Federal Functional Classification System of the Regional Roadways

The Federal-Aid Highway Act of 1973, as amended, requires the use of functional highway classification to update and modify the Federal-aid highway system. The Federal Functional Classification (FFC) system groups roadways into classes according to their function and the type of service they provide. Functional classification also provides a basis for receipt of Federal transportation funding. All roadways classified as a rural major collector or above are eligible for Federal funding.

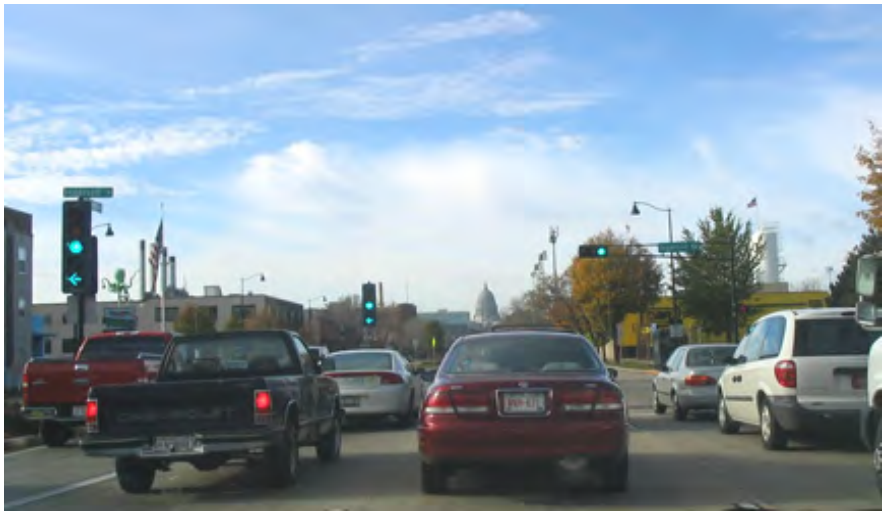
The FFC system divides roadways into two groups—urban and rural—based upon whether the roadway is located within the urban area boundary of a metropolitan area. The urban area boundary is based upon the urbanized area boundary defined by the U.S. Census Bureau. It is based upon total population and population density. The Madison Urban Area was adjusted to also include major employment centers. The reason for distinguishing urban and rural areas in the roadway functional classification system is that they have fundamentally different characteristics in terms of density and types of land use, density of roadway networks, and nature of travel patterns.

TABLE 13
URBAN FEDERAL FUNCTIONAL CLASSIFICATION (FFC) OF ROADWAYS

FFC	FUNCTION	LAND USE	TRAFFIC DEMANDS	FACILITY TYPE
FREEWAYS	Moving inter- and intra-regional traffic, particularly long trips in the high traffic volume corridors.	Providing access to major industrial and commercial developments.	Normally in excess of 20,000 vehicles per day and often over 50,000 vehicles per day.	High speed, divided highway with full control of access and grade separated interchanges.
EXPRESSWAYS	Serve longer trip desires and high traffic volume corridors where not served by freeways.	Serve major centers of activity, with service to abutting land uses secondary to the provision of travel service.	Generally in the range of 15,000 to 35,000 vehicles per day.	Divided highway with partial access control, some grade separated interchanges access only with surface street systems, and no access to abutting land uses.
PRINCIPAL ARTERIALS	Serve longer trip desires and high traffic volume corridors, where not served by freeways.	Serve major centers of activity, with service to abutting land uses secondary to the provision of travel service.	Generally in the range of 15,000 to 35,000 vehicles per day.	Typically, divided street with major access points at intersections with the surface street system. Some limited direct access permitted to abutting land uses.
MINOR ARTERIALS	Interconnect with and augment the principal arterial system and provide service to trips of moderate length.	Distributes traffic to geographic areas smaller than those served by the higher system, with more emphasis on service to abutting land uses.	Generally in the range of 5,000 to 15,000 vehicles per day.	Number of lanes and type of median directly related to traffic volumes and abutting land uses.
COLLECTORS	Connect local streets to the arterial street systems.	Serve residential neighborhoods with direct access to abutting land uses.	Generally in the range of 2,000 to 5,000 vehicles per day, with some roadways 10,000 vehicles per day or more.	Typically, two-lane streets.

Source: FHWA

The FFC system classifies roadways into four major systems: principal arterials, minor arterials, collectors, and local roadways. Principal arterials are further subdivided into the Interstate system, other freeway, and other (generally expressways). Rural collectors are subdivided into major and minor. Table 13, on the previous page, describes the function, land uses served, traffic demands, and facility types of the classes of roadways. Figure 12, on page 35, shows the functionally classified roadway system in Dane County as approved in 2004.



Traffic Growth and Congestion

The population, employment, development, and travel trends discussed above have led to increasing traffic volumes and congestion levels on regional roadways. The increase in traffic volumes has been especially large on the Beltline and Interstate route system and on radial arterials beyond this system that lead into the Madison area such as USH 151, Verona Road (USH 18/151), USH 12/18, USH 14, and Mineral Point Road (CTH S). Increases in traffic volumes on these roadways were fastest during the 1980s, but have continued to grow since then. The circumferential Beltline and Interstate system has helped to alleviate traffic growth on cross-Isthmus arterials such as Johnson/Gorham Street, Atwood/Williamson Street, Monroe Street, and University Avenue. However, these roadways remain congested during peak periods. This congestion has also limited the amount of traffic growth on these roadways during peak periods.

Figure 13, on page 36, shows the growth in average daily traffic volume from 1990 to 2000 on the arterial roadway system in the Madison area. Figure 14, on page 37, shows the 2000 congestion levels on the arterial and collector roadway system. "Congested" levels represent Level of Service (LOS) D and "very congested" represents LOS E or worse. There were 95 miles of congested roadways and 30 miles of very congested roadways in 2000. Some congested corridors shown in Figure 14 have been addressed since 2000 such as USH 12 between the City of Middleton and Sauk City and McKee Road (CTH PD) between Nesbitt and Maple Grove Roads.

Transportation System Management and Operations

The existing roadway system represents a major investment of resources. While investments in new and expanded roadways are needed to meet existing and future capacity needs, it is critical that the best use be made of roadway facilities already in place. Lower cost investments in existing roadway facilities, which can be implemented in the near-term, will help reduce or delay the need for higher cost capacity expansions in the future. For many roadways in already developed areas, expansion of capacity is not always feasible due to right of way constraints and/or environmental and neighborhood impacts.

Transportation System Management (TSM) measures seek to improve the operational efficiency of the arterial street and roadway network through access management, traffic engineering techniques (e.g., adding left turn lanes/ signals, improved signal timing), information dissemination, and incident and work zone management. Some of these strategies now include the use of advanced transportation technologies (e.g., real-time traffic information, ramp metering), referred to as Intelligent Transportation Systems (ITS).

<u>Arterial Street Traffic Management</u>

The objectives of arterial street traffic management are to reduce congestion, improve safety, and support other agencies during emergencies. TSM measures that seek to improve the operation and efficiency of the arterial street network are discussed below.

Access Management

Access management is the proactive management of vehicular access points to land parcels adjacent to the roadway in order to promote the efficient and safe use of the roadway. Techniques to control access include: access street or interchange spacing; limiting or prohibiting driveway access; use of dedicated turning lanes, or in the case of freeways, auxiliary lanes; median treatments (e.g., raised medians, two-way, left-turn lanes), and right-of-way management for future roadways or roadway improvements.

Cities and villages have the authority to restrict roadway access and also control access through plat review and approval. Standards for access control are also typically addressed as part of comprehensive, neighborhood, or corridor plans. Dane County controls access on county roadways in unincorporated areas. All of the county roadways in the Madison planning area are designated as access-controlled roadways with special restrictions on new access points. WisDOT controls access on all state roadways, and has designated nearly all state roadways in the planning area as access controlled, including most recently STH 138.

WisDOT conducts access studies to develop long-term access plans for state roadway corridors, which allows both WisDOT and local communities to plan for future land use and transportation needs. WisDOT Southwest District is currently conducting access studies for USH 12/18 between the Interstate and CTH N and the STH 19/STH 113 corridor between the Village of Waunakee and the City of Sun Prairie.

It is much simpler to control access at the time development occurs rather than retrofit an already developed roadway corridor. However, improvements in access control can still be made as part of redevelopment and street reconstruction projects. As part of the planned reconstruction of Monona Drive, improvements in access control will be made by eliminating and/or consolidating driveway access points and adding a median for the segment from Broadway to Dean Avenue.

Intersection Improvements, Traffic Signal Coordination, and Curb-Lane Parking Restrictions

Most of the delay on urban arterial streets occurs at intersections. Congestion and delay at intersections can be reduced through: (a) geometric improvements such as adding or lengthening turn lanes; and (b) traffic control improvements such as two- or four-way stop control, roundabouts, or signalization. For arterial streets with traffic signals spaced ½ mile or less apart, improvements in signal timing can also reduce congestion and delays. The critical peak period capacity of arterial street corridors can be increased through curb lane parking restrictions during peak periods. Regent Street, Monroe Street, Williamson Street, and Atwood Avenue are among those arterial streets with peak period curb lane parking restrictions in the City of Madison. When implementing these strategies, the impacts on the safety and convenience of pedestrians, bicyclists, and transit users must be considered.

Traffic signal coordination is the process of making traffic signals work together rather than independently along a corridor. Coordination of signals can greatly increase the operational efficiency of each intersection in the roadway system. Traffic signal systems, consisting of system hardware, software, and communication linkages, are the most effective means of coordinating signals. Systems allow many routine control functions to be accomplished automatically and in a synchronized manner, and provide signal staff with the ability to monitor signal operations from remote locations, detect control problems, and adjust operating functions and timing parameters. Systems provide more reliable operations and reduce the time needed to correct malfunctions when they occur.

Most of the signals in the Madison area are part of a coordinated traffic signal system that is operated and maintained by the City of Madison Traffic Engineering Division. The City has on ongoing program to evaluate and make adjustments to the timing of the traffic signals. Dane County and local jurisdictions reimburse the City for work on signals on county roadways and those located outside the City. The signals are programmed to maintain optimum traffic flow while also meeting other goals such as providing sufficient time for pedestrians to cross the street and to clear cross traffic on side

streets as well as allowing for left-turning traffic. The timing of the signals is adjusted for different days of the week, times of the year, and for special events (e.g., football Saturdays).

The only traffic signals not maintained by the City of Madison Traffic Engineering Division are those along Stoughton Road (USH 51) and Verona Road (USH 18/151), the Beltline interchange signals in Monona at South Towne Drive and Monona Drive, and the signals in the City of Middleton. WisDOT is currently in the process of trying to better coordinate the signals on Verona Road and Stoughton Road. The City of Middleton has coordinated the signals on Greenway Boulevard and Century Avenue, but not those on University Avenue.

Planned Special Events Management
In addition to making adjustments to the timing of the traffic signals, the City of Madison Traffic Engineering Division works with UW-Madison, local law and traffic enforcement agencies, and Metro Transit to employ a number of other traffic management strategies for special events. These include: (a) informing the public of available and recommended travel options such as public transit and alternative routes; (b) use of Metro shuttle bus service from remote parking lots; (c) providing extra law enforcement personnel to assist travelers, direct traffic, and clear disabled vehicles; and (d) other special traffic control measures such as detouring traffic to special routes.

Emergency Vehicle Signal Pre-emption
Emergency vehicle signal pre-emption allows emergency vehicles to intervene in the normal operation of traffic signals through wireless technologies. The regular cycle of the traffic signal is interrupted to either change the traffic signal to the green phase or to hold the green phase, allowing the emergency vehicle to pass through the intersection without delay. The City of Madison and other area communities are in the process of implementing traffic signal pre-emption. Most of the Madison area signals are now equipped with emergency vehicle pre-emption capability.

Emergency Management
As a result of the disaster along the Gulf Coast of the United States from hurricane Katrina, the Governor of Wisconsin mandated plans be developed for the complete evacuation of the twelve largest cities in the State. Therefore, the City of Madison is currently in the process of developing an emergency evacuation plan with assistance from Wisconsin Emergency Management and Dane County Emergency Management. MPO staff is providing assistance to this effort in the form of data necessary to complete the project.

Freeway Management and Operations
The regional freeway system, including the Interstate and Beltline, provides the backbone of the regional roadway system and the highest level of service when traffic flows smoothly and safely. Freeway traffic management involves the implementation of strategies, policies, and technologies designed to improve the operation and management of the regional freeway system. The objectives of freeway management programs are to minimize congestion (and its side effects), improve safety, enhance overall mobility and goods movement, improve reliability and predictability, and provide support to other agencies during emergencies. Freeway traffic management measures are discussed below.

Infrastructure Improvements
These include lower cost (relative to capacity expansion) improvements such as adding auxiliary lanes and widening and/or lengthening ramps to eliminate bottlenecks. They can also include improved signing, pavement markings, and lighting. Auxiliary lanes were most recently added on the Beltline between the Verona Road and Whitney Way interchanges.

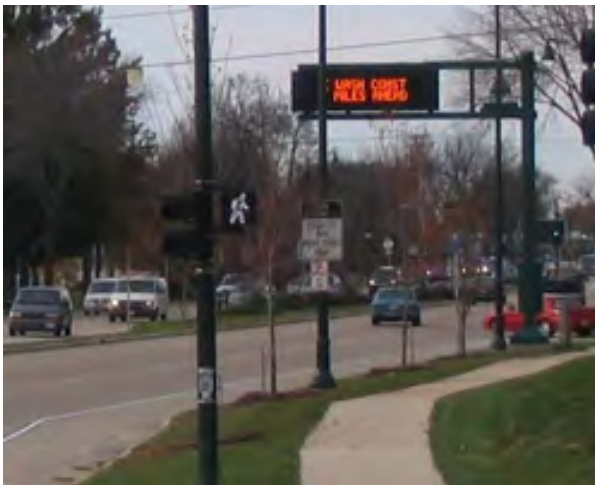
Operational Control

This includes most commonly ramp management, which involves use of ramp meters (traffic signals on entrance ramps) to control the amount of traffic entering the freeway to maintain or enhance operational efficiency. Ramp meters regulate traffic entering onto the freeway, preventing platoons of merging vehicles, which causes traffic flow on the freeway to break down. By allowing only one or two vehicles to enter the freeway at a time, traffic flow is maximized, speeds are more uniform, and congestion-related crashes are reduced. Typically, ramp meters include a bypass lane for high occupancy vehicles (HOVs), which provides an incentive for carpooling and transit. Metering systems vary from fixed-time operation to more advanced systems with computerized control based upon real-time traffic conditions provided by traffic detectors that measure the speed, volume, and density of traffic.

Ramp meters with a HOV bypass lane were installed on the Beltline in 2001 at three on-ramp locations (Whitney Way eastbound, Fish Hatchery Rd. westbound, Park St. westbound) as part of WisDOT's Southwest Wisconsin Intelligent Transportation Systems (ITS) Program. The timing of the meters is adjusted based on Beltline traffic data provided by detectors imbedded in the roadway. A study of the benefits of the Beltline ramp meters on nine freeway links near where they are located was recently completed.[3] The study found the ramp meters resulted in a 3-8% average travel speed improvement and 1.5-3.0% travel volume improvement compared to conditions without them. A before-and-after study found a 50% reduction in crashes. An additional ramp meter is being installed for the Todd Drive westbound on-ramp.

Information Dissemination

This includes measures to provide real-time information on traffic congestion and construction activities to travelers both prior to trip departure (e.g., via the Internet and telephone) and when en-route (e.g., via changeable message signs, media broadcasts, highway advisory radio, and mobile communication devices). The information may be used to choose a different route or travel time or to adjust driving behavior in response to unsafe conditions.



Real-time information is provided by traffic detectors, which can be imbedded in the pavement or consist of closed-circuit television cameras. Both types of detectors have been installed on the Beltline. Information from the detectors along the Beltline is shared with public safety agencies and the media. Sharing the data is planned to be expanded to other agencies in the future. Traffic detectors are also being installed as part of the East Washington Avenue reconstruction project. Changeable message signs have also been used as part of that project both on East Washington Avenue and on STH 30. The information from the detectors is tied into WisDOT's Traffic Management Center in Milwaukee, which is staffed at all times and can be contacted via a toll-free telephone number. The State Patrol and the Dane County 911 Center also have access to the information. The information is also provided to the media. WisDOT maintains information on its Web site on planned construction activities. Real-time information on traffic congestion on the Madison area freeway system is not yet available on WisDOT's Web site as it is for the Milwaukee freeway system. WisDOT's Web site includes views from the closed circuit television camera network on the Milwaukee freeway system, colored-coded maps depicting the level of freeway traffic congestion, and current travel time and delay information for various freeway segments.

Real-time information dissemination allows travelers to avoid congested areas by selecting different routes, times, or even destinations, or at least take the delays into consideration when making travel plans. Even in those cases where travelers cannot avoid the congestion, the knowledge of traffic conditions reduces stress and limits risk taking behavior, thus producing better travel conditions.

[3] Evaluation of Ramp Metering on Madison Beltline – Final Report, prepared by University of Wisconsin –Madison for WisDOT, WisDOT Project ID #1206-00-17 (January 13, 2005).

Traffic Incident Management

Traffic incident management broadly describes enhanced traffic control strategies and emergency management to minimize traffic disruption and safety impacts attributable to disabled vehicles, debris, traffic crashes, and planned roadway activities. Research has shown that over 50% of total traffic delay in the largest cities in the U.S. is attributable to traffic incidents. In smaller metropolitan areas such as Madison, the percentage is probably even higher. The goal of incident management is to prevent incidents from reducing traffic capacity, and if they do, to restore capacity as quickly as possible. This decreases the occurrence and severity of congestion and the possibility of secondary crashes.

Incident management strategies include:

(1) Use of freeway safety patrols to search for and respond to incidents;
(2) Technologies and communications systems for rapid detection of an incident and appropriate inter-agency response to it (e.g., cameras and other vehicle detectors, 911 and media reports);
(3) Traveler information systems (e.g., message signs, media, Internet);
(4) Roadway reference markers to identify the exact location of incidents;
(5) Construction of crash investigation sites; and
(6) Designation of alternate routes.

Implementation of traffic incident management strategies can reduce freeway congestion by 20-30%, improve incident travel times by 20%, reduce secondary crashes by 80%, and reduce incident fuel consumption by 35%[4].

WisDOT has implemented an incident management program for the Interstate and Beltline System as part its Southwest Wisconsin ITS Program. The program includes: a safety patrol who operates during weekday peak periods; cameras and other traffic detectors; a communications system with links to the region's 911 Centers, WisDOT's Transportation Management Center in Milwaukee, radio communication infrastructure, the media, and enforcement and highway maintenance agencies; and roadway reference markers. The safety patrols have been particularly effective in improving the timeliness and efficiency of incident management, because they are constantly roving the freeway and they provide a wide range of functions within the incident management process.

WisDOT has also begun implementation of an alternate "blue" route system. Alternate routes are designated, clearly marked and signed arterial street routes, which generally parallel freeway segments. Motorists would use the routes during major freeway incidents and ramp closures. Motorists would be directed through advisory information to these routes. USH 51 from north of the county line to south of Stoughton has been designated and signed as an alternate "blue" route for Interstate 39/90. Additional alternate routes for Interstate 94 and possibly the Beltline are being considered.

Motor Vehicle Safety and Crash Data

The City of Madison Traffic Engineering Division maintains crash data for all reported crashes in the City involving motorists, bicyclists, and pedestrians. Because only crashes resulting in serious injury or more than $1,000 in property damage are reported, almost all of the reported crashes involve a motor vehicle. The crash data is obtained from reports filed with the Madison Police Department. Since 1984 the crash data has been computerized, and since 2001 the data has been converted to a GIS format for mapping in order to aid in identifying high crash locations and obtaining other information and statistics for analysis purposes. For example, analyses of crash types and driver factors in crashes can now be conducted for particular locations or location types (e.g., signalized intersections). City Traffic Engineering Division staff use the crash data to identify crash patterns, driver factors, or violations that may be mitigated through traffic control or roadway geometric changes, safety education efforts, and/or traffic enforcement activities.

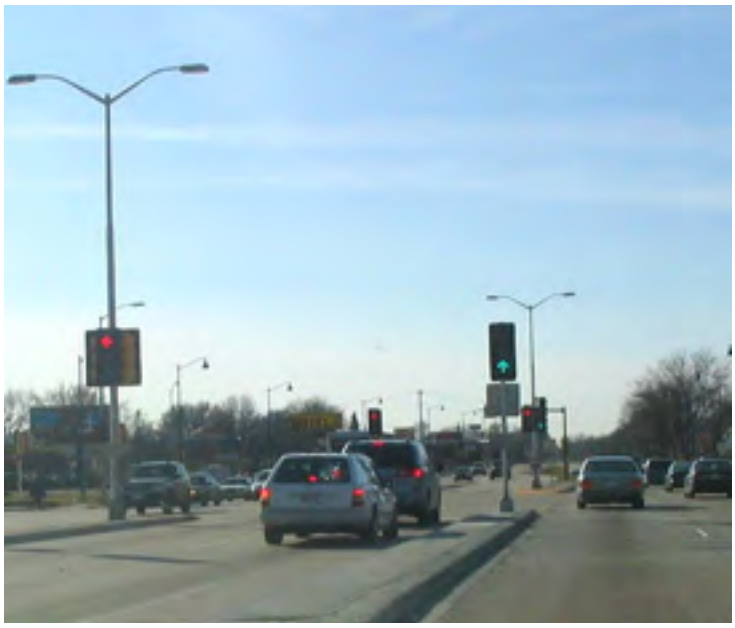
From 2001-2003, there were an average of 4,873 motor vehicle crashes in the City of Madison (excluding the Beltline and Interstate) resulting in an average of 2,547 injuries and 13 fatalities. A little over one-third (37%) of the crashes occurred at intersections. Of the intersection crashes, around 47% occurred at signalized intersections with signals under normal operation, 3% at signalized intersections with signals on flash, and 50% occurred at non-signalized intersections.

[4] Dane County Incident Management Program Brochure (12/98)

The most common manner of collision for intersection crashes is vehicles entering an intersection at right angles and one vehicle making a left turn, together accounting for around two-thirds of such crashes. The most common driver factors in intersection crashes were failure to yield the right-of-way and disregarding traffic control. For non-intersection crashes, rear end is by far the most common manner of collision, accounting for around one-half of all such crashes. Sideswipe (i.e., vehicles going the same direction with angle impact) accounted for less than 10% of such crashes. The most common driver factors for non-intersection crashes were inattentive driving, following too close, failure to have control of vehicle, and failure to yield right-of-way.

Figure 15, on the next page, shows the high crash frequency intersections (excluding the West Beltline Highway) and street segments in the City of Madison from 2001-2004. As expected, the higher volume arterials such as East Washington Avenue, Stoughton Road (USH 51), Mineral Point Road and Gammon Road have a high crash frequency. Some safety improvements such as wider travel lanes, intersection improvements, and improved signing, are being incorporated as part of the ongoing East Washington Avenue reconstruction project. Other particular problem intersections include: Verona Road near the Beltline, S. Park Street/W. Badger Road; S. Park Street/Regent Street; 600 S. Whitney Way/Median Break (Westgate Mall); and the Gammon Road intersections between Mineral Point Road and the Beltline.

The above-mentioned South Park Street intersections, along with the S. Park Street/Beltline, N. Park Street/University Avenue, Fish Hatchery Road/Greenway Cross, and John Nolen Drive/North Shore Drive intersections have been the subject of an AAA Road Improvement Demonstration Program in 2005-'06. The program brings together public and private partners to contribute engineering expertise and cooperation between governmental units to develop traffic safety enhancements at high crash intersections. Typical enhancements include re-timed traffic signals, brighter and/or better placed signs, larger street signs, dedicated turn lanes, and improvements for pedestrians, bicyclists, and transit users.



Location specific data for crashes on local roadways in other cities and villages in the Madison metropolitan area is not readily available. Monona Drive is one roadway with an identified safety problem. The crash rate for Monona Drive is three times the state average for an urban roadway. Around three-quarters of the crashes are either rear-end or angle crashes, suggesting that left-turning movements into driveways are a major cause of crashes. The design for the reconstruction of Monona Drive, the first segment of which is programmed in 2008, calls for consolidation of driveways and construction of a median from Broadway to Dean Road.

Countywide, there was an average of 10,279 motor vehicle crashes per year from 2001-2004. Of those, an average of 6,977 involved property damage only, 3,260 also involved an injury, and 42 involved a fatality. Seat belt use by Dane County drivers was estimated at 77% in 2005 by WisDOT, compared to a statewide average of 73%.

Table 14, on page 44, shows the number, severity, and type of crashes, total persons injured, and estimated economic loss in the larger cities and villages in the Madison metropolitan area in 2004.

The Dane County Traffic Safety Commission, which is comprised of staff from the Dane County Highway and Transportation Department and Sheriff's Office, WisDOT Central and District Offices, and State Patrol, meets quarterly to review crash data, particularly fatalities, and to discuss safety issues such as planned projects, research, grant programs, and proposed legislation.

TABLE 14
MOTOR VEHICLE CRASHES IN MADISON AREA CITIES AND VILLAGES WITH 5000+ POPULATION
2004

Municipality	# of Crashes			Total Killed	Total Injured	Economic Loss	Crashes Involving			
							Alcohol		Speed	
	Fatal	Injury	Property Damage				#	%	#	%
City of Madison	13	1,838	2,916	14	2,601	$94,006,000	389	8.2	587	12.3
City of Fitchburg	1	123	417	1	179	$8,694,000	35	6.5	59	10.9
City of Middleton	0	131	289	0	174	$5,941,000	26	6.2	66	15.7
City of Monona	1	87	178	1	125	$5,328,000	18	6.8	47	17.7
City of Stoughton	1	42	96	1	55	$3,453,000	15	10.8	22	15.8
City of Sun Prairie	0	98	208	0	151	$4,983,000	17	5.6	36	11.8
City of Verona	0	22	74	0	28	$1,315,000	6	6.2	11	11.5
Village of McFarland	0	16	51	0	24	$1,090,000	9	13.4	6	9.0

Source: 2004 Wisconsin Traffic Crash Facts prepared by WisDOT

Note: Economic loss is calculated using 2003 National Safety Council estimates plus 3%, the consumer price index. Costs used: Fatality: $1,154,000, Incapacitating injury: $57,200, Non-incapacitating injury: $18,700, Possible injury: $10,300, and Property damage: $8,400.

WisDOT Southwest District staff review crash data for state roadways to identify high crash locations that merit further review for possible traffic safety enhancements. Crash data is reviewed as part of special corridor studies such as the two USH 51 studies on the segments from the Interstate south to the Beltline and between McFarland and Stoughton. Detailed review of crash data for specific locations is also conducted as part of the project programming process to determine if safety improvements can be incorporated into preservation projects.

Figure 16, on the next page, shows those state roadway segments in Dane County with crash rates that exceed the statewide average for that roadway type. Further analysis is warranted for these roadway segments to determine if there are any potential short-term and/or long-term engineering or traffic control solutions to enhance safety. The safety problem on USH 12 between STH 19 and Middleton has been addressed through the reconstruction of that roadway to a four-lane expressway. Other roadways in the Madison metropolitan planning area with higher than average crash rates include: Beltline from Gammon Road to John Nolen Drive; Verona Road (USH 18/151) south of the Beltline; segments of USH 51, numerous segments of STH 19; USH 14 west of Middleton; and East Washington Avenue (USH 151). The Verona Road/West Beltline corridor, entire Beltline corridor and interchanges, USH 51, and STH 19 are all subject to ongoing studies, which include addressing safety issues. As noted above, some safety improvements are being incorporated as part of the ongoing East Washington Avenue reconstruction project between Blair Street and Thierer Road.

Roadway Pavement and Bridge Conditions

Roadways

Pavement management—the systematic process of overseeing the maintenance and repair of a network of roadways—allows transportation agency staff to maintain the condition of roadways and reduce pavement maintenance costs. Pavements have a varying life cycle dependent on many conditions. Implementation of a pavement management program or system allows transportation staff to determine pavement rating relative to all other pavements in a jurisdiction. It also allows year-to-year monitoring of pavements and, most importantly, facilitates predictions of when to cost effectively overlay, rehabilitate, or reconstruct a road.

The key is maintaining streets in good condition rather than allowing pavements to deteriorate to the point where extensive rehabilitation or reconstruction becomes necessary. This not only reduces maintenance costs in the long run, but also reduces consumer costs as well. Driving on roads in disrepair causes vehicles to deteriorate more quickly, require more maintenance, and consume more fuel.

Pavement deterioration is caused by the combination of traffic loads and moisture, which is expedited during freezing and thawing periods in the late winter and early spring. Pavement at intersections is more prone to worsen because of slow-moving, frequent stop-and-go traffic that causes more stress on roadways. Improved pavement and construction techniques are now being developed that provide a more durable road surface. Earlier maintenance is also being emphasized.

The Pavement Surface Evaluation and Rating (PASER) system was developed by the Wisconsin Transportation Information Center to assist local communities in evaluating the condition of roadways and setting priorities for road maintenance, repair, and reconstruction. The PASER system involves visual evaluation of pavement surface and provides standard ratings to promote consistency. PASER ratings follow a scale from 1 to 10. PASER ratings of 8-10 indicate the roadway is relatively new with little or no maintenance required. Ratings of 5-7 indicate that routine maintenance (e.g. crack filling and/or preservative treatment (seal coating or overlay)) is required. A rating of 4 or less indicates that structural improvement (thick overlay or recycling of pavement) or reconstruction is warranted.

Figure 17, on the next page, shows the pavement condition of both local and state arterial and collector roadways. Approximately 51% of this roadway network has a PASER rating of 8-10, 42% has a PASER rating of 5-7, and 7% is rated 4 or below. Several of the major roadway segments rated 4 or below were either just resurfaced or reconstructed or are programmed for rehabilitation or reconstruction. These include: East Washington Avenue; CTH M (North); CTH CV; Lien Road; two of three segments of Monona Drive; University Avenue between Allen Boulevard and Segoe Road; two sections of S. High Point Road; and Park Street south of Century Avenue in the City of Middleton.

The City of Madison Engineering Department rates one-half of all city streets each year using the PASER system. Curbs are also separately rated. According to the City's 2004 Street Condition Report, the average pavement rating for the city's arterial and collector streets was just under 7 while the average rating for local streets was slightly lower at 6.7. Only 2.6 miles of the arterial roadway network and 4.1 miles of the collectors were rated 4 or below. The average curb rating was also just under 7. The city's roadway network totals over 739 miles. In 2004, 13 miles of streets were resurfaced or reconstructed and routine maintenance (crack filling, seal coating) was conducted on another 63 miles. The city also constructed almost 10 new miles of street.

The Wisconsin Department of Transportation (WisDOT) uses a more sophisticated pavement evaluation system that includes three different pavement measures: (1) International Roughness Index (IRI), with a scale of 5-0, 0 being the best; (2) Rut, measured in inches of depth; and (3) Pavement Distress Index (PDI), with a scale of 100-0, 0 being the best and is the rating used to illustrate the pavement condition of state roadways in Figure 20. The PDI rating is most similar to the PASER system. USH 12 was reconstructed to a four-lane expressway and Interstate 39/90/94 north of CTH V was resurfaced this year. Interstate 94, which also has the worst pavement rating, is programmed for major rehabilitation work in 2007-'08. Also, as noted above, East Washington Avenue (USH 151), a state-connecting roadway, is in the process of being reconstructed.

As expected, the overall pavement condition of state roadways is better than that of county and local arterial/collector roadways. Around 75% of state roadways are in the best pavement condition category compared to 36% of county and 44% of municipal arterial/collector roadways.

Bridges

There are a total of 540 roadway bridge structures in Dane County. Of those, 284 are owned by the State, 85 by Dane County, 46 by the City of Madison, 33 by other cities and villages, 90 by towns, and two by UW-Madison.

The Federal Highway Administration (FHWA) has developed guidance for appraising and rating the structural integrity and functional design of bridges. Bridges are classified as "deficient" if they are either "structurally deficient" or "functionally obsolete" based upon National Bridge Inventory (NBI) ratings for various parts of the bridge structure and bridge geometry (deck, under-clearances, and approach roadway alignment). FHWA has also developed a system for rating the "sufficiency" of bridges, which indicates the bridge's sufficiency to remain in service. Bridges are assigned a value between 0 and 100 based upon evaluations in three areas—structural adequacy and safety, serviceability and functional obsolescence, and essentiality for public use—with special reductions allowed for extreme safety problems and lack of alternative routes.

The Wisconsin Department of Transportation (WisDOT) maintains a database on the condition of State and local bridges using the NBI rating system. It is updated every two years, and also indicates the year the bridge was last reconstructed. The ratings are used to determine eligibility for Federal funding under the Highway Bridge Replacement and Rehabilitation Program (HBRRP). In order to be eligible for HBRRP funding, bridges must: (a) be classified as deficient; (b) have a sufficiency rating of either less than 50 (for eligibility for replacement or rehabilitation funds) or less than 80 (for eligibility for rehabilitation funds); and (c) not have been reconstructed within the past ten years.

According to the bridge inventory, there are 50 state owned bridges classified as deficient with 11 of those classified structurally deficient and 39 classified functionally obsolete. Of those, 26 have sufficiency ratings low enough to make them eligible for Federal HBRRP funding. Six of these bridges are programmed for work, including the two Interstate 39/90/94 bridges over Lien Road, Buckeye Road (CTH AB) bridge over I-39/90, and Milwaukee Street bridges over I-39/90, which are scheduled for replacement.

There are 67 locally owned bridges classified as deficient (25 county, 20 City of Madison, 7 other city/village, 15 town) with 42 classified structurally deficient and 25 classified functionally obsolete. Of these, 57 have sufficiency ratings low enough to make them eligible for Federal HBRRP funding. Thirteen are programmed for replacement, including the East Washington Avenue bridges over the Yahara River and STH 30, Milwaukee Street bridge over Starkweather Creek, and CTH M (North) bridge over Spring Creek.