

# Data Management

## Sectioning

Sectioning is the process to define what pavement sections are and how the system uses them. Because each piece of data is ultimately tied to a pavement section, these sections are the basis for all data within the pavement management system.

A pavement section is a contiguous segment of pavement along a given route. Its dimensions are specified both longitudinally or "along the route/road", and laterally "across the route/road". Any given data element can be described for the full pavement network by creating a full coverage of the network as the union of a set of pavement sections. For example, it is possible to define a set of traffic sections to define traffic data between major intersections, or to define condition sections that divide the same pavement network into 0.1-mile sections. It is also possible to have many data elements that share the same set of sections. For example, traffic data such as AADT, % trucks, and traffic growth rate may all be defined for the same set of Traffic sections.

Based on the data source, there are many different sets of sections within a PMS, each section with the corresponding pavement-related data attached:

- Pavement structure sections
- Traffic sections
- Condition sections
- Asset Data sections
- Management Sections

With the pavement data and its sections defined, the next step is to aggregate data from various sources to one set of sections so that network analysis can be performed.

## Data Aggregation and Aggregation Rules

Data aggregation is the process to coordinate data when they are stored using different sectioning. It allows the consolidation of all these different data sets into one network coverage. Specifically, data aggregation is the set of rules created for each data element that allows data from one set of sections to be summarized over another set of sections. Most of the time, we are interested in aggregating data from various sources into one particular set of sections, the Management Sections.

Management Sections are the set of sections used for all analysis within the pavement management system. For example, when running network analysis each management section is treated as a whole when programming pavement treatment actions. Therefore, it is important to summarize all the critical pavement data over each management section for analysis, and this is a data aggregation process. Management Sections are usually also used for creating Network Master and Performance Master.

Aggregation Rules define how data is summarized from one set of sections onto another set of sections. Usually there are two kinds of rules:

- Across the road rules (lateral aggregation)
- Along the road rules (longitudinal aggregation)

Generally, a lateral rule is applied to identify from which lanes and/or directions data will be summarized, then a longitudinal rule is applied to summarize the data that meets the selection criteria from the lateral rule.

An example of lateral aggregation rule is that the lateral aggregation process usually takes the data from a representative lane and direction, when management sections cover more than one direction and/or more than one lane.

Once the lateral rules have been applied, longitudinal rules can be applied to the resulting data. Longitudinal rules come in two forms:

- Representative point
- Summarization functions

Representative point aggregation allows the user to specify a specific point within a management section about where data will be obtained. A classic example is the summary of pavement structural information. The user specifies the location where pavement structural statistics will be summarized. Another example is to query the value of an attribute at the midpoint of the current section.

Summarization functions can also be used for aggregating data. Commonly used functions include minimum, maximum, length weighted average, and sum. An example is to calculate the International Roughness Index (IRI) value of a management section based on the IRI information from several condition survey sections. Usually the length weighted average IRI from the condition survey sections are used as the value for the management section.

The key to the summarization functions are defining the intersection rules. A potential question that may arise during the summarization process is whether to summarize all sections that intersect with the management section, or only those fully included within the management section (full intersection). This then becomes a judgment call for the customers.