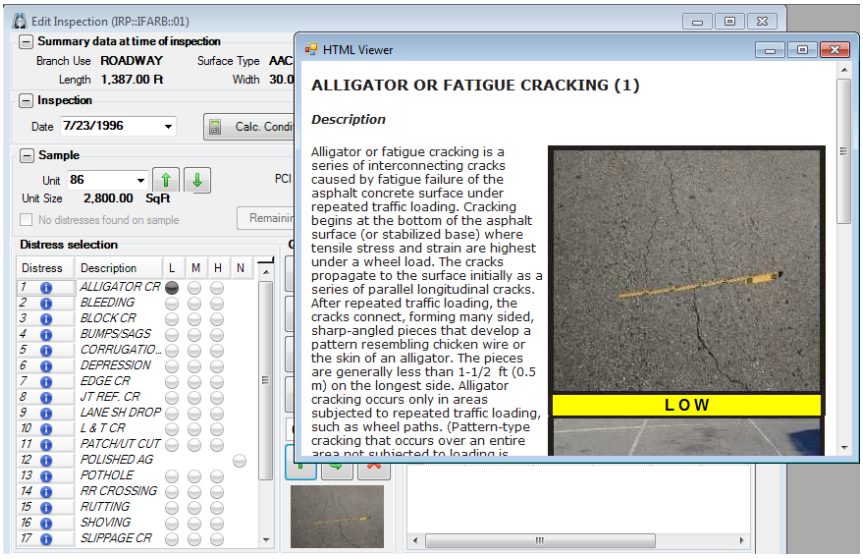

Figure 2: The online distress user guide can be opened within PAVER™ by clicking on the information button.

Prediction Modeling

The Prediction Modeling function in PAVER™ helps identify and group pavements of similar construction that are subjected to similar traffic, weather, and other factors affecting pavement performance. Pavement condition historical data is used to build a model that can accurately predict the future performance of a group of pavements with similar attributes, see Figure 3.

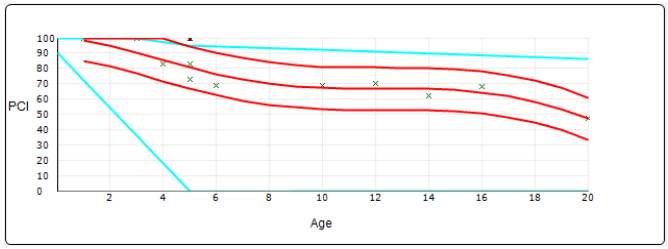

Figure 3: Pavement "family" models can be developed to predict future pavement condition.

Condition Analysis

The Condition Analysis feature allows users to view the condition of the entire pavement network or any specified subset of the network. This feature reports past conditions based on prior interpolated values between previous inspections and projected conditions based on prediction models. In PAVER™, conditions can be viewed on GIS maps in addition to tables and graphs, see Figure 4.

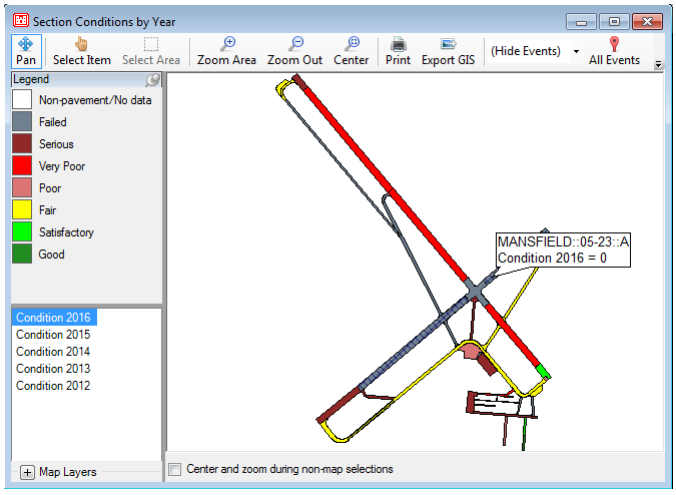

Figure 4: Internal GIS can be used to display pavement condition and analysis results. For example: Condition Analysis and Work Planning outputs are displayed in GIS.

Work Planning

The PAVER™ Work Planner is a tool for planning, scheduling, budgeting, and analyzing alternative pavement maintenance and repair (M&R) activities.

The Work Plan has been optimized for greater speed and is more than 100 times faster with large databases than previous versions.

PAVER™ 7 uses M&R Families. Sections are assigned to M&R Families to establish groups of pavements which use different pavement cost tables or receive similar types of M&R work. The Work Planner uses M&R Families along with inspection data, maintenance policies, maintenance costs, and predictions of future pavement conditions to recommend M&R activities at the section level.

PAVER™ 7 also supports credit for global work after the latest inspection.

The PAVER™ work plan provides two ways to analyze budgets scenarios. The first way determines the consequence of a selected budget on pavement condition and the resulting backlog of Major M&R (unfunded). In addition to a single budget scenario, PAVER™ 7 offers a budget split feature. The budget split feature allows the user to split a budget based on different M&R work types. This can aid a user that has a set budget for Global work and a different set budget for Major work. The second way determines the budget requirements to meet specific management objectives, i.e. backlog elimination or PCI goal. This enables managers to develop a variety of funding scenarios to support their decisions, see Figure 5.

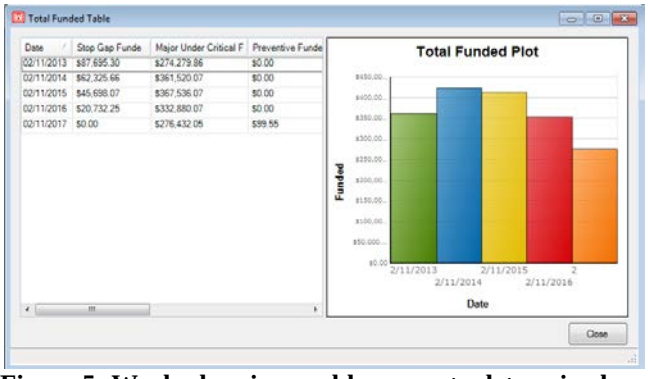

Figure 5: Work planning enables users to determine how much funding is required to meet management objectives, such as maintaining current PCI or eliminating backlogs.

Project Planning

The Project Planning tool, included in the M&R Plan, allows the user to develop projects based on user-specified required work and PAVER™ recommended work. This tool greatly aids the user in planning projects and automatically updates work history data upon completion of the project, see Figure 6.

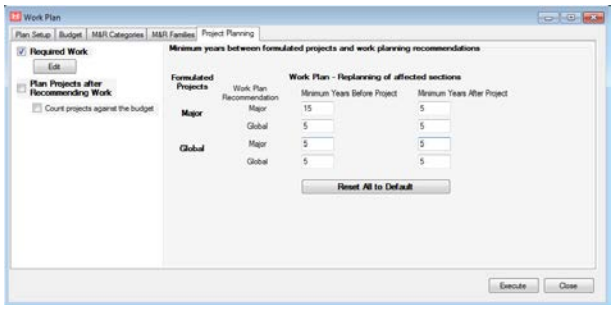

Figure 6: Project Planning allows the user to plan projects based on recommended work analysis and installation management priorities.

GIS Interface

PAVER™ includes internal mapping capabilities to view GIS reports directly in PAVER™. PAVER™ also produces shapefiles of reports, such as inventory, inspection, condition analysis, and work plan, which can be viewed in commercial GIS software.

Selection Tools

PAVER™ 7 offers an improved user interface. Tools assist users in selecting pavement sections. GIS and tree based selection tools provide additional methods for selecting inventory items throughout PAVER™. For example, inventory and inspection screens will display the selected pavement section for data viewing or editing, as shown in Figure 7.

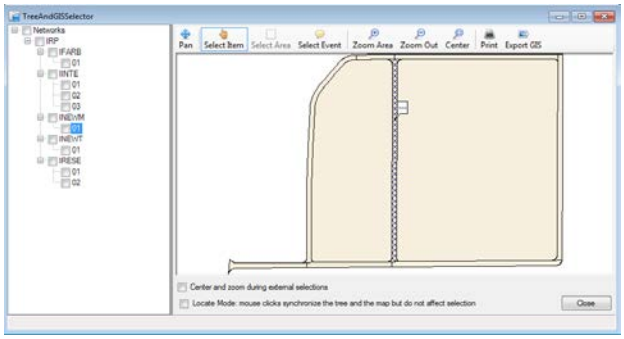

Figure 7: GIS and tree based selection tools provide additional methods for selecting inventory items throughout PAVER™.

GIS Assignment Tool

The GIS Assignment tool links the PAVER™ data for individual pavement sections to GIS data. The GIS Assignment tool provides an internal "point-and-click" interface to create, remove, or change the link between pavement sections and GIS map features.

Using the same visual layout as Selectors, Figure 8, the tool dramatically reduces the time required to create or change the link between GIS and pavement data. It is designed to work directly with the same shapefiles that are used in PAVER™'s internal GIS capabilities.

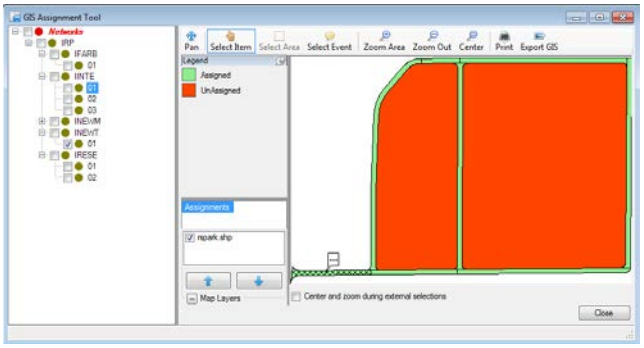

Figure 8: The GIS Assignment Tool links the PAVER™ data for individual pavement sections to GIS data.

Selection Criteria Available on Export

PAVER™ 7 allows a user to share a subset of an inventory, which the user controls using selection criteria in the export process.

XML Import

The user may import XML files from other programs when they conform to the published XML import format. PAVER™ FieldInspector™ and PAVER™ ImageInspector™ are two such programs.

Optimization for Large Databases

PAVER™ 7 has been optimized to handle large databases (10,000+ sections). It is highly recommended that the user have PAVER™ 7 installed on a 64-bit computer and use a SQL Server (Express) database.

Wizards

Wizards assist the user by providing a step by step process for several common tasks.

- **Last Construction Date Wizard** determines the most recent construction date for selected sections. The wizard conducts the calculation according to a specified deterioration rate, and discards any inconsistent data.
- **Set Properties Wizard** updates or clears a specified inventory property for selected sections. This wizard is limited to inert properties which do not affect the PCI calculations or prediction modeling of family models.
- **Split Section Wizard** separates Sections into a desired division of subsections that can be analyzed individually using any tool in PAVER™.
- **Work Entry Wizard** is a convenient way for the user to apply multiple work items to multiple sections, as well as have the option to create a work history report.
- **Add Work History from Tabular Data** allows the user to add inventory data from a GIS/Tabular report.
- **Define Inventory from GIS/Tabular Data** allows a user to create an Inventory using the attributes of the shapefile. This option imports those GIS and Tabular Data results into PAVER™.
- **Update Inventory from Tabular Data** allows the user to edit or update inventory data from a GIS/Tabular report.
- **FieldInspector™/ImageInspector™ Inspection Data Export** gives the user the ability to export sections to be surveyed in preparation for use in the PAVER™ FieldInspector™ / ImageInspector™. This Export tool uses an *.I70 file to export information about sections to be surveyed in the PAVER™ sister programs.
- **FieldInspector™/ImageInspector™ Data Import** allows the user to import survey information into a database. This import tool uses an XML file to import survey conditions at the frame, sample, or section level. Using a specified XML format, the wizard guides the user through the import process. This wizard also provides data verification to insure that survey information is being imported properly into the database.
- **Inspection Report/Forms/Setup** allows the generation of Inspection Records, Inspection Forms, and Reinspection Reports for the inspection process. The user is able to create these records, forms, and reports over multiple sections for the inspection.

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