CHAPTER 5

TRAFFIC

This chapter includes pertinent information to consider in evaluating and assessing traffic issues on DDOT projects. The Program Manager/Project Manager must confer with Traffic Services Administration for necessary information and assistance relating to traffic issues. Safety and the efficient movement of vehicles and pedestrians are the ultimate goals.

The design of safer public streets and highways begins at the Design Scoping Review and continues through advertisement. Highway safety to reduce vehicular accidents and fatalities can be divided into three areas of concern:

- Roadway safety improvements (visibility and operation characteristics).
- Roadside hazard elimination (forgiving roadside concepts).
- Traffic engineering and operations (improving traffic regulations, warnings and directions).

AASHTO recommended order of preference, for treatment of roadside obstacles on existing highways, is as follows:

- Identify hazard utilizing TSA accident data (TARAS)
- Elimination of the hazard.
- Relocation of the hazard to a point where it is less likely to be struck.
- Usage of breakaway devices to reduce the hazard.
- Selection of a cost-effective traffic barrier (longitudinal barrier or crash cushion) to reduce accident severity.

The Project Manager is responsible for providing a design for the safe and efficient movement of vehicles and pedestrians. In many instances, benefits gained from a specific safety design or treatment can equal or exceed additional cost.

The Project Manager can best utilize limited design funds by preparing a benefit/cost analysis and preparing safety reports detailing feasible alternatives and recommendations.

The Project Manager should document the safety issues and any benefit/cost analysis that should include, but not limited to, the following:

- Encroachments.
- Roadside geometry.
- Accident costs including fatality costs).

As mentioned in the **Project Management Checklist** chapter, AASHTO design and safety standards for all projects on the National Highway System are applicable to any

proposed improvement regardless of funding (Federal or private). Deviations from standards must have approved design exceptions. The FHWA has established 13 controlling criteria requiring formal approval, with the exception of the clear zone (**23 CFR Part 625, Design Standards for Highways**).

5.1 Traffic Design Data

Traffic Services Administration (TSA) Information - The following TSA information items should be collected from for DDOT projects:

- Current ADT (average daily traffic - less than two years old).
- Design Hourly Volume.
- Percentage of Trucks.
- Functional Classification.
- Turning Movement Volumes (must be less than two years old).
- Number of Lanes.
- Transit information.
- Pedestrian information.
- Parking information.
- Accident Data

5.2 Traffic Accident Analysis

Accident Analyses (crash data) should be made available to the designer. This information can be obtained from the TSA Traffic Safety Division (TSD). Reviewing road safety and accident frequency is necessary for collecting pertinent data such as accident types, accident numbers, accident rate and accident severity.

5.3 Turning Movements/Access

The design, number, and location of access points to collector and arterial roadways must have an approval from DDOT and necessary Highway Access Permit from DDOT. The number of access points must be kept to a minimum and designed to be consistent with the type of roadway facility. Access points will be reviewed and approved by the District based on the following factors:

- Access location(s) as shown on the site plan.
- Proposed traffic-turning movements.
- Analysis of on site (driveway) stacking/queuing and impacts to adjacent streets.
- Signalization requirements and design in accordance with these guidelines.

- Geometric design of the access and proposed improvements to the District facilities in accordance with AASHTO, DDOT, or other nationally accepted design standards.

5.4 Signal Warrants

The latest edition of the MUTCD will be used to evaluate traffic signal warrants. The Traffic Engineer will conduct the warrant study for the highway and/or the city street intersection, together with all the necessary calculations, documentation, and traffic signal warrant justification for each location.

5.5 Traffic Movement Diagram

It is necessary to provide graphic representations showing volumes for each movement. The traffic movement diagram serves as the graphic representation. It illustrates, in the plans, the design traffic volume predicted for each movement within an intersection or interchange. It is used as confirmation for acceptable levels of service and in justifying design features such as turning lanes and storage lengths.

The diagram should be included on the plan sheet showing the proposed intersection or interchange design. It provides a permanent record, in the plans, of the data that justified the design features of the intersection/interchange. At a minimum, it will show the design hourly volume for each movement within the intersection/interchange. The diagram may also show the current average daily traffic; it will reflect the current year and 20 year projection of traffic movements. The traffic movement data should be no more than two years old.

5.6 Intersection/Interchange Design

The factors usually considered for intersection/interchange justification are:

- Traffic - capacity, turning movements, signal warrants.
- Accidents - cause of accidents and their type/frequency, pedestrian and bicycle involvement and their needs when in urban areas.
- Physical - topography, improvements and physical requirements and restraints.
- Economic - the cost of improvements and economic effects on abutting businesses.
- Human - decision and reaction times, driver expectations, and natural paths of movement.

Intersection and interchange design should move traffic safely and efficiently through various conflict points that may arise at the crossing of highways. The crossing of two or more highways can be accomplished three ways:

- At-grade intersections.
- Grade separations.
- Interchanges.

The above factors also apply to the interchange design, along with addressing highway classification, character and composition of traffic, design speed, and degree of access control.

The following data is required for initiating a final design on an intersection design:

- Basic data - traffic, physical, and economic factors.
- Preliminary design - aerial photos (if available), topographic maps, and preliminary sketches of plan and profiles for alternative designs.
- Comparative costs - cost estimates of alternative designs.
- Selection of suitable design - from the standpoint of traffic adequacy and economy and safety considerations.
- Final plans - design approval of intersection configuration, complete calculations, plans and profiles, traffic flow diagrams showing the design hourly volume and the design year of all anticipated traffic movements, and proposed construction plans.

The following data is required for initiating a final design on interchange design and approval:

- Submit feasibility study to examine the traffic impacts of the interchange on the arterial roadway system. The study is to include alternate routes, congestion, effects on the existing highway system, and economic analysis, and local commitment to improving local roads.
- The final report to be submitted for formal approval by the DDOT Chief Engineer.
- A project level feasibility study shall be done to determine the precise location and extent of traffic impacts to the roadway system. Upon preliminary approval by the Chief Engineer, the request will be forwarded, if necessary, to the FHWA for approval.
- Environmental studies shall be conducted and appropriate documentation prepared.

5.7 Bike/Pedestrian Improvements

The Program Manager/Project Manager must confer with Traffic Services Administration and Bike Coordinator in the Transportation Policy and Planning Administration (TPPA) for bike and pedestrian issues.

The proper placement and design of bike and pedestrian facilities are important elements of design on all projects. The Project Manager should include the options for providing bicycle and pedestrian facilities on new construction and reconstruction projects. These facilities are an integral part of the roadway environment. All streets and bridges must be designed without any impediment to bicycles and pedestrians providing bike friendly wheelchair/bicycle ramps, curb inlets with safety grates on streets and scuppers with safety grates on bridges. For 3R type projects, the design of pedestrian and bicycle facilities should be considered where warranted and cost effective.

Bicycle and pedestrian facilities should utilize the latest design standards and Americans with Disabilities Act requirements, including sidewalks, crosswalks, over/underpasses, traffic control features, curb cuts and access ramps for persons with disabilities. Curb cuts and other provisions for persons with disabilities are required on all Federal-aid projects involving provisions for curbs or sidewalks. Exceptions to Americans with Disabilities Act Standards require variance approval. The need to provide traffic control for bicycles and pedestrians should be included in the Traffic Control Plan.

According to the Code of Federal Regulations, Highways, the safe accommodation of pedestrians and bicyclists should be given full consideration during the development of Federal-aid highway projects, and during the construction of such projects. The special needs for the elderly and persons with disabilities shall be considered on all Federal-aid projects.

Where current or anticipated pedestrian and/or bicycle traffic presents a potential conflict with motor vehicle traffic, every effort shall be made to minimize the conflicts. Where rumble strips are proposed on projects, there are no adverse affects to bicycles. Also, properly designed speed humps have no adverse effect on bicycles.

Replaced and rehabilitated bridge decks should be reconstructed to accommodate bicyclists where they are permitted and when the cost is reasonable. The Project Manager has the responsibility to evaluate bicycle and pedestrian facilities in the design of any new construction and reconstruction work.

Pedestrian movements are less predictable than motorists movements. The designer should consider this to ensure general safety of the relationship of these different modes of transportation. The scoping document should discuss applicability of providing bicycle and pedestrian facilities and the Form 463a,

Design Data, should reflect these decisions. For new or reconstruction projects, the Project Manager should document design decisions and variances for bicycle and pedestrian facilities.

The inability to provide for bicycle and pedestrian facilities should also be documented. Guidelines are in the **AASHTO Guide for the Development of Bicycle Facilities** and the **AASHTO Policy on Geometric Design of Highways and Streets**.

NOTE: These design guidelines shall be used on all projects.

5.8 Americans With Disabilities Act Standards

The Program Manager/Project Manager must confer with the Chief Transportation Engineer or his/her technical support Engineer for the current standards. The Project Manager should seek to eliminate hazards within sidewalk areas such as poles and signs. Signing and pavement marking for disabled and van accessible parking must be added in new and reconstructed parking areas.

New facilities shall meet the current standards for persons with disabilities whenever a new highway project is constructed. When an existing highway is to be reconstructed, all new facilities will accommodate persons with disabilities. If a facility is altered, the alterations must meet current ADA standards. During construction, ADA temporary access and facilities should be addressed.

In consultation with the DDOT ADA Coordinator, the Project Manager will be responsible for incorporating the design and implementation of all facilities in compliance with the ADA. The Americans with Disabilities Act manual issued by the Equal Employment Opportunity Commission of the U.S. Department of Justice should also be utilized.

These requirements should be identified in the early stages of design, such as the Design Scoping and be included in the design plans for both new and existing facilities.

5.9 Mass Transit Accommodations

The Program Manager/Project Manager must confer with the Mass Transit Division, in the Transportation Policy and Planning Administration (TPPA), concerning public transit issues. On Federal Aid projects involving public transit, FHWA, DDOT, and FTA shall coordinate to facilitate project selection, approval, and completion.

The decision to implement transit accommodations is usually a joint effort between the FHWA, FTA, WMATA, and DDOT. Appropriate design standards

and plans, and project decision type documentation should be sent to the FHWA and to transportation agencies for review and advisement when appropriate.

Transit projects should be considered in both the planning and the design process. The planning process should consider major capital investments and issues, such as light rail or commuter rail lines, high-occupancy vehicle lanes, or major expansions to bus systems.

The design process should not only consider major project decisions, but should also include consider smaller elements that would accommodate and facilitate transit service delivery, such as park-n-ride lots, and bus stops/pads/shelters.

In scoping stage, the Project Manager should consider future mass-transit needs and incorporate appropriate elements into the project scope. It is important to ensure that project design does not preclude future transit options. The Project Manager should coordinate with WMATA on long-range planning necessary to incorporate transit elements into the plans.

The Project Manager is responsible for the coordination of any highway construction plans that involve high-occupancy vehicle lanes, parking facilities, bus pullouts, etc.

5.10 Traffic Calming

The Program Manager/Project Manager, in coordination with Traffic Services Administration, will incorporate traffic calming when:

- The community requests it.
- When deemed necessary by the Department utilizing the **District of Columbia Traffic Calming Policies and Guidelines** 2002 Manual

Traffic calming is the implementation of physical and perceptual techniques intended to slow or divert traffic on existing or planned roadways. It is often a reactive approach to minimize high speeds and volumes of vehicular traffic.

Significant efforts in traffic calming have been put forward on existing roadways and in the development of new roadways to limit traffic speeds and traffic volumes in neighborhoods and to provide for safer travel for all modes of transportation including pedestrian, bicycle, and vehicular. In addition, new streets shall be laid out so as to minimize opportunities for cut-through traffic.

5.11 Traffic Signal Plan

The Program Manager/Project Manager must confer with Traffic Signal System Division in TSA during the scoping of the project for their traffic signal requirements in the project. Traffic signal plans will include a complete layout of

the intersection showing the location of the signals, conduit, signal cabinet, power source and existing utilities. In addition, a sketch of the signal faces, a phasing diagram, a legend, general notes pertaining to the signalization, and a summary of approximate quantities will be included. (Refer to Chapter 31, Traffic Control, in Part II of this manual for detailed technical criteria).

The Design Engineer shall complete all necessary calculations for documentation of the signal warrant study, prepare the traffic signal design, compute quantities, draft specifications and complete drawings for the final signal plans. The design engineer shall also certify that all traffic plans conform to the MUTCD and the District Standards.

5.12 Lighting Plan

The Program Manager/Project Manager must confer with the Electrical Division and Streetlight Branch in TSA for their streetlight requirements. Warrants for lighting are outlined in the **AASHTO Informational Guide for Roadway Lighting.**

Coordination with the utility company is necessary to ensure proposed materials are compatible with utility inventories. The power source locations should be designated by and negotiated with the utility company in order to supply the power. In special lighting situations (e.g., ornamental or decorative lighting), the District and Federal share of costs shall not substantially exceed the estimated cost of conventional highway lighting, unless such special lighting is within the scope of the project (e.g., enhancement projects) or is otherwise justified by the public interest or historical areas.

The following information should be shown on the lighting plan:

- Circuit type, voltage and location of power source.
- Luminaire type, lumens, and locations.
- Light standard type, mounting height, bracket arm type and length, and foundation details.
- Size and location of electrical conduit, conductor size, location of direct burial cable, and locations of pull boxes and junction boxes.

5.13 Permanent Signing and Pavement Marking

All proposed permanent signing and pavement markings must be reviewed and coordinated with the Traffic Safety Division in TSA.

5.14 Construction Traffic Control Plans

Design of construction traffic control plans should include speed, clear zone, horizontal and vertical alignment, typical section, (e.g., lane width, super-

elevation and shoulder design) horizontal and vertical sight distance, clearance, curve radii, temporary barrier with properly designed end terminals, surfacing requirements, approach ties, environmental mitigation and construction traffic control. All designs for traffic control plans shall be in compliance with the MUTCD and the DDOT **Work Area Traffic Control Manual, 2000.**

In particular, the designer must consider vertical clearance to overhead structures such as bridges or false work, especially when utilizing shoulders where clearance is often less. A detour should provide adequate area for construction of the object around which the detour is being built. Adequate space should be provided for the contractor to work without impeding the flow of detour traffic.

When planning a detour, the designer must consider running speed, barrier widths, offset required to barriers, and clear distance to construction activities including typical construction sign placement. Temporary drainage is also an integral aspect of a detour design. The length of detour should be designed according to the surrounding topography considering duration of detour and amount of traffic demand.

Important considerations when designing a detour are that the motorists pass safely through the construction zone when work is taking place next to the travel way, and that construction workers are provided with a safe work area. Construction work area should be adequate to not delay or impact traffic whenever conditions and economics permit. Priorities for providing a proper detour are:

- Safety for pedestrians, motorists and workers.
- Adequate construction work area.
- Maintaining reasonable detour design speeds.
- Providing adequate roadway capacity.
- Providing proper direction and warning signs
- Economical detour design.
- Consideration of vehicles that exceed legal weight and height limitations.

The detour alignment should be as smooth as possible in relation to and from the major roadway alignment; it is desirable to maintain the lane width and geometric design speed properties of the main roadway. A detour should be designed with a speed as close to the original speed as is reasonably possible. However, a detour through a residential neighborhood should be designed to calm traffic and not upset the residents.

The designer should anticipate the level of motorist compliance with the reduced speed in a detour zone, when deciding on the detour design speed. Many motorists do not comply with the reduced speed zones, despite adequate signing. However, when safety consideration warrants, the detour posted speed may be

lower than the design speed. This allows the motorist to read and follow the directional signs.

The Project Manager is responsible in coordination with Traffic services Administration for scoping and designing the detour. The design should include all proper pay items for the detour, including provisions for maintenance, removal and disposal. On projects with Federal oversight, the designer shall meet all Federal standards and obtain FHWA concurrence with the design.

NOTE: Signing and striping for the detour should be included in the Traffic Control Plan.