Traffic Monitoring for Class and Weight

2018 Highway Information Seminar (HIS)

Steven Jessberger

Travel Monitoring and Surveys Section

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U.S. Department of Transportation
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2001 vs. 2016 TMG Changes

- Prior to 2001 TMG organization was by data type
- 2016 done by business need
- Class data: 5, 15 and 60 minute intervals
- Speed data: 5, 15 and 60 minute intervals
  - (all in 5 mph increments)
  - min bins 15, max bins 25
- Weight data: English units
- Per Vehicle Format (PVF) data: any data fits and even left and right axle weights can be reported

2016 TMG Formats (continued)

- Weight data – (TMG pages 7-43 to 7-47) **all now in English units**
  - Weights in whole pounds
  - Lengths to 1/10th foot
- Per Vehicle Format (PVF) data (TMG pages 7-48 to 7-69)
  - Supports any data type
  - Temperature
  - Left and Right axle weights
  - Vehicle Length – bumper to bumper
  - Inductive Signatures – re-id vehicles
  - Time to 1/100th Seconds (supports bridge design)
  - Speed by Class reporting, delay and gap …
  - Dramatically improved QC methods

Many states moving to this more detailed format

2016 TMG Factoring

- Classification Factoring on TMG pages 3-46 to 3-49
- Determine your program – inventory and maximum and minimum number of desired sites
- Determine travel patterns and method to use
  - TMG methods – volume, Functional Class or Clustering
  - Geographic patterns
  - Land use and urban boundaries
  - Unique travel patterns (ports, corridor flows, industry, …)
- Assign counts to patterns
- Annualize all portable class counts for a minimum of the 6 HPMS vehicle types listed in the Vehicle Summary Table
- Adjust and analyze factor groups at least every 5 years
- Minimum of 6 permanent CCS sites per group

Factoring for Class

- **Perform factoring for a minimum of 6 vehicle types used for HPMS summary table:**
  - Motorcycles: class 1
  - Passenger vehicles: class 2
  - Light duty pick-up truck: class 3
  - Buses: class 4
  - Heavy duty single unit trucks: classes 5-7
  - Combination unit trucks: classes 8-13
- Travel patterns may not be used for all classification sites, you may have sites with unique vehicle class factoring that differ from the grouping used for volume factoring

Class Specific AADT Calculation Example

Date	MC Volume	PC Volume	LT Volume	Bus Volume	SU Volume	CU Volume	ADT
Aug. 14 (Tues)	518	30,705	11,215	58	4,103	4,162	50,761
Aug. 15 (Wed)	494	31,689	11,834	48	3,697	3,469	51,231
Tuesday Factor	1.24	1.02	1.02	1.06	0.88	0.8	
Wednesday Factor	1.23	1.00	1.00	1.03	0.89	0.79	
August Factor By Class	0.95	0.97	0.97	0.81	0.84	0.91	
AADT Based on Tuesday	610	30,380	11,096	50	3033	3030	48,199
AADT Based on Wednesday	577	30,738	11,479	40	2764	2,494	48,092
Average	594	30,559	11,288	45	2898	2,762	48,145
AADT computed from total volume = (50,761 + 51,231) × 0.95 × 0.98 DOW factor) =							47,477
Difference of average computed from total volume minus average computed by class specific factors and then summed							-668
Fraction of Traffic	0.012	0.635	0.234	0.001	0.060	0.057	
Proportional Adjustment (Fraction of Vehicles × Error)	-8	-424	-157	-1	-40	-38	
Final AADT by Class (Volume + Proportional Adjustment)	585	30,135	11,131	44	2,858	2,724	47,477

Axle Correction Factors - ACF

- Provided and applied to all single road tube counts for every factor group.
- WIM sites (Per Vehicle Format - PVF)
- Classification Sites (PVF) (portable and permanent sites)
- Publicly provided yearly updates of all ACFs
  - MPO's
  - Other local agencies (towns, counties and small cities)
  - Contractors and consultants performing counts

Axle Classification Trees/Methods

- Method to identify the class of a vehicle based on number of axles, axle spacings, and possible weight data
- Visual representation of computer methods

					Axle Space Between Axle Numbers (feet)			
Class	Vehicle Description	**Bin**	**Axles**	**1 - 2**	**2 - 3**	**3 - 4**	**4 - 5**	**5 - 6**
1	Motorcycles	**1**	**2**	1.0 - 5.9				
2	Passenger Cars	**2**	**2**	6.0 - 10.2				
3	Other(Limo, Van, RV)	**3**	**2**	10.3 - 13.0				
4	Bus w/ 2 Axles	**4**	**2**	23.1 - 40.0				
5	2 Axle, Six Tire, Single Unit Trucks	**5**	**2**	13.1 - 23.0				
2	Any 2 axle vehicles	**6**	**2**	1.0 - 45.0				
2	Passenger Cars w/1 axle trailer	**7**	**3**	6.0 - 10.2	6.0 - 18.0			
3	Other w/1 Axle tralier	**8**	**3**	10.3 - 13.0	6.0 - 18.0			
4	Bus w/ 3 Axles	**9**	**3**	23.1 - 40.0	1.0 - 6.0			
6	3 Axle, Single Unit Trucks	**10**	**3**	6.10 - 23.0	1.0 - 6.0			
8	3 Axle, Single Trailer Trucks	**11**	**3**	6.10 - 22.0	11.0 - 40.0			
4	Any 3 axle vehicles	**12**	**3**	1.0 - 45.0	1.0 - 45.0			
2	Passenger Cars w/2 axle trailer	**13**	**4**	6.0 - 10.2	6.0 - 18.0	1.0 - 6.0		
3	Other w/2 AT	**14**	**4**	10.3 - 13.0	6.0 - 18.0	1.0 - 6.0		
7	4 Axle, Single Unit Trucks	**15**	**4**	6.1 - 23.0	1.0 - 6.0	1.0 - 13.0		
7	4 Axle, Single Unit Trucks	**16**	**4**	6.1 - 23.0	8.0 - 20.0	1.0 - 6.0		
8	4 Axle, Single Trailer Trucks	**17**	**4**	6.1 - 22.0	11.0 - 44.0	3.5 - 12.0		
8	4 Axle, Single Trailer Trucks	**18**	**4**	6.1 - 22.0	1.0 - 6.0	6.1 - 44.0		
8	Any 4 axle vehicles	**19**	**4**	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0		
3	Other w/3 AT	**20**	**5**	10.3 - 13.0	6.0 - 18.0	1.0 - 6.0	1.0 - 6.0	
7	5 Axle, Single Unit Trucks	**21**	**5**	6.1 - 23.0	1.0 - 6.0	1.0 - 6.0	1.0 - 13.0	
9	5 Axle, Single Trailer Trucks	**22**	**5**	6.1 - 24.5	1.0 - 6.0	6.1 - 46.0	1.0 - 13.0	
9	5 Axle, Single Trailer Trucks	**23**	**5**	6.1 - 24.5	15.0 - 25.0	1.0 - 6.0	1.0 - 6.0	
11	5 or less Axle, Single Trailer Trucks	**24**	**5**	6.1 - 23.0	11.1 - 30.0	6.1 - 20.0	11.1 - 30.0	
9	Any 5 axle vehicles	**25**	**5**	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	1.0 - 45.0	

How Well Do Your Class Sites Work?

- 5 axle dump truck – class 7 or 9?
- 6 axle dump truck – class 7 or 10?
- 7 axle dump truck – class 7 or 13?

- Quad in the rear multi-trailer – class 10 or 13?

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Effective Weight Data Collection

- See the brand new WIM Pocket Guide

https://www.fhwa.dot.gov/policyinformation/knowledgecenter/wim_guide/

- WIM site calibration performed yearly
- WIM sites for factoring groups – at least 1 per factor group recommended
- Daily data review for operation, calibration and processing

Data Inter-Relations

- Weight data for spacing accuracy means speed data from the same site will not need QC performed for accuracy
- PVF data allows for one data type storage for all your traffic data needs
- Speed data from classification and weight sites
- Utilizing WIM sites for pavement design, enforcement and other uses
- Speed by class reports from PVF data

Any questions or feedback on the 2016 TMG?

NHI TMG Trainer

Steven Jessberger

1200 New Jersey Ave. SE

Washington DC 20590

202-366-5052

steven.Jessberger@dot.gov