CHAPTER 10

TRAFFIC GATES
10. Traffic Gates

10.1. Introduction and Usage

The purpose of using Traffic Gates at freeway on-ramps is to minimize the utilization of law enforcement vehicles and personnel as temporary roadway barriers. Traffic Gates allow for easy closure of freeway entrance ramps during planned incidents such as sporting events and unplanned incidents such as freeway emergencies.

There are three types of Traffic Gates either presently in use, or planned for installation. Recently, Type III Barricade Traffic Gates have been installed at the freeway on-ramps in Racine and Kenosha Counties with Vertical Swing Arm Traffic Gates to be included in the I-94/USH-41 rehabilitation project in 2001. Horizontal Swing Arm Traffic Gates have also been installed at several freeway entrance ramps in Milwaukee County.

10.2. Traffic Gate Types

Traffic Gates are broken into three basic types, dependant upon the part of the freeway system it is to be installed on. The two types of Traffic Gates, and their appropriate uses, are as follows:

- **Type III Barricade** - Used in low volume, rural areas where the primary anticipated use is to restrict traffic during severe weather conditions.
- **Horizontal Swing Arm** - Used in high volume, urban areas where the primary anticipated use is to restrict traffic during special events and serious traffic incidents.
- **Vertical Swing Arm** - Used in high volume, urban areas where the primary anticipated use is to restrict traffic during special events and serious traffic incidents.

10.2.1. Type III Barricade

Type III Barricade Traffic Gates are used at locations at which closures are anticipated to be infrequent. While not in use, the Type III Barricade is stored off the on-ramp on wood posts with brackets to hold them in place. In order to be put into use, an official of an agency authorized by WisDOT removes the barricade from the storage posts and places it across the subject on-ramp. An example of a Type III Barricade (both in the stored and deployed positions) is shown in Figure 10-1 and Figure 10-2.

The **advantages** of the Type III Barricade Traffic Gate include the following:

- Low cost installation
- Easy storage
- High visibility to motorists

The **disadvantages** of the Type III Barricade Traffic Gate include the following:

- Difficult and labor intensive to use
- Requires open, flat space for storage posts
10.2.2. Horizontal Swing Arm

Horizontal Swing Arm Traffic Gates have been used at locations at which closures are anticipated to be more frequent. While not in use, the Horizontal Swing Arm is locked in the Ramp Open position. In order to be put into use, an official of an agency authorized by WisDOT unlocks the swing arm, moves it into the Ramp Closed position, and locks it in that position. A lockable cabinet of sufficient size to store any necessary traffic control items, such as traffic cones, temporary signs required for signing plan, and a copy of the signing plan should be placed on a concrete pad within 100-feet of the Traffic Gate. An example of a Horizontal Swing Arm Gate is shown in Figure 10-3.
10.3. Horizontal Swing Arm Traffic Gate

The advantages of the Horizontal Swing Arm Traffic Gate include the following:

- Easy to use
- High visibility to motorists

The disadvantages of the Horizontal Swing Arm Traffic Gate include the following:

- Requires long, flat space for installation
- Requires two large areas without underground utilities for footings
- Difficult and expensive to install
- Requires significant clear space to swing, which is especially crucial during winter during snow clearance and removal operations.

10.2.3. Vertical Swing Arm

While Vertical Swing Arm Traffic Gates have not been used in Wisconsin for this purpose to date, they are popular in other parts of the country. This type of Traffic Gate is similar to railroad crossing gates. While not in use, the Vertical Swing Gate is locked with the arm in the Ramp Open position. In order to be put into use, an official of an agency authorized by WisDOT unlocks the swing arm, cranks the arm down into the Ramp Open position, and locks the gate. A lockable cabinet of sufficient size to store any necessary traffic control items, such as traffic cones, temporary signs required for signing plan, and a copy of the signing plan should be placed on a concrete pad within 100-feet of the Traffic Gate. Under most circumstances, the Vertical Swing Arm Traffic Gate will be the most appropriate Traffic Gate type.
The advantages of the Vertical Swing Arm Traffic Gate include the following:

- Easy to use
- High visibility to motorists
- Familiarity – vertical swing gates are used at railroad crossings

The disadvantages of the Vertical Swing Arm Traffic Gate include the following:

- Requires long, flat space for installation
- Difficult and expensive to install
- Aesthetically unpleasant

To date the Federal Highway Administration has only approved vertical swing gates for installation on light poles. This installation method is currently the only type crash tested and approved for use.
10.3. Traffic Gate Design Process

The design process presented here demonstrates the steps needed for proper traffic gate deployment. It does not, however, take every possible variable into consideration. The designer must understand that a certain amount of judgement is always necessary for a successful deployment. The design process is broken into the following steps.

1) **Collect initial data** required for the proposed Traffic Gate location.
2) **Determine traffic gate type** for implementation
3) **Determine traffic gate site** for proposed design
4) Perform **site design**
5) **Revisit steps 1 through 4** until design is complete
6) Utilizing the table found at the back of this chapter and the information contained within Appendix A, determine the **construction details** needed for the proposed design, details which **need to be modified**, and new details which **need to be created** to provide complete construction plan.
7) Utilizing the table found at the back of this chapter and the information contained within Appendix B, determine the **special provisions** needed for the proposed design, special provisions which **need to be modified**, and new special provisions which **need to be created** to provide a complete construction set.
8) **Conduct local agency outreach and coordination** explaining the use and impacts of the proposed traffic gate(s)

In the following sections, each task is broken down in more detail. In each step, there are additional subtasks, each of which need to be performed as part of the overall design. Care should be taken by designers to familiarize themselves with all steps before proceeding.

10.4. Initial Data Collection

The data collection phase focuses on evaluating existing conditions along the roadway where a Traffic Gate is considered for deployment. Typical data needed prior to locating and selecting a Traffic Gate include the following:

- Base mapping of freeway and local roadway network
- Right of Way definitions
- Profile information of selected ramp
- Existing underground utilities in area of proposed Traffic Gate
- Existing freeway trailblazer signing in the area

It is important that this information be very accurate. In many cases, field surveying will be required to obtain sufficiently accurate information. The design of a Traffic Gate installation should be thought of in similar terms to the design of any structure, as field adjustments during construction will be very difficult if discrepancies in the plans are discovered.

In particular, the location of existing underground utilities is very important. This information will be used to determine if the footings required for the proposed Traffic Gate will fit in the desired location. If there is no room for the necessary footings, the selected Traffic Gate...
Gate type and location will need to be reevaluated. If the decision is made to install the gate regardless of the existence of underground utilities, the relocation of these utilities may add dramatically to the cost of the Traffic Gate.

The profile information along the selected on-ramp is also very important. Inaccuracies in this information may lead to the installation of a Traffic Gate in which the swing arm is too high, or too low. Either of these situations would pose a safety hazard to motorists.

10.5. Determination of Traffic Gate Type

Prior to locating a Traffic Gate on a freeway on-ramp, some engineering decisions need to be made, and the Traffic Gate type selected. The decisions that a designer must make prior to selecting a location include the following:

- Anticipated primary purpose of the traffic gate - Will the traffic gate primarily be used during severe weather conditions, or during planned and unplanned traffic incidents?
- Type of traffic gate desired - What advantages and disadvantages of the different types of traffic gate will need to be considered and accounted for in the design?

10.6. Traffic Gate Placement

Ideally, the decision to place a Traffic Gate on a particular freeway on-ramp should be made as part of a system-wide implementation plan based on a history of incident rates and severity, and on frequency of closures due to severe weather. Lacking a formal implementation plan, the decision to install Traffic Gates may be made on a project-by-project basis based on the same factors. Each District’s Freeway Operations Unit should make this decision with input from local law enforcement and maintenance agencies.

10.7. Site Design

The site design is broken into three subtasks. The subtasks deal with the placement of the structure and necessary footing, or footings, and the necessary signing changes that will need to be made when the Traffic Gate is used to close an on-ramp. The subtasks include the following:

- Traffic Gate supports and location
- Traffic Gate dimensions
- Trailblazer sign inventory and ramp closure plan

These tasks involve defining the details that will differ from location to location, within a Traffic Gate type. They are explained in greater detail below.

Traffic Gate Supports and Location

Once the decision has been made to install a Traffic Gate on a freeway on-ramp, the exact location of the Traffic Gate should be based on the information obtained during the data collection steps described above. All pertinent regulations and necessary clear zones must be observed when determining the locations of any permanent structures, which may be obstacles to vehicles using the ramp when the ramp is open.
In the event that no suitable location can be found on a desired freeway on-ramp, the selected freeway on-ramp and Traffic Gate type must both be reevaluated. If no Traffic Gate type is deemed suitable at the on-ramp, installation of a Traffic Gate should be reconsidered. The costs of relocating existing utilities, or re-grading the surrounding area will add considerably to the cost of a Traffic Gate.

**Trailblazer Sign Inventory and Ramp Closure Plan**

A signing plan based on the locations of existing trailblazer signs should be developed for times when the Traffic Gate is used. This should be done to facilitate implementation of the Traffic Gates, and to avoid directing motorists to closed ramps.

**Traffic Gate Dimensions**

Once a freeway on-ramp, Traffic Gate type, and specific location on the on-ramp have all been deemed suitable, the final design of the individual Traffic Gate may proceed. Final design of the gate will include determining the necessary dimensions for the specific conditions at the selected site, and modifying the existing construction details to match. The dimensions to be determined for each Traffic Gate differ by Traffic Gate type, but in general include the elevations of each footing relative to the pavement, the height of the swing arm pivot point from the footing, the span of the swing arm, and the height of the swing arm supports.

For a **Type III Barricade Traffic Gate**, the exact locations of the two storage posts should be shown on the appropriate plan sheet after verifying that the locations are suitable.

For a **Horizontal Swing Arm Traffic Gate**, the span of the swing arm should be determined first. The span should be adequate for both the pivot arm and the Ramp Closed support arm to be a sufficient distance, based on any pertinent standards, from the traveled roadway. The Ramp Open support arm should also be a sufficient distance from the traveled roadway. The exact locations of the pivot post and the two storage posts should be shown on the appropriate plan sheet after verifying that the locations are suitable. The installation site should then be surveyed to determine the exact elevations of the post locations. This information will be used to dimension the vertical elements of the Traffic Gate on the pertinent construction details. The construction details should then be modified for each individual location. It is important that the construction details state that all dimensions shown are "For Bidding Purposes Only". The construction details should show location specific dimensions for the following information:

- Minimum horizontal distance from face of curb, or edge of paved shoulder, to all three of the vertical posts
- Required horizontal span of swing arm
- Vertical distance from the crown of the roadway to the bottom of the swing arm
- Vertical distance from the footing to the bottom of the pivot hinge on the pivot arm

During construction, the contractor should be required to reverify the dimensions shown, and to submit shop drawings for approval, prior to manufacturing, or ordering the Traffic Gate assemblies.
For a **Vertical Swing Arm Traffic**, the span of the swing arm should be determined first. The span should be adequate to prevent any vehicle from going around the Traffic Gate when in the Ramp Closed position, while also having the vertical support member a sufficient distance, as required by any pertinent standards, from the traveled roadway. When in the Ramp Open position, the edge of the swing arm nearest the traveled roadway should also be a sufficient distance, as required by any pertinent standards, from the traveled roadway. The exact location of the vertical support member should be shown the appropriate plan sheet after verifying that the location is suitable. The installation site should then be surveyed to determine the exact elevation of the vertical support member location. This information will be used to dimension the vertical elements of the Traffic Gate on the pertinent construction details. The construction details should then be modified for each individual location. It is important that the construction details state that all dimensions shown are "For Bidding Purposes Only". The construction details should show location specific dimensions for the following information:

- Minimum horizontal distance from face of curb, or edge of paved shoulder, to the vertical support member and to the edge of the swing arm when in Ramp Open position
- Required horizontal span of swing arm
- Vertical distance from the crown of the roadway to the bottom of the swing arm
- Vertical distance from the footing to the pivot point on the vertical support member

During construction, the contractor should be required to reverify the dimensions shown, and to submit shop drawings for approval, prior to manufacturing, or ordering the Traffic Gate assemblies.

Whichever Traffic Gate type is selected, each Traffic Gate site will require its own set of construction details and its own bid item, similar to when multiple Overhead Sign Supports are included in one project.

**10.8. Local Agency Coordination**

**Deployment Agencies**

Traffic gates can be deployed by various agencies, including:

- Wisconsin Department of Transportation Staff
- County Sheriff Department
- Wisconsin State Patrol
- County Maintenance Department

Prior to installing any Traffic Gates, all agencies that will be approved to use the them should enter into an agreement detailing the appropriate use of the gates. Each of these agencies must have keys to unlock the traffic gates from their storage positions, and unlock the storage cabinets holding the necessary traffic control items. These agencies should also be responsible for setting up temporary trailblazer signing, as described by the signing plan contained in the storage cabinet.
Local Communities

It is crucial that outreach and coordination be conducted with the local agencies nearby the proposed traffic gate. This outreach and coordination consists of multiple issues, including:

- Explaining the use of the proposed traffic gate
- Coordinating staff between agencies to determine traffic impacts resulting from the ramp closure
- Developing supplemental measures to minimize local street traffic impacts (proper signing, signal timings, etc.)
- Developing an operations plan, identifying roles and responsibilities for successful use.

Failure to conduct the proper local agency outreach and coordination may result in delayed gate implementation, or potential interagency / political opposition to the traffic gate.

10.9. Traffic Gate Construction Details

Construction details previously used during construction of traffic gates are found in Figure 10-6. These details, in Adobe Acrobat format, can be found in Appendix A. Electronic Microstation versions of these files can also be found on the ITS Design Manual CD.

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<th>Description</th>
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<td>ADVANCE FLASHER FOR GATE CLOSURE</td>
</tr>
<tr>
<td>trafgate1</td>
<td>RAMP CLOSURE GATE DETAILS (GENERAL ELEVATIONS AND GATE DETAILS)</td>
</tr>
<tr>
<td>trafgate2</td>
<td>RAMP CLOSURE DETAILS (GATE ARM PIVOT DETAILS)</td>
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<td>RAMP CLOSURE DETAILS (GATE ARM PIVOT DETAILS)</td>
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<td>trafgate5</td>
<td>RAMP CLOSURE GATE DETAILS (GATE ARM FLASHERS WIRING DIAGRAM)</td>
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Figure 10-6: Ramp Gate Construction Details

10.10. Traffic Gate Special Provisions

Due to on-going development and evaluation, special provisions used for traffic gate implementation are currently being refined and will be available in a future manual update.