Development of Traffic Inputs for New *Mechanistic–Empirical Pavement Design Guide*

Case Study

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Vehicle classification and axle load data are required for the structural design of new and rehabilitated flexible and rigid pavements with the new *Mechanistic–Empirical Pavement Design Guide* (MEPDG) developed under NCHRP Project 1-37A. The axle load spectra are determined from traffic data collected at weigh-in-motion (WIM) stations, and vehicle count and class data are recorded by vehicle classification stations. Some preliminary results are presented for an extensive traffic data-processing effort conducted to develop traffic inputs required by the MEPDG to design pavements in New York State. The data collected by classification and WIM sites from 2004 to 2009 were processed with the TrafLoad software developed in NCHRP Project 1-39. The discussion focuses on the variability of the major traffic input variables required by the MEPDG, as obtained from data collected in New York State, and on the differences between the data obtained from individual stations, state average values, and the default values recommended by the MEPDG, where applicable. The effect of variability of the major traffic input variables on the performance predicted by the MEPDG for a typical flexible pavement structure is also discussed.

Traffic data are paramount input variables required for the structural analysis and design of pavement structures. Traffic data are used to determine the number and magnitude of vehicle loads that are applied to the pavement structure over its design life. Traffic data input required by the new *Mechanistic–Empirical Pavement Design Guide* (MEPDG) software is the same for flexible and rigid pavements and for new or rehabilitated pavement structures (*1*). Traffic data can be input into the design guide software at three levels based on the type and amount of traffic data available: Level 1 is site specific and directly related to the project; Level 2 is region specific, so that a state can use its own regionalized data if site-specific inputs are not available; and Level 3 is MEPDG default data for nationwide use (*2*).

The typical traffic data elements required for the MEPDG software are

- Initial two-way annual average daily truck traffic and percentage of trucks in the design direction and design lane,
- Vehicle class distribution,
- Monthly adjustment factors (MAFs),
- Hourly adjustment factors (HAFs),
- Traffic growth factors,
- Vehicle operation speed,
- Axle and wheelbase configurations, and
- Axle load distribution factors (ALDFs).

To generate the traffic data required by the new design guide, the TrafLoad software was developed as part of NCHRP Project 1-39 to serve as a principal source of traffic data for the MEPDG software (*3*). TrafLoad software accepts weigh-in-motion (WIM) and classification data files as inputs and produces vehicle classification statistics and load spectra for each site as outputs for use by the MEPDG software.

DATA SOURCES AND ELEMENTS USED IN TRAFFIC CHARACTERIZATION

The traffic data are collected and available in the form of WIM data, automatic vehicle classifications, and vehicle counts. WIM data are a tabulation of data recorded for each vehicle passing through the WIM station. The data records include vehicle class, weight, number and spacing of axles for each vehicle weighed, time of collection of data, location, direction, and lane of travel. The WIM data are used to develop the axle load distribution or load spectra for each axle type within each vehicle class.

Automatic vehicle classification data are a tabulation of the number and types of vehicle classes counted over a period of time. These data are used to determine the normalized truck class distribution.

Vehicle counts are counts of the number of vehicles categorized as passenger vehicles (FHWA classes 1 to 3), buses (FHWA class 4), and trucks (FHWA classes 5 to 13) over a period of time. Figure 1 shows the standard vehicle classes that are used by FHWA for classification purposes.

Vehicle Classification Data

TrafLoad generates estimates of annual average daily traffic (AADT) by vehicle class and relevant data to derive monthly traffic distribution

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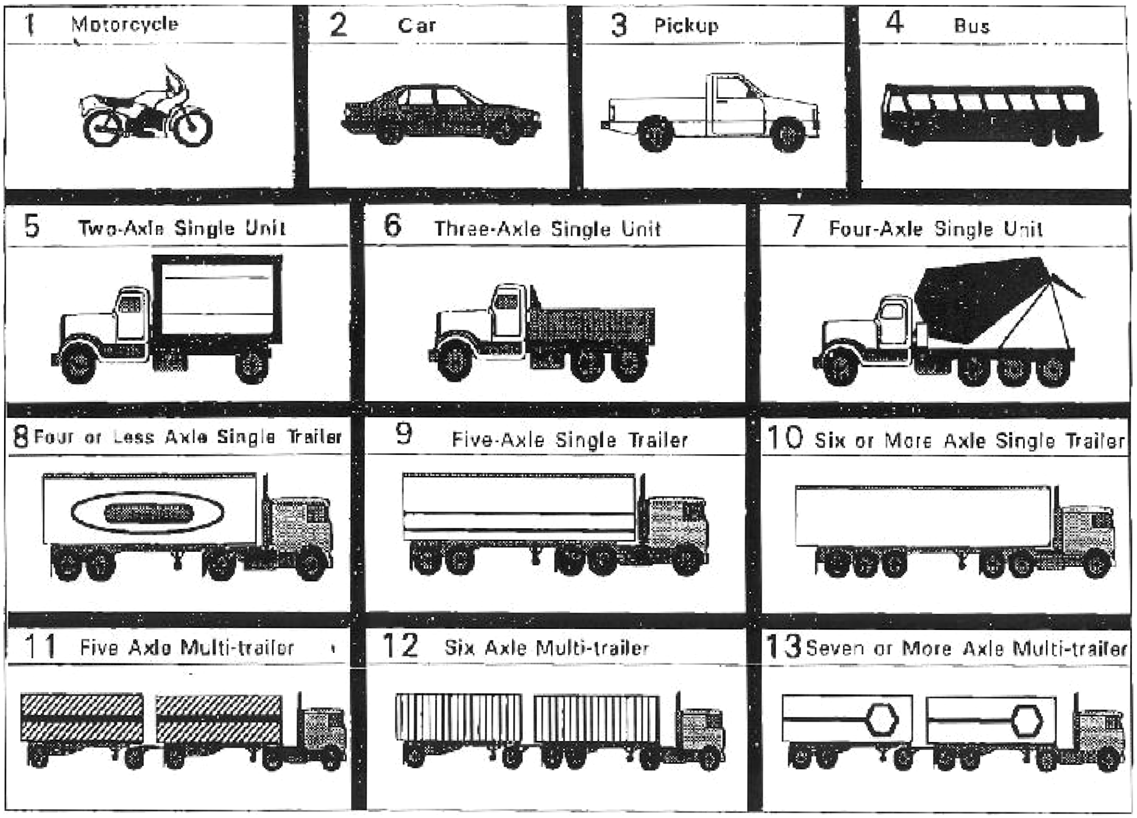

FIGURE 1 FHWA vehicle classes used for traffic data collection (*4*).

factors and hourly distribution factors from the vehicle classification data. On the basis of the amount and extent of classification data available, three levels can be processed by the TrafLoad software; each of the three levels is further divided into A and B levels, as follows:

Level 1. Site for which continuous automatic vehicle classification counts are available for a period of at least 1 week for each of 12 consecutive months. If such data are collected from the actual design site, the site is a Level 1A site. If the data are collected from a nearby site, the site is a Level 1B site.

Level 2A. Site having short-duration classification counts from automatic vehicle classification for a period of at least 48 weekday hours per year (in a given year).

Level 2B. Site for which only a manual classification count is available for a period of at least 6 weekday hours.

Level 3A. Site on the same road as Level 1 or Level 2 site and for which only AADT data are available without any classification data.

Level 3B. Site for which only information on AADT and percent trucks is available.

WIM Data

For any particular project, the load spectra are developed by the TrafLoad software with the data collected from WIM equipment either on the same road or at a nearby site. The number of axles of each type for each vehicle class is generated by TrafLoad. On the basis of the WIM data available for each site, TrafLoad identifies three levels:

Level 1 (site specific). Design-lane WIM data are collected for a location on the same pavement project site or a location that provides an accurate representation of the truck WIM loading conditions at the design site,

Level 2 (truck weight road group). WIM data are based on the average load spectra for a selected truck weight road group composed of similar truck weight characteristics, and

Level 3 (statewide average). If limited information on the axle load spectra at the pavement site is available, a statewide average load spectrum obtained from the average load spectra of the WIM sites in a state is used.

PROCESSING OF VEHICLE CLASSIFICATION AND LOAD-SPECTRUM DATA WITH TRAFLOAD

The major part of the traffic input in the new design guide software includes traffic volume adjustment factors (MAFs, AADT, HAFs, and traffic growth factors) and axle load distribution factors for each axle type and vehicle class. TrafLoad makes the generation of these inputs from the raw traffic files relatively easy since it can handle large volumes of data. The output is generated in tabular format and can be directly copied to Microsoft Excel for further use. The steps to be followed to obtain the vehicle classification and load-spectrum results from TrafLoad are as follows:

1. Identification of level of classification and WIM data by looking into the raw data files of each site;

2. Specification of pavement design site information: site identifier, level of classification site, beginning and end date of available data, design direction and lane, and type of load spectra (current or seasonal);
3. Loading of classification and WIM data into TrafLoad;
4. Processing of vehicle classification and WIM data;
5. Review of classification and load-spectrum results; and
6. Conversion of TrafLoad output files into the format required by the MEPDG software with Microsoft Excel templates. Version 1.0 of the MEPDG software accepts the TrafLoad output files directly; no conversion is needed.

The most important part in processing of traffic data with TrafLoad is data quality. In Level 1 analysis (site specific) one week per month (OWPM) of data coverage out of the year is reliable enough as compared with continuous data for the entire year. Several researchers (*5–7*) have suggested that continuous data are warranted, but OWPM data can be used for Level 1 site-specific analysis. To check the effect of continuous and OWPM data, statistical analyses and MEPDG analysis should be done in order to check the individual parameter's variability in different traffic input patterns. It is also important to evaluate the differences between the default values in the MEPDG and site-specific data processed with TrafLoad. For this evaluation, predicted pavement distresses with MEPDG trial run analysis for different sets of traffic inputs are used, and then the results from the analysis are compared by using difference normalization (*6*). This technique helps to find the effect on pavement performance of using site-specific and default values.

Research conducted at Michigan State University (*5*) suggests that there is not much difference between the continuous and OWPM data for tandem-axle load averages for vehicle class 9 and average annual daily truck traffic (with a *p*-value of 5%). The average annual daily truck traffic difference is lower than the MEPDG analysis. A paired *t*-test was performed to check whether the continuous data are comparable with OWPM data, and the results suggest that the OWPM data are different from continuous data. The OWPM data may overpredict pavement life at 95% reliability.

Statistical analysis was performed to check the variability in the site-specific data parameters (e.g., AADT and MAF). Differences were observed in the continuous data processed with TrafLoad and the SAS software (AADT), which showed that a significant difference exists between continuous data and the OWPM data. Regression analysis was used to examine the characteristics of axle load spectra among the sites, which are used in the MEPDG analysis (*7*).

TRAFFIC DATA PROCESSING FOR NEW YORK STATE

A major task conducted as part of FHWA pooled-fund project TPF-5(079) (*8*) is to develop the traffic inputs required by the MEPDG software for the design of pavement structures in New York State. The Traffic Monitoring Unit of the New York State Department of Transportation (DOT) provided the vehicle classification and WIM data recorded by all the stations in the state in six calendar years: 2004 to 2009. The data, provided in the form of W-card and C-card files, were used for analysis with the TrafLoad software.

In the first step in the traffic data analysis, the sites were classified into different data levels based on number of days and hours of data available for each month for each station. The levels were selected after inspection of each vehicle classification and WIM file to check for the days and hours of data available.

The vehicle classification and load-spectrum runs were processed for all sites. However, results were successfully obtained only for all Level 1A classification sites. No results were obtained for Level 2A classification sites; the software invariably crashed when a non–Level 1A site was processed. Level 1 WIM sites that have 12 to 24 months of data available were successfully run for load-spectrum results. The numbers of Level 1A sites and WIM data sites for which processing with TrafLoad was successful are as follows:

	2004	*2005*	*2006*	*2007*	*2008*	*2009*
Vehicle classification and volume data	67	70	66	56	76	81
WIM data	19	21	20	12	19	23

The results of the TrafLoad processing were saved in separate files for each vehicle classification and WIM station and for each calendar year in both the TrafLoad output format and the format required by the MEPDG software. The files were verified individually during conversion to detect any erroneous results or anomalies. The data were recorded separately for the two directions of traffic by most vehicle classification and WIM sites. Separate files were processed for each direction for these stations. For example, the 2007 traffic data were processed for 56 vehicle classification sites. However, the results were reported in 109 files; 53 out of 56 stations recorded data separately for each direction, and 3 sites had data recorded for one direction only.

Variability of Parameters Related to Vehicle Class and Volume

The traffic data processed for the four calendar years not only provide the input data required by the MEPDG software but also allow the identification of changes of truck pattern (volume or weight) across the state. In addition, the data can help in deciding if state average values or the default values recommended by MEPDG can be considered as representative for the entire state and used in the pavement design process in lieu of data provided by stations in the vicinity of the project. The following discussion and conclusions were drawn only from the data recorded in 2007; it is assumed at this stage of the analysis that the results are valid for the other five calendar years.

Volume Growth Rate

The rate of traffic volume growth significantly affects the value of the cumulative traffic volume estimated for the entire design life of the pavement. The MEPDG allows the user to select among several traffic growth models. However, the compound (exponential) growth model is the most widely used.

The traffic volume data recorded in the six calendar years (2004 to 2009) by the vehicle classification stations in New York state provided the average annual daily truck traffic values for each station and year. These data were used in the computation of the growth rate of the compound (exponential) model for 90 station-direction combinations; the values are plotted in Figure 2. As seen in Figure 2, the growth rate varies significantly between the minimum value of –35.6% and the maximum value of +36.1%. The average recorded growth rate is +0.2%, with 82 values ranging from –10% to +10% and 63 values ranging from –5% to +5%.

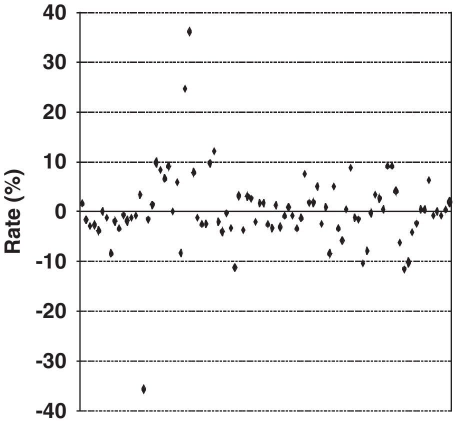

FIGURE 2 Compound (exponential) growth rates for 90 station–direction combinations, New York, 2004–2009.

Vehicle Class Factors

Vehicle class factors (VCFs) allow the computation of the number of trucks in each of the 10 classes from Class 4 to Class 13 (Figure 1). The MEPDG software allows the user to select one of 17 sets of default values, depending on the functional classification of the road. Figure 3 shows the VCF values for roads classified as rural–principal arterial–Interstate for 12 stations located on roads falling in this functional class as well as the default set values recommended by the MEPDG for this functional class (FC = 1). As can be seen, with the exception of one station, the computed sets of VCFs are close to each other and to the default set recommended by the MEPDG.

However, for all other functional classes, the sets of VCF values varied significantly and large differences were observed relative to the default set recommended by the MEPDG. Figure 4 shows the computed sets of VCFs as well as the default set recommended by the guide for roads classified as urban–principal arterial–street. The plot reveals that for the majority of sites and stations, the percentage of Class 9 vehicles is much higher than that recommended by the MEPDG, whereas the percentage of class 5 vehicles is much lower than that recommended by the guide. This finding suggests that the VCF values are site specific and that no state average set or default set should be used in the pavement design process for roads falling in this functional class.

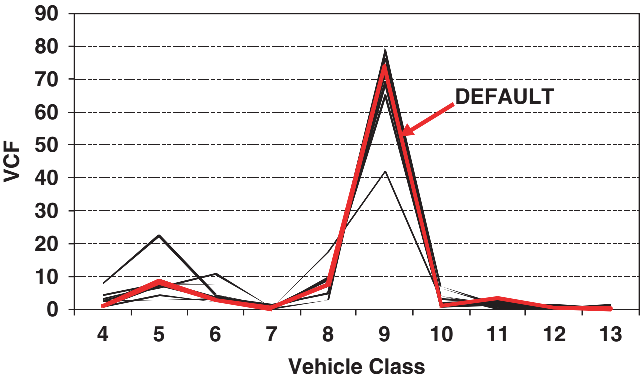

FIGURE 3 VCFs for rural–principal arterial–Interstate classification, 2007.

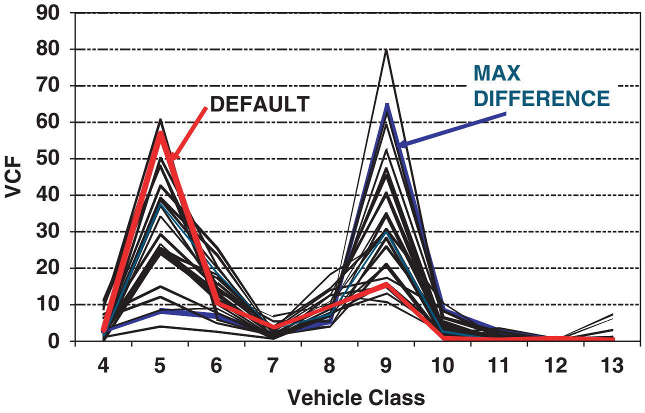

FIGURE 4 VCFs for urban–principal arterial–street classification, 2007 (max = maximum).

To determine the site for which the difference between the computed VCF values and the values in the MEPDG default set is the largest, the following formula is proposed:

$$\mathrm{DIF}(\mathrm{VCF}) = \sum\left(\mathrm{VCF}_i - \mathrm{VCF}_i^{\mathrm{default}}\right)^2 \tag{1}$$

where VCF_i is the computed VCF values for Vehicle Classes 4 to 13 and $\mathrm{VCF}_i^{\mathrm{default}}$ represents the default VCF values for Vehicle Classes 4 to 13.

The largest value of DIF(VCF) was recorded for Site 004181, Direction 1. The set of VCF values for this site is highlighted in blue in Figure 4. The values for this site are 8 and 64.5 for Vehicle Classes 5 and 9, respectively, and the VCF values recommended by the MEPDG for the same classes are 56.9 and 15.3, respectively.

Hourly Adjustment Factors

The HAFs are used to compute the number of trucks passing over the pavement in each of the 24 h of the day. Figure 5 shows the HAF values for 109 sites as well as the average set of HAF values. As can be seen, the sets of HAF values varied significantly, and large differences were observed relative to the set of average HAF values. This finding suggests that the HAF values are site specific and that no state average set should be used in the pavement design process.

To determine the site for which the difference between the computed HDF values and the values in the average HDF set is the largest, the following formula is proposed:

$$\mathrm{DIF}(\mathrm{HAF}) = \sum\left(\mathrm{HAF}_i - \mathrm{HAF}_i^{\mathrm{avg}}\right)^2 \tag{2}$$

where HAF_i is the computed HAF values for hours 1 to 24, and $\mathrm{HAF}_i^{\mathrm{avg}}$ represents the average HAF values for hours 1 to 24.

The largest value of DIF(HAF) was recorded for Site 004380, Direction 1. The set of HAF values for this site is highlighted in blue in Figure 5, and the set of average HAF values is highlighted in red.

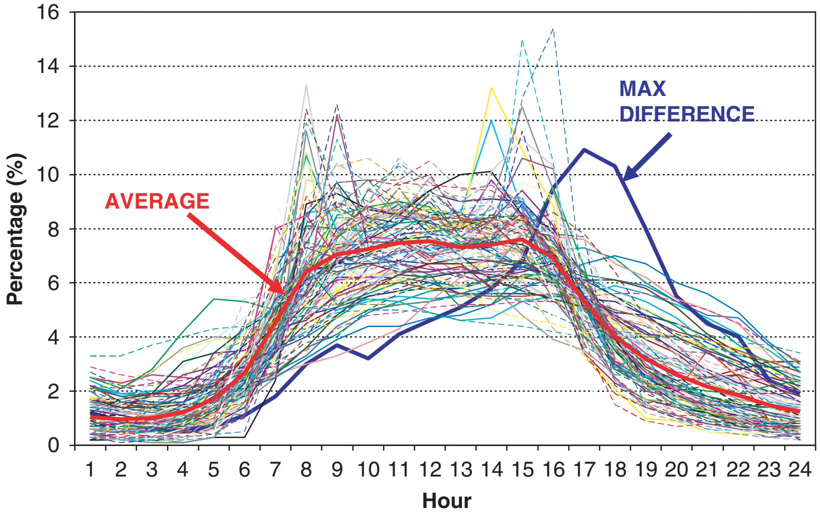

FIGURE 5 Percentages for HAFs.

Monthly Adjustment Factors

The MAFs are used to compute the number of trucks passing over the pavement in each of the 12 months of the year. Figure 6 shows the values for 109 sites as well as the average set of MAF values. As can be seen, the sets of MAF values varied significantly. However, more than three-fourths of the sets were close to the average MAF set. This finding suggests that a state average MAF set could be used in the pavement design process.

To determine the site for which the difference between the computed MAF values and the values in the MEPDG average set is the largest, the following formula is proposed:

$$\mathrm{DIF}\left(\mathrm{MAF}\right) = \sum\left(\mathrm{MAF}_i - \mathrm{MAF}_i^{\mathrm{avg}}\right)^2 \quad (3)$$

where MAF_i is the computed MAF values for months 1 to 12 (January to December), and $\mathrm{MAF}_i^{\mathrm{avg}}$ represents the average MAF values for months 1 to 12.

The largest value of DIF(MAF) was recorded for Site 008580, Direction 1. The set of MAF values for this site is highlighted in blue in Figure 6, and the set of average MAF values is highlighted in red.

Variability of Parameters Related to Axle Groups per Vehicle and Axle Load

Average Number of Axle Groups per Vehicle

The average number of axle groups per vehicle (AGPV) (single, tandem, tridem, and quad axles) along with the axle load spectra allow

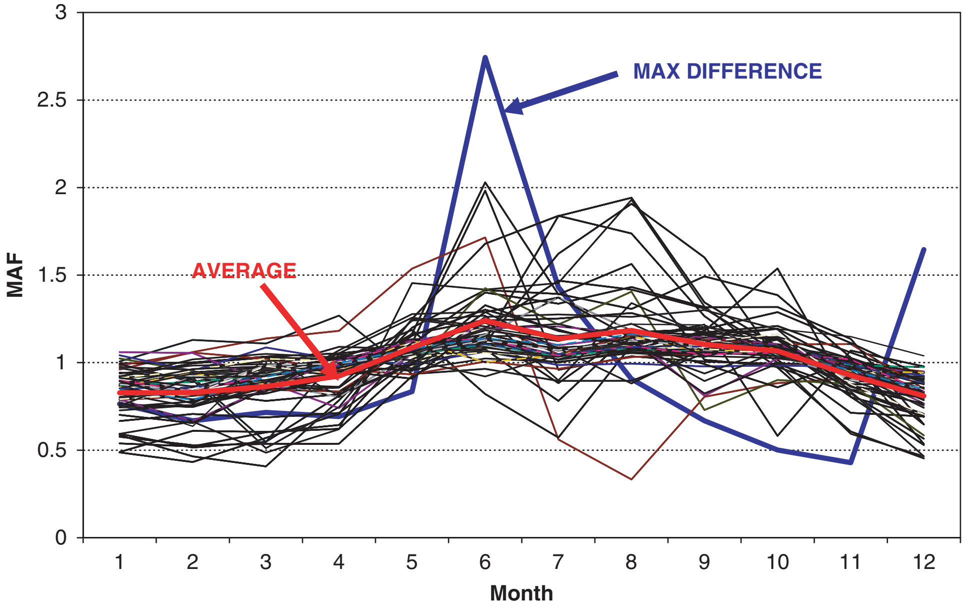

FIGURE 6 MAFs for Class 9 vehicles.

TABLE 1 Average Number of Axles per Vehicle Class

Vehicle Class	State Average				Default MEPDG Values				Site 000797-1			
	Single	Tandem	Tridem	Quad	Single	Tandem	Tridem	Quad	Single	Tandem	Tridem	Quad
4	1.41	0.68	—	—	1.29	0.71	0.00	0.00	1.17	0.83	0	0
5	2.08	0.01	—	—	1.99	0.01	0.00	0.00	2	0	0	0
6	1.03	1.03	0.01	—	1.00	1.00	0.00	0.00	1	1	0	0
7	1.32	0.29	0.68	0.07	1.39	0.40	0.58	0.02	1.28	0.28	0.7	0.01
8	2.48	0.65	0.01	0.00	2.18	0.77	0.02	0.00	2.51	0.49	0	0
9	1.28	1.97	—	0.00	1.29	1.86	0.00	0.00	1.17	1.92	0	0
10	1.08	1.03	1.01	0.05	1.07	0.84	1.00	0.12	1	0.99	1	0.01
11	3.33	0.25	0.38	0.06	4.40	0.05	0.16	0.00	1.8	0.54	0.69	0.01
12	3.51	1.21	0.05	0.00	3.96	1.01	0.00	0.00	1.5	1.5	0.5	0
13	2.05	0.93	0.40	0.20	1.36	0.93	0.90	0.34	2.95	0.03	0.02	0.01

NOTE: — = not applicable.

the computation of average damage induced by the vehicles in each class to the pavement structure. The WIM stations record the number of each axle group for each weighed truck. The data are recorded in the W-card files.

The average AGPV for each vehicle class was computed for each WIM station with the TrafLoad software. Then the state average AGPV values were computed for the entire state in Table 1, which also gives the default values recommended by the MEPDG software.

The average number of single axles for all vehicle classes is shown in Figure 7 for all WIM stations, along with the state average and the MEPDG default values. As can be seen, with the exception of one site, the computed sets of AGPVs are close to each other and to the default set recommended by the MEPDG. The AGPV values vary more for Vehicle Classes 8, 11, 12, and 13. The average number of single axles for Site 000199 is much higher than the corresponding average numbers for the other sites, the state average, and the default values. This finding suggests that at this site, many vehicles belonging to class 13 might have been attributed to class 11; the procedure used at this site for vehicle classification should be reviewed. Therefore, the data collected at this site were not included when state average values were computed for traffic volume parameters and axle load-spectrum data.

To determine the site (except for Site 000199) for which the difference between the computed AGPV values and the values in the MEPDG default set is the largest, the following formula is proposed:

$$\mathrm{DIF}(\mathrm{AGPV}) = \sum\left(\mathrm{AGPV}_i - \mathrm{AGPV}_i^{\mathrm{default}}\right)^2 \tag{4}$$

where AGPV_i is the computed average number of single axles for Vehicle Classes 4 to 13, and $\mathrm{AGPV}_i^{\mathrm{default}}$ represents the default values of the average number of single axles for Vehicle Classes 4 to 13.

The largest value of the difference was recorded for Site 000797, Direction 1. The set of single AGPV values for this site is highlighted in blue in Figure 7. This site recorded the lowest average number of single axles for Vehicle Class 12.

A similar algorithm was employed to determine the site (except for Site 000199) for which the difference between the computed tandem AGPV values and the corresponding values in the MEPDG default set is the largest. The results of the calculations indicated that the AGVP values for Site 000797, Direction 1, have the highest deviation from the values of the default MEPDG set.

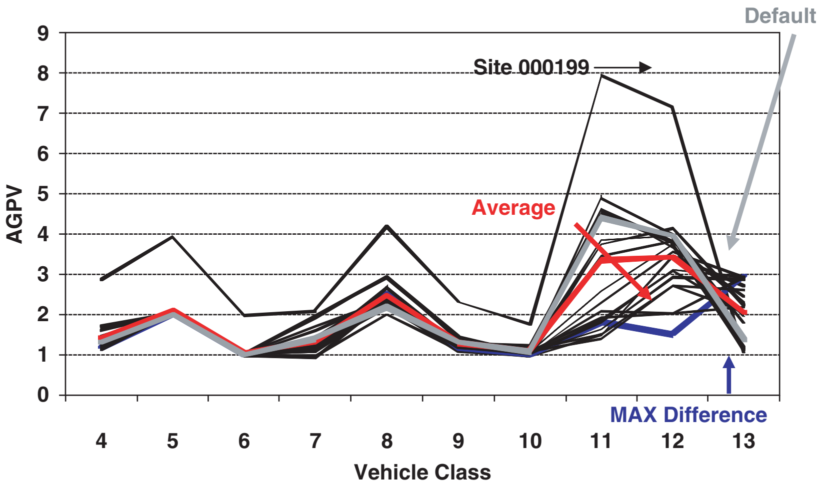

FIGURE 7 Average number of single axles per vehicle class.

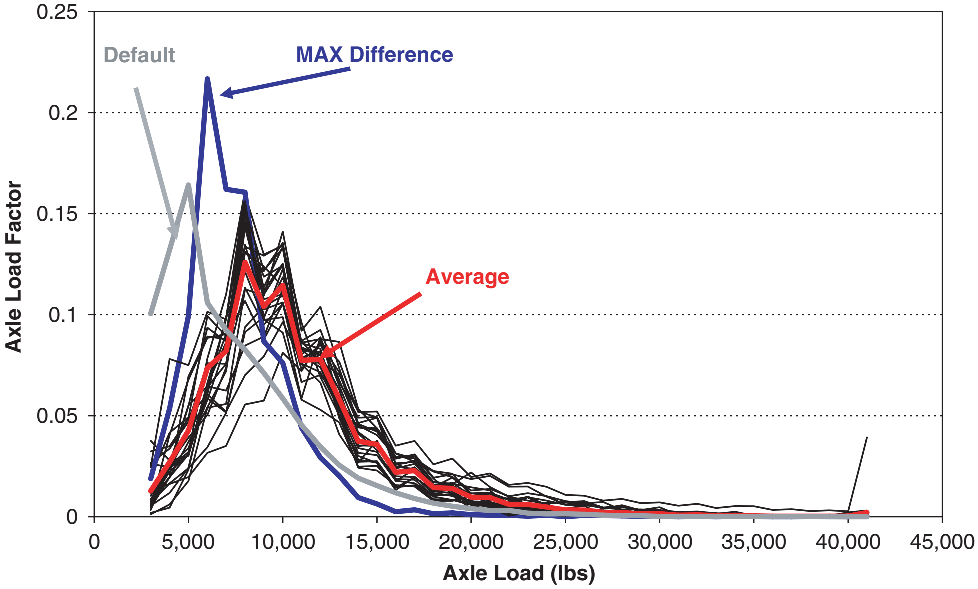

FIGURE 8 Single-axle load spectra, Vehicle Class 5, September 2007.

Axle Load Spectra

A major enhancement of the MEPDG method compared with other design methods for pavement structures is that it does not convert axle loads into equivalent standard axle loads; it computes the damage induced to the pavement by each axle group at a spectrum of load magnitude. In this way, the concept of equivalent standard axles or wheels is not used; the equivalency method has always been empirical. The MEPDG software provides the user with a default set of load-spectrum values.

TrafLoad processes the axle load data recorded by WIM stations and reports the load spectrum for each axle group (single, tandem, tridem, and quad axles) for each vehicle class and for each month of the year. TrafLoad reports the data in separate files for each WIM site. Average load spectra for the entire state were computed from the values recorded at all WIM sites.

Because the axle load spectrum is reported for each site for each axle type for each of the 10 vehicle classes and for each of the 12 months of the year, it is not possible to identify the WIM site for which the axle load spectrum has the highest deviation from the state average set or from the default MEPDG set without running the MEPDG software.

However, to illustrate the possible variation of the load spectra, the values computed for September 2007 for the single axles of Vehicle Class 5 and tandem axles of Vehicle Class 9 are reported in Figures 8 and 9, respectively. Figure 8 reveals that for September 2009,

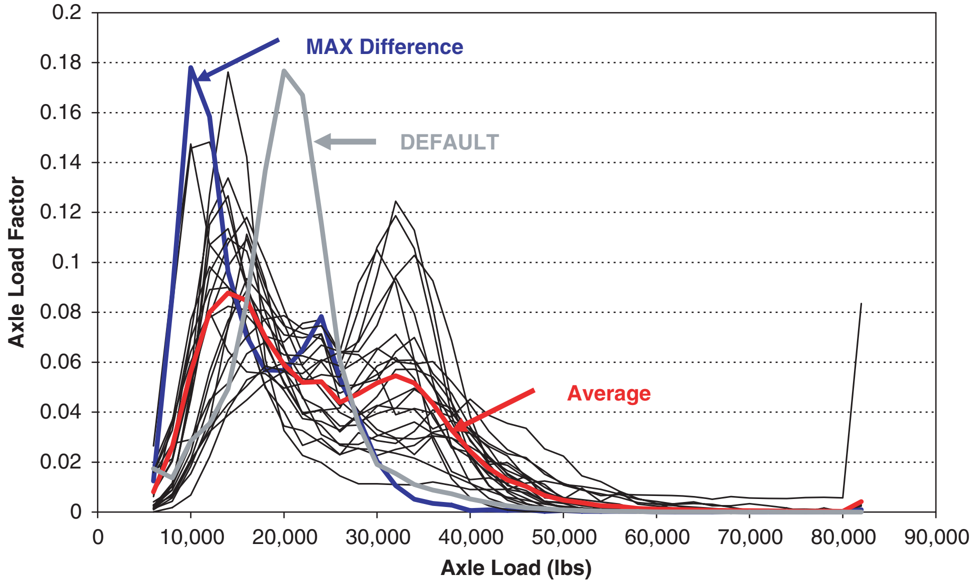

FIGURE 9 Tandem-axle load spectra, Vehicle Class 9, September 2007.

the state average loads for the single axles of Vehicle Class 5 are higher than the default values recommended by the MEPDG. Figure 9 suggests that the state average load spectrum for the tandem axles of class 9 vehicles is more widely distributed than the default load spectrum recommended by MEPDG for these vehicles.

Effect of Variability of Traffic Parameters on Performance of Typical Flexible Pavement

To determine the effect of the variability of traffic parameters on the performance of a typical flexible pavement structure, multiple runs of the MEPDG Version 1.0 design software were performed; the traffic parameters were changed in each run relative to the base case, which employs the default values used by the software.

The asphalt pavement modeled represents a typical structure used by New York State DOT:

- A 4.0-in. asphalt concrete surface layer with SM 9.5-mm mix,
- An 8.0-in. asphalt concrete base layer with SM 19.0-mm mix,
- A 12.0-in. crushed stone base, and
- An AASHTO A-7-6 soil for the infinite subgrade layer.

The data used for the designs of the two asphalt concrete mixes were for two actual New York State DOT mixes used in a new flexible pavement project. The 30-year design was done considering a truck traffic volume of 850 trucks per day in the most loaded lane in the initial year. With the exception of one case, a 2.0% compound growth rate was used for traffic growth.

Table 2 gives the percent change in asphalt concrete rutting, total rutting, and international roughness index (IRI), defined as $\text{IRI}_{\text{final}}-\text{IRI}_{\text{initial}}$, when the average and maximum difference traffic parameters are used instead of the default values. The results show that the variability of the traffic parameters affects the computed rut depth in the asphalt concrete layer the most and the increase in IRI from the initial value the least. The HAF does not affect the distresses computed at the end of the 30-year design period because the MEPDG takes the HAFs into account only for the design of new concrete pavement structures and of concrete overlays (*1*). The variation of the MAF causes a maximum variation of the asphalt concrete rutting of 18%, whereas the IRI increased by only 2.4%. The maximum variation of the asphalt concrete rutting due to the variability in vehicle class distribution was 15% for urban principal arterials and 4% for rural principal arterials.

TABLE 2 Percentage of Distress Value Change due to Variation of Vehicle Class and Volume Parameters

Factor	Case	AC Rutting (%)	Total Rutting (%)	$\text{IRI}_{\text{final}}$ – $\text{IRI}_{\text{initial}}$ (%)
MAF	Default	0	0	0
	Average	7.1	4.0	1.0
	Maximum	18.1	9.7	2.4
HAF	Default	0	0	0
	Average	0	0	0
	Maximum	0	0	0
VCD (RPA)	Default	0	0	0
	Average	0.4	1.6	0.3
	Maximum	–4.0	–1.1	–0.3
VCD (UPA)	Default	0	0	0
	Average	–15.0	–6.2	–1.7
	Maximum	0.4	2.2	0.5
Growth rate	2%	0	0	0
	5%	27.0	15.6	4.1

NOTE: VCD = vehicle class distribution; RPA = rural principal arterial; UPA = urban principal arterial; AC = asphalt concrete.

Because the axle load spectrum is reported for each site for each of the 10 vehicle classes and for each of the 12 months of the year, to observe the effect of variability of the axle load spectrum from one weigh station to another, runs of the software were performed separately with axle load-spectrum data recorded by the 23 weigh stations and with the default axle load-spectrum data. The default values for the vehicle class and volume parameters were employed in all the runs.

Figure 10 indicates that, as for the traffic volume parameters, the variability of the axle load spectra affects the computed rut depth in the asphalt concrete layer the most; differences of –25 to +38%

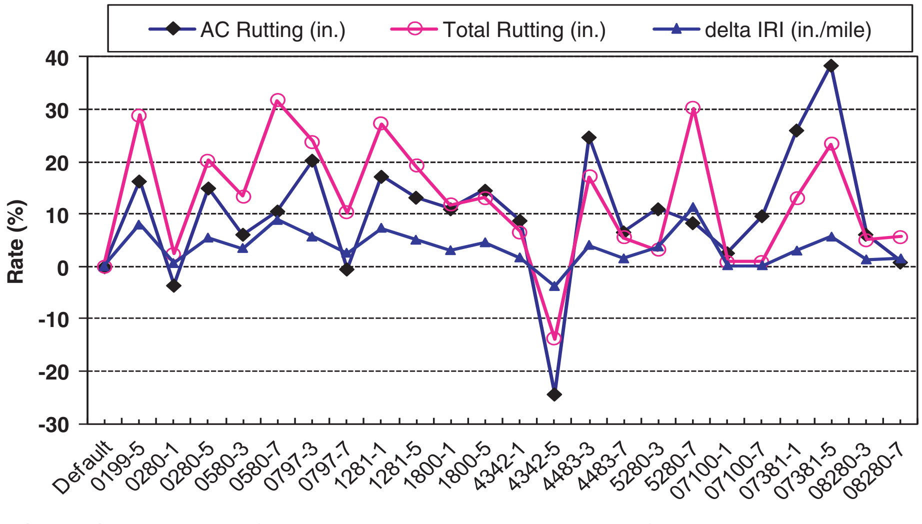

FIGURE 10 Percentage of distress value change due to variation of axle load spectra (AC = asphalt concrete).

were observed. This finding suggests that the load-spectrum values are site specific and that no state average set or default set should be used in the pavement design process. However, the change in the increase in IRI from the initial value due to the variation of the axle load-spectrum data was less than 10%.

CONCLUSIONS

Vehicle classification and axle load data are required for the structural design of new and rehabilitated flexible and rigid pavements with the new MEPDG developed under NCHRP Project 1-37A. The axle load spectra are determined from traffic data collected at WIM stations, and vehicle count and class data are recorded by vehicle classification stations. Some preliminary results are presented of an extensive traffic data-processing effort conducted to develop the traffic inputs required by the MEPDG to design pavements in New York State. The data collected by classification and WIM sites in 2004 to 2009 were processed by using the TrafLoad software developed in NCHRP Project 1-39. The focus of the research effort was to study the variability of the major traffic input variables required by the MEPDG as obtained from the data collected in New York State and the differences in the data obtained from individual stations, state average values, and the default values recommended by the MEPDG, where applicable.

The main conclusions regarding the variability of the major traffic input parameters are as follows:

- The growth rate of traffic volume in the compound (exponential) model varies significantly. The average recorded growth rate was +0.2%, but about 90% of the values ranged between −10% and +10% and about 70% of the values ranged between −5% and +5%.
- The VCFs had values close to those recommended by the MEPDG model only for roads classified as Rural–Principal Arterial–Interstate. Therefore, the default values can be used in the pavement design process only for roads in this functional class. For all other functional classes, the computed VCFs differed significantly from the default recommended values.
- The HAF values varied significantly, and large differences were observed relative to the average HAF values. This finding suggests that the HAF values are site specific and that no state average set should be used in the pavement design process. However, the MEPDG takes the HAFs into account only for the design of new concrete pavement structures and concrete overlays (*1*).
- The MAFs varied significantly. However, since more than three-fourths of the sets were close to the average MAF set, it is recommended that a state average MAF set be used in pavement design in New York state.
- The estimated numbers of AGPVs for the WIM sites are close to each other and to the default set recommended by the MEPDG for the majority of vehicle classes. However, AGPV values varied significantly from site to site for Vehicle Classes 8, 11, 12, and 13.
- An overall assessment of the variability of the axle load spectra as recorded by the WIM sites could not be made. However, comparisons made on subsets of data showed that large differences exist in the recorded values, the average values for the state, and the default values recommended by the MEPDG. This finding suggests that the load-spectrum values are site specific and that no state average set or default set should be used in the pavement design process.

This study will continue with the analysis of the 2010 traffic data. Future work to be conducted as part of the study includes

- Evaluation of the variability of traffic volume parameters and axle load-spectrum data from year to year for the same station and for the state average values;
- Investigation of the effectiveness of using traffic volume parameters and axle load-spectrum data averaged per substate region, truck weight road group, or functional class instead of state average values; and
- Assessment of the effect of traffic volume parameters and axle load spectra on the performance of other typical pavement structures (e.g., concrete pavements, thin asphalt pavements).

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