



Traffic Engineering & Highway Safety Bulletin



August 2001

Military Traffic Management Command Transportation Engineering Agency
720 Thimble Shoals Boulevard, Suite 130 • Newport News, VA 23606-4537

Traffic Engineering For Better Gates



Introduction

Mandatory vehicle access control to military installations is a Department of Defense (DOD) requirement (DOD Directives 5200.8 and 5200.8-R). Recently, many installations have requested MTMCTEA's traffic engineering assistance for improving their gate areas. The primary focus of this bulletin is to provide fundamental traffic engineering guidance that will allow installation personnel to improve safety and efficiency at gate areas. A poorly designed gate contributes to congestion, accidents, wasted energy, inaccessibility, and off-installation impacts. Factors to consider in designing gates include: existing right-of-way, traffic volumes and classification, traffic control, proximity to intersections, and desired security level. 

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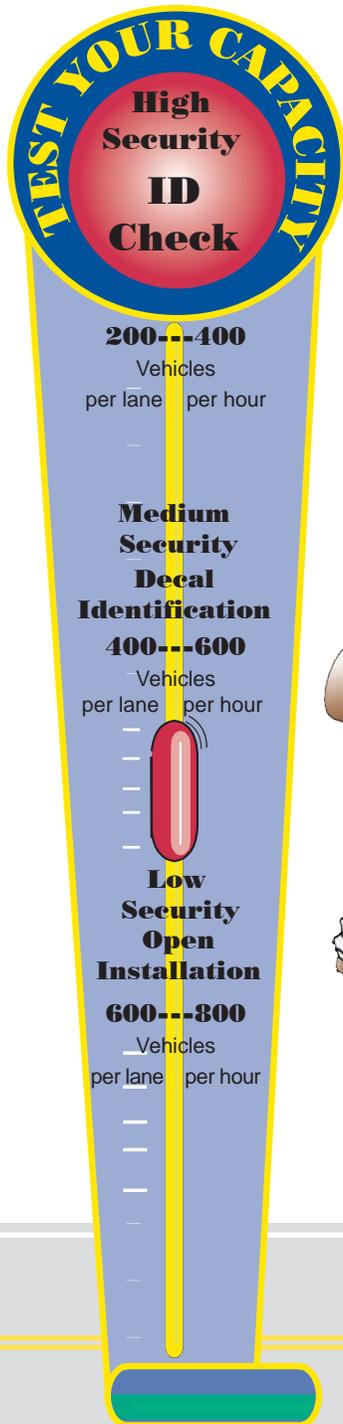


Capacity

Design capacity is the maximum volume of traffic that a proposed gate would be able to serve without an unreasonable level of congestion occurring. Capacity is used at the design level in assessing the adequacy of gates to serve current and future traffic demands. Vehicles arriving at a gate faster than they can be processed cause congestion.

(continued from page 1)

The illustration below shows the capacities per lane per hour based on various security levels. If the hourly lane capacity is exceeded, congestion will occur. Even if gates are designed based on the lane capacities shown in the illustration, some congestion may still occur due to the random arrival of vehicles and distinct

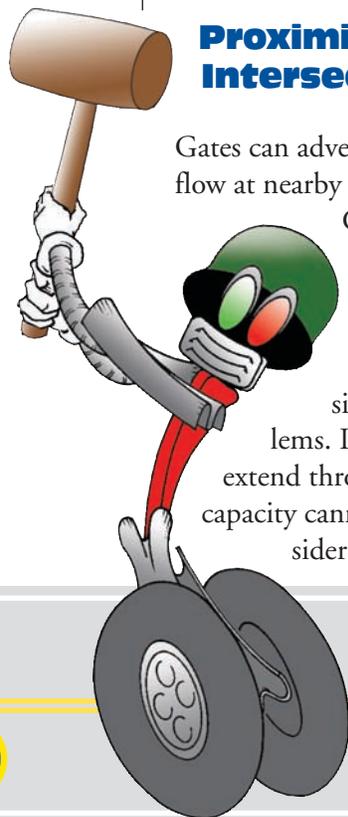


peaking that typically occurs for short periods during the design hour.

Capacity can be increased and congestion reduced by setting staggered work hours, encouraging carpooling, adding lanes, implementing tandem processing (two booths per lane), redirecting traffic to other gates, or even building new gates. 

Gates can be relocated to new alignments or moved farther from the intersection to provide additional room for vehicles to stack. The latter may require modifications to the fence line and side streets. 

Proximity to Intersections



Gates can adversely affect traffic flow at nearby intersections.

Construct gates a minimum of 300 feet from any intersection to reduce vehicle conflicts and sight distance problems. If queues (backups) extend through intersections and capacity cannot be improved, consider relocating the gate.

Gatehouses

Design the gatehouse so that:

- ❖ Guards can function freely and safely.
- ❖ The structure is on a curbed island.
- ❖ Platform surfaces are made with anti-skid properties.
- ❖ A minimum platform width of 2 feet is provided behind the curb.

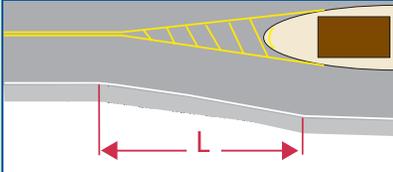
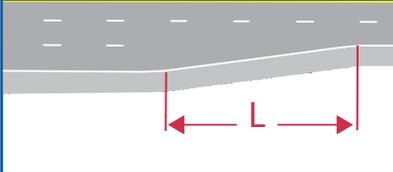
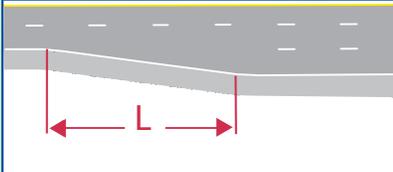
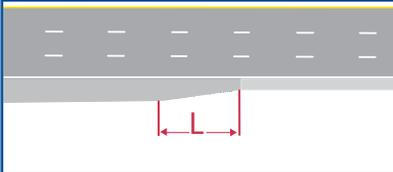
Transition Tapers

Properly constructed tapers enhance traffic flow and safety. Tapers give an opportunity for drivers to recognize a geometric change and react properly. Transitions are needed at gates to handle lane additions and curbed islands containing gatehouses. 

Answers from Page 2

1. The gate is located less than 100 feet from an intersection. During off-peak periods, vehicles can be processed fast enough so that backups do not impact the neighboring intersection. During peak periods, vehicles cannot be processed fast enough, thus creating backups that impact intersection capacity and safety.

2. On the right-hand side is a STOP sign. STOP signs should not be used for gate control unless every vehicle is required to stop at all times. For more flexible control, gate guards using manual gestures should be used. The STOP sign, in this case, creates added confusion and should be removed.

Situation	Min. Transition Length Criteria W - transition width S - 85th percentile speed
Lane Redirected 	<ul style="list-style-type: none"> ❖ For 40 mph or less, Minimum Length = $WS^2 / 60$ ❖ For greater than 40 mph, Minimum Length = $W \times S$ ❖ In no case should the transition length be less than 100 feet
Lane Dropped 	<ul style="list-style-type: none"> ❖ For 40 mph or less, Minimum Length = $WS^2 / 60$ ❖ For greater than 40 mph, Minimum Length = $W \times S$
Lane Added 	<ul style="list-style-type: none"> ❖ Minimum Length = $WS / 3$ or a 10:1 ratio taper, whichever is greater
Shoulder-to-Curb Transition 	<ul style="list-style-type: none"> ❖ 10:1 minimum taper for a transition from a shouldered roadway to a curbed, unshouldered roadway (such as a gatehouse approach)

Lighting

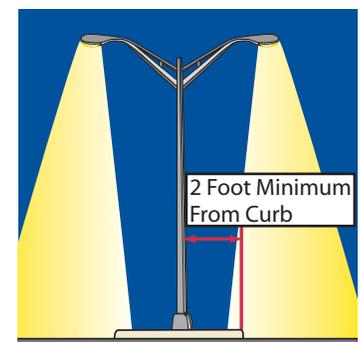
All gates need good overhead lighting to help drivers navigate through the gates at night. Lighting is also required for guards to perform their security functions. Lighting should be complete and continuous.

Gatehouse lighting is important so that motorists and guards can see each other. Gatehouse lighting must be applied carefully so that it is not directed into the driver's eyes and does not backlight important signs.

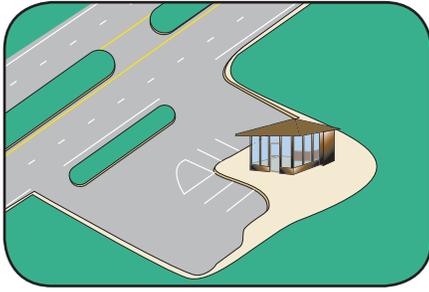
Roadway lighting should provide enough intensity so that pedestrians, guards, islands, and other hazards can be seen. A minimum surface lighting average of 2 horizontal foot-candles should be provided at lim-

ited-use gates, 3 at secondary gates, and 4 at primary gates. More intensity is desirable when practical.

On curbed roadways, light poles should be located at least 2 feet behind the face of curb. On uncurbed roadways, the pole should be at least 12 feet from the travel-lane's edge or 6 feet from the edge of the shoulder; whichever is greater. 



Parking



Parking or stopping near the through lanes at primary gates can cause congestion and crashes. Do not permit parking adjacent to travel lanes at primary gates. If visitors must park their vehicles to obtain passes, provide a separate parking lot.

At low-volume gates, a turnout lane can be used if parking cannot be provided elsewhere due to geometric constraints and security requirements. It should be large enough to accommodate at least two vehicles. 

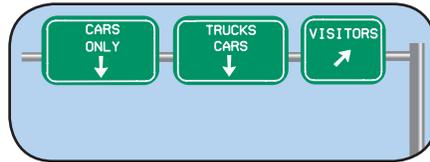
Traffic Control

Often, problems at gate areas are related to poor use of traffic control devices. The general rule for traffic control at gates is KEEP IT SIMPLE. Use as few signs as possible. Do not use permanent or portable STOP signs or traffic signals for gate control unless every vehicle is always required to stop. For more flexible control, guards should use manual gestures.

If features of the gate or its approaches are not readily visible or obvious, use warning signs to alert drivers. Warning signs, however, should never be used as a substitute for good traffic design at gate areas.

Regulatory signs inform drivers of traffic laws and regulations. Common regulatory signs used at gates include: SPEED LIMIT, lane use, ONE WAY, and VISITOR PARKING. For gates open intermittently, use a GATE CLOSED sign listing hours of operation, along with a Type III barricade (see *Limited Use Gate*, page 7).

Lane use signs are useful for directing traffic into the appropriate lanes. These signs help reduce conflicts between vehicles, and improve the efficiency of gate operations. Use overhead signs when the gate is at or near capacity, or when there are three or more lanes.



Variable Message Signs (VMS) offer the ability to automatically change the information being provided to motorists. A VMS located at a gate can be used to advise motorists of the security level, roadway status, or other general information. 

MTMCTEA Can Help!

MTMCTEA highway engineers stand ready to help installations with their traffic engineering concerns—especially those involving high accident locations. We perform many types of studies with an emphasis on low-cost improvements that are immediate or short-term and yield high benefits to their implementation costs. Generally, the studies conducted include:

- ❖ Fatal crash analysis
- ❖ Safety audits
- ❖ High accident locations
- ❖ Traffic engineering
- ❖ Traffic impact (such as BRAC)
- ❖ Access roads
- ❖ Force protection
- ❖ Signal operations

IN THE NEXT ISSUE

Forgiving Roadside Treatments:

- Breakaway Supports
- Guardrails
- Shoulder drop-offs

Contact Us

Phone:

DSN: 927-4313



❖ Rick Sumrak (757) 599-1170

E-mail: SumrakR@tea-emh1.army.mil

❖ Richard Quesenberry (757) 599-1164

E-mail: QuesenbR@tea-emh1.army.mil

❖ Paul Allred (757) 599-1190

E-mail: AllredP@tea-emh1.army.mil

Fax:

Commercial: (757) 599-1682 DSN: 927-2119

E-mail:

Traffic@tea-emh1.army.mil

Mailing Address:

MTMCTEA
Attn: MTTE-SA
720 Thimble Shoals Blvd., Suite 130
Newport News, VA 23606-4537

Primary Gate

High security (ID Check):

One-booth lanes:

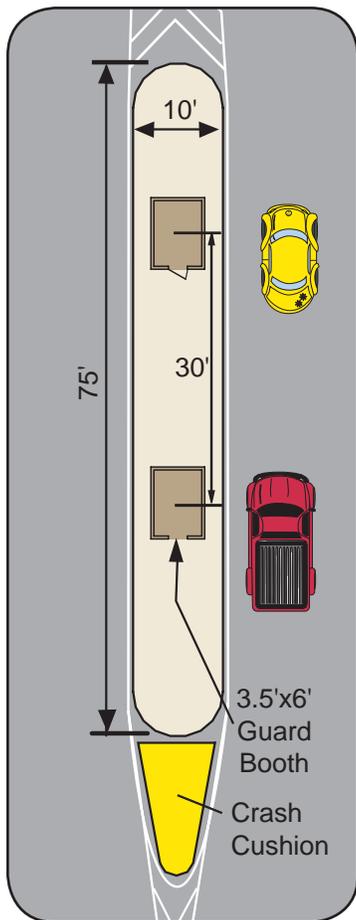
(one guard per lane) 200 - 400 vehicles per lane per hour

Tandem-booth lanes:

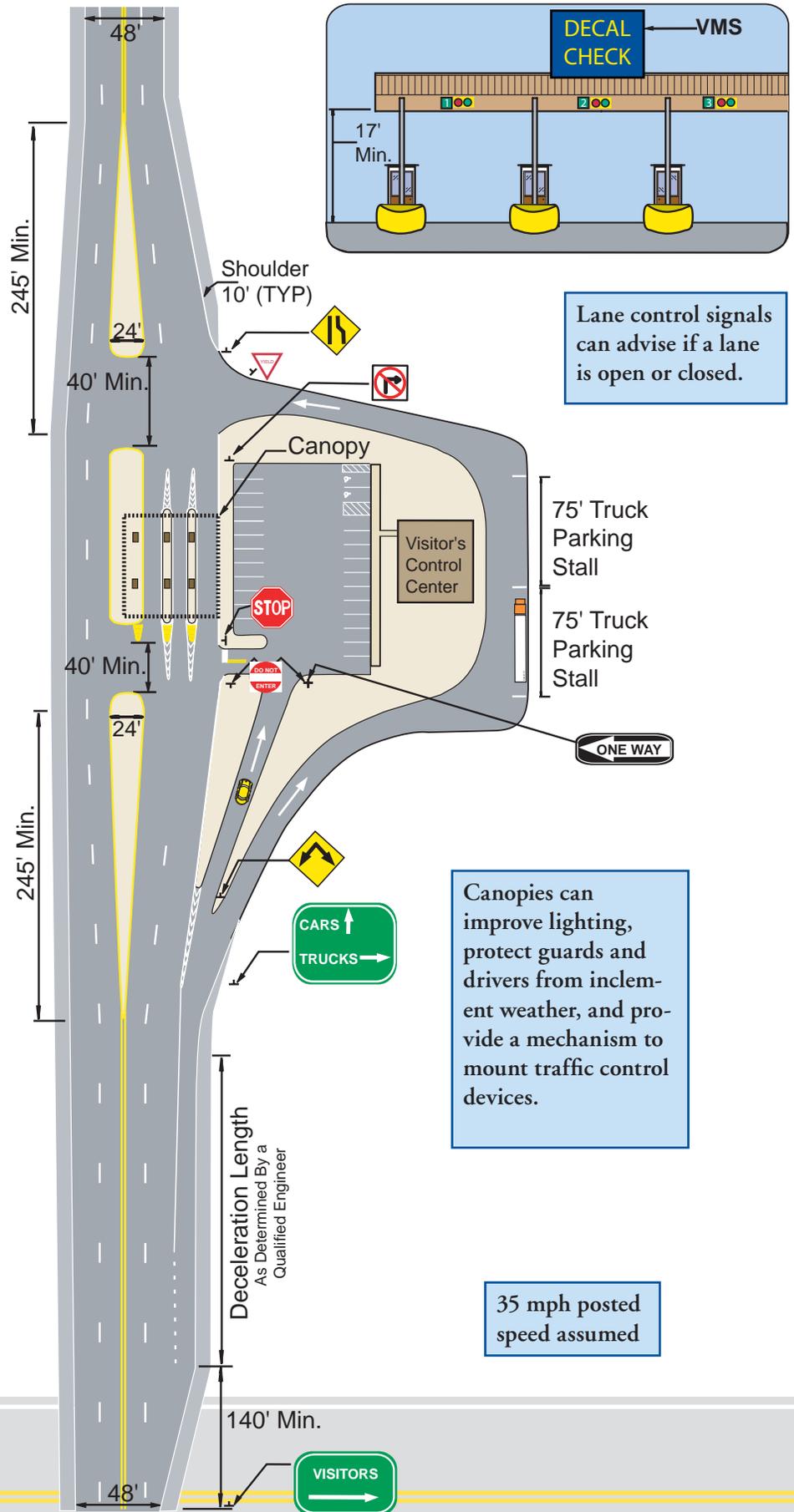
(two guards per lane) 250 - 500 vehicles per lane per hour

Medium security (Decal Check):

(one guard per lane) 400-600 vehicles per lane per hour



Tandem processing can improve capacity by up to 25 percent per lane.



Lane control signals can advise if a lane is open or closed.

Canopies can improve lighting, protect guards and drivers from inclement weather, and provide a mechanism to mount traffic control devices.

35 mph posted speed assumed

Secondary Gate

❖ High security (ID Check):

200-400 vehicles per lane per hour

Two islands: (two guards)
400-800 vph

One island: (one guard, assume one lane closed)
200-400 vph

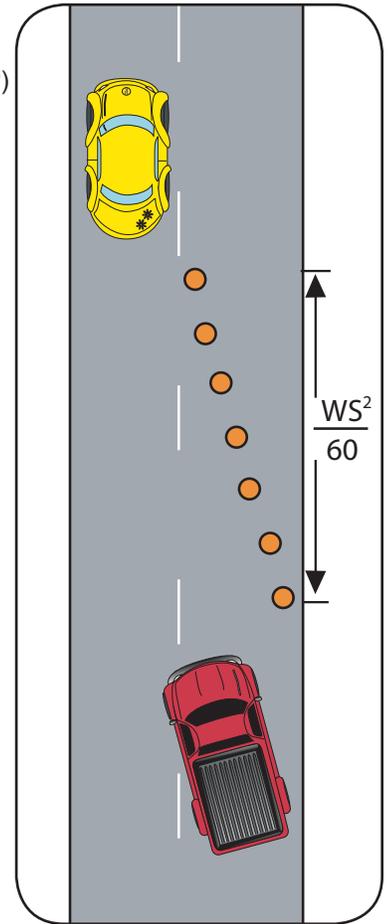
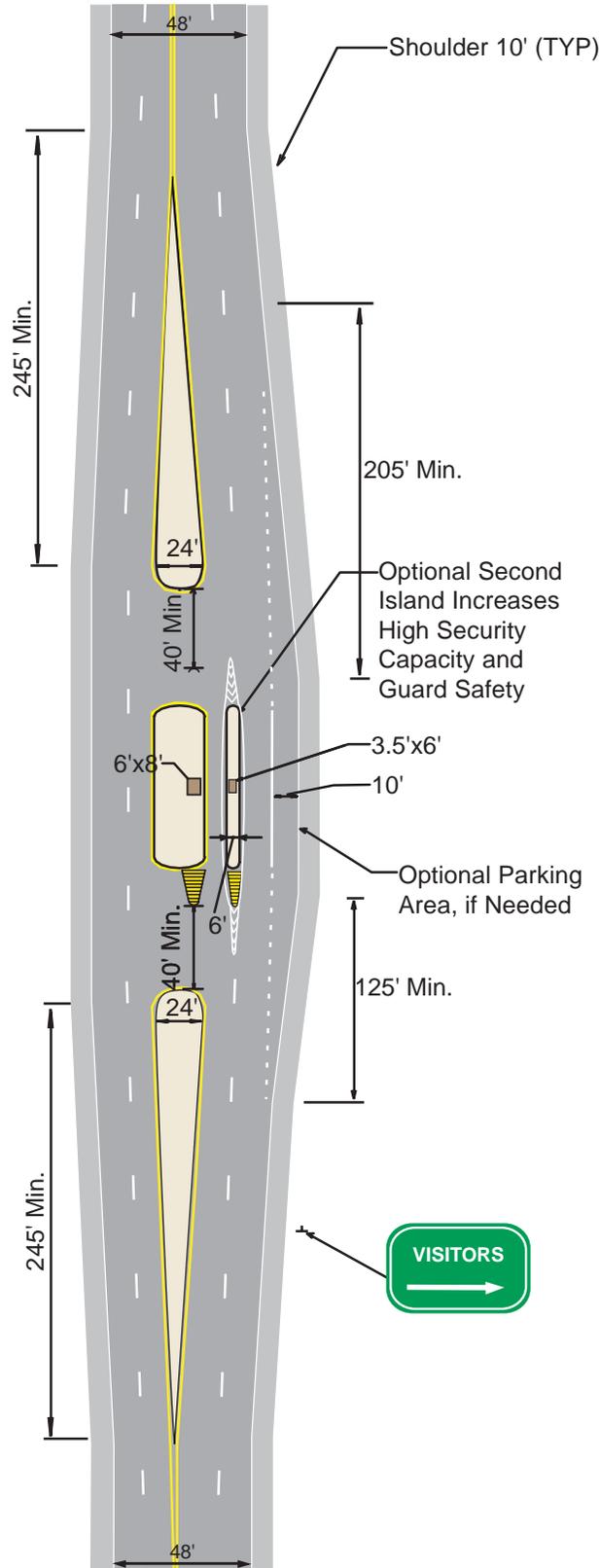
Note: See illustration to the far right for proper placement of traffic cones for channelizing traffic into the inside travel lane.

❖ Medium security (Decal Check):

(one guard per lane)
400-600 vehicles per lane per hour

Two islands: (two guards)
800-1200 vph

One island: (one guard for two lanes) 600-900 vph



Merging Lanes

When reducing processing at gates to one lane, traffic cones should be:

- ❖ Minimum of 18 inches high
- ❖ Reflectorized
- ❖ Either orange or the same color as the pavement marking that they supplement, or for which they are substituted
- ❖ Distance between cones in feet should equal the posted speed limit in mph

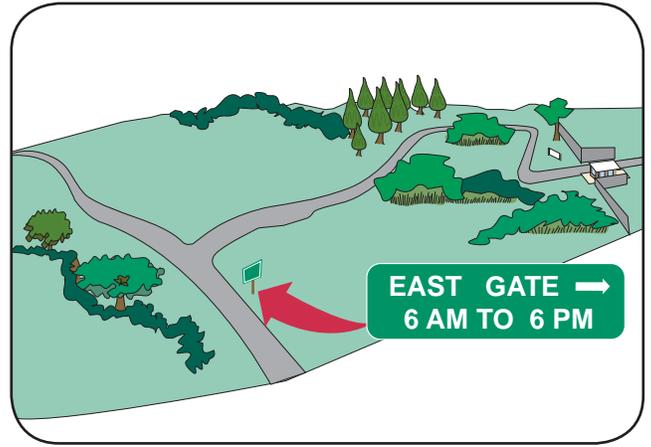
35 mph posted speed assumed

Limited Use Gate

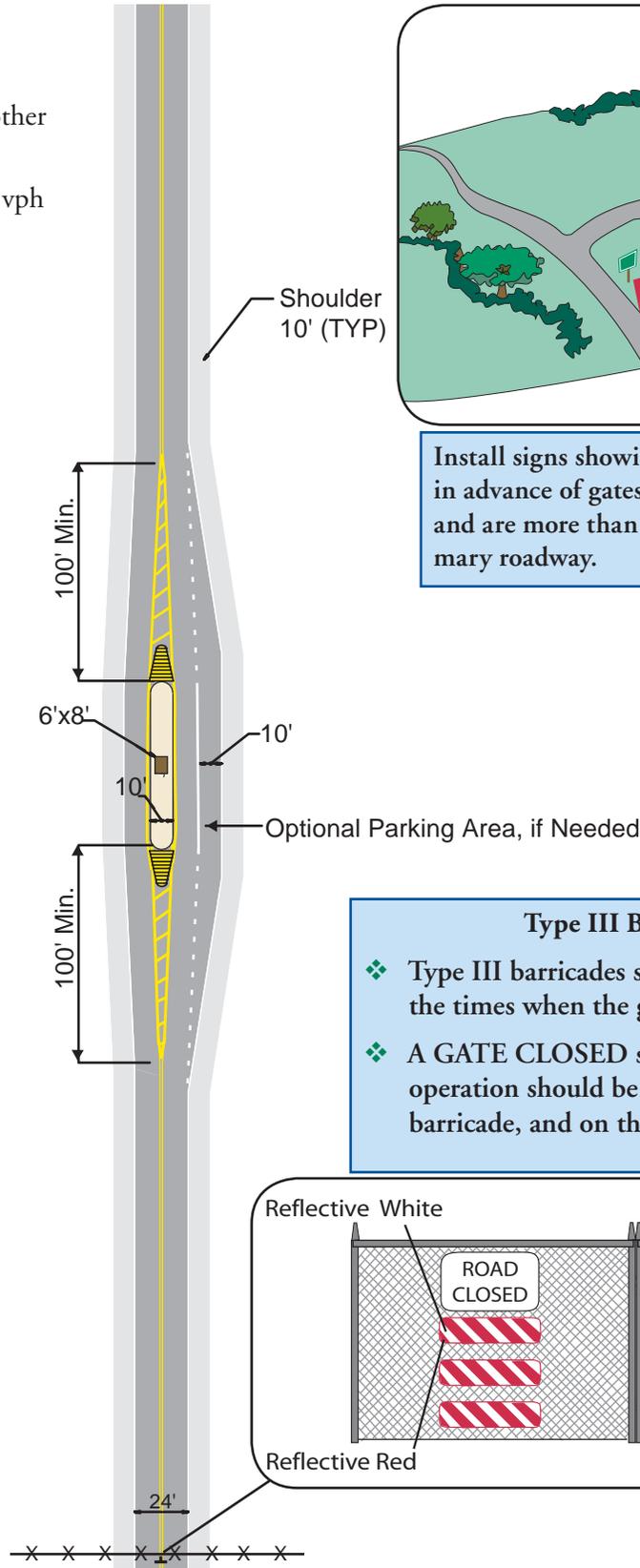
❖ **High security:** 0 vph*

*Close and direct traffic to other gates

❖ **Medium security:** 400-600 vph

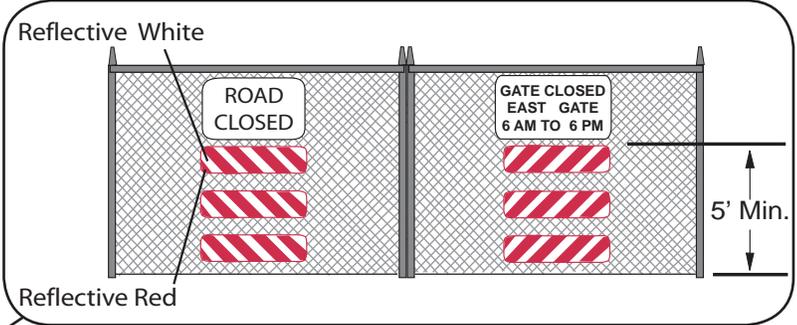


Install signs showing the hours of gate operation in advance of gates that have limited-use hours and are more than one mile away from the primary roadway.



Type III Barricades

- ❖ Type III barricades should be used during the times when the gate is closed to traffic.
- ❖ A GATE CLOSED sign listing the hours of operation should be installed prior to the barricade, and on the barricade as well.



35 mph posted speed assumed

Reference List

- ❖ American Association of State Highway and Transportation Officials. *A Policy on Geometric Design of Highways and Streets*. Washington. D.C. January 1996.
- ❖ American Association of State Highway and Transportation Officials. *Roadside Design Guide*. Washington. D.C. 1996.
- ❖ Military Traffic Management Command Transportation Engineering Agency. *MTMCTEA Pamphlet 55-17, Better Military Traffic Engineering*. Newport News, VA. January 1987.
- ❖ Federal Highway Administration. *Manual on Uniform Traffic Control Devices*. Washington D.C. December 2000.
- ❖ Military Traffic Management Command Transportation Engineering Agency. *MTMCTEA Pamphlet 55-15, Traffic Engineering For Better Gates*. Newport News, VA. December 1982.
- ❖ www.tea.army.mil



Training

Continuing Education	Phone	Web Site
Penn State University; The Penn Transportation Institute	(814) 865-4700	www.pti.psu.edu
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University of California Berkeley; Institute of Transportation Studies	(510) 231-9590	www.its.berkeley.edu/techtransfer/

Prepared with the assistance of  **Gannett Fleming**

William J. Cooper
Director, MTMCTEA

DEPARTMENT OF THE ARMY

Military Traffic Management Command
Transportation Engineering Agency
720 Thimble Shoals Blvd., Suite 130
Newport News, Virginia 23606-4537

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