

## Appendix E

# Breach Lane Marking

This appendix provides commanders with an Armywide standard system for breach lane and bypass marking. It centers around a systematic, phased upgrade of lane marking. Each upgrade conforms to the tactical requirements for that phase of the attack, from initial reduction of the obstacle to the passage of larger follow-on forces as well as the return traffic necessary to sustain the force.

Marking the breach lane or bypass is a critical subcomponent of obstacle reduction. Effective lane marking allows the commander to project forces through the obstacle quickly, with combat power and C<sup>2</sup> intact. It gives the assault force confidence in the safety of the lane and helps prevent unnecessary minefield casualties.

There are two critical components to any lane-marking system. They are the—

- Lane-marking pattern (the location of markers indicating the entrance, the lane, and the exit).
- Marking device (the type of hardware emplaced to mark the entrance, the lane, and the exit).

The lane-marking system outlined in this appendix centers around standardizing the marking pattern across the Army rather than standardizing the marking device. Standardizing the marking pattern is critical to offensive operations. A common lane pattern—

- Enables cross attachments and adjacent units to recognize breach lanes easily with minimal knowledge of a particular unit's tactical SOP.
- Gives all forces a standardized set of visual cues needed to pass through a lane safely and maintain their momentum.
- Facilitates quick conversion to the lane-marking requirements of Standardized Agreement (STANAG) 2889 (see *Figure E-8, page E-14*).

Until the Army adopts a standard lane-marking device, the commanders decide what hardware to use. This gives units a greater flexibility, allowing them to adopt a marking device tailor-made for their type of unit and operations focus (such as an armored or light force, mounted or dismounted attack, limited visibility, thermal capability); however, regardless of the type of device used, it must support the standard lane-marking pattern outlined in the following paragraphs. Therefore, commanders should consider the marking device guidelines and examples in this appendix before developing or adopting their own system. Theater-level commanders

should determine and standardize the device used based on the availability of resources and METT-T.

## LANE-MARKING TERMS

The following defined terms provide a common basis for discussing lane marking:

- Entrance markers.
- Handrail markers.
- Exit markers.
- Entrance funnel markers.
- Final approach markers.
- Far recognition markers.
- Guides and traffic control posts.

## Entrance Markers

Entrance markers indicate the start of a reduced lane through an obstacle. They signify the friendly side limit of the obstacle(s) and the point at which movement is restricted by the lane width and lane path. Entrance markers also indicate the width of the reduced and proofed path. Therefore, it is critical for the maneuvering force to distinguish the entrance point clearly, since it signifies the point at which passing vehicles can no longer adjust their movement in reaction to the situation (such as direct and indirect fire) without jeopardizing the force. Entrance markers must be visually different from handrail markers to help the force distinguish this critical point in the lane. The distance between entrance markers must be the same as the width of the reduced lane. Entrance markers placed a minimum of 4.5 meters apart indicate a lane capable of supporting mounted movement, while markers placed a minimum of 1 meter apart indicate a dismounted lane. When obstacle limits are vague or unknown (such as a buried minefield), the breach force uses its best judgment and marks the entrance wherever obstacle reduction and lane proofing begins.

## Handrail Markers

Handrail markers define the lane path through the obstacle as well as indicate the limits of the lane width. As a minimum, mounted and dismounted lanes will have a left handrail. Mounted and dismounted forces moving through the lane should keep the left handrail immediately to the left of their vehicle or person. The lane width is defined by the

entrance markers. Therefore, when only the left handrail is marked, drivers use both the entrance and handrail markers to gauge the lane width and lane path. As the operation progresses, lane marking may be upgraded to include both left and right handrails.

### **Exit Markers**

Exit markers indicate the far side limit of the reduced lane through an obstacle. For the passing force, the exit signifies the point at which movement is no longer confined to the lane path. Like entrance markers, exit markers must be distinguishably different from handrail markers; however, the exit may be marked the same as the entrance. Exit markers are placed to the left and right of the exit point and spaced the width of the reduced lane. This visual reference is critical when only the left handrail is marked. The combination of entrance markers, left handrail markers, and exit markers gives the driver and tank commander the visual cues (entrance and exit points, lane width, and lane path) to pass safely through a reduced lane.

### **Entrance Funnel Markers**

Entrance funnel markers augment entrance marking. They assist the small-unit commander in guiding the lead element of his combat column formation. As the platoons approach the funnel markers, they move into column formation. The V formed by the funnel markers forces the platoon into a column and assists drivers and tank commanders in making last-minute adjustments before entering the lane.

### **Final Approach Markers**

A final approach marker is a highly visible, more robust marker that augments the visual signature of entrance funnel markers. The final approach marker is critical when initial assault forces must maneuver to the breaching site. Normally, the initial assault force can observe the breaching area but cannot clearly distinguish entrance funnel markers. The final approach marker—

- Provides the assault force commander with a highly visible reference point toward which to maneuver his formation.
- Signals company team commanders to begin changing from combat column to column formation, with platoons in combat column.

### **Far Recognition Markers**

A far recognition marker is a highly visible marker located between the final approach marker and the friendly unit. It is primarily used when passing battalion-size forces through a lane where distance, visibility, or terrain do not allow the passing force direct observation of the final approach marker. When possible, far recognition markers should be different

from the final approach marker. The far recognition marker indicates the point at which forces begin changing their formation to posture for the passage. The far recognition marker triggers company teams to change to combat column formation. A single far recognition marker may serve up to two initial breach lanes when located 200 to 400 meters apart. Normally, one far recognition marker will not serve more than two lanes unless all the lanes of that breaching site are within a 500-meter front. Once lanes are upgraded to two-way traffic, far recognition markers are required for each two-way lane. Far recognition markers should be visually alterable so they can be distinguished from the far recognition marker of an adjacent lane(s). This assists the C<sup>2</sup> of large formations when passing on several adjacent lanes. When a far recognition marker serves more than one lane, a guide or traffic control post (TCP) is collocated with the far recognition marker nearest to the breach.

### **Guides and Traffic Control Posts**

A TCP or guide is a two-man team with communications means that assists the commander in controlling the movement of forces. When possible, military police (MP) should man TCPs. Initially, however, the commander may use other personnel as guides to man critical far recognition markers until MPs establish full TCPs. TCPs and guides provide the commander with a man on the ground to control traffic flow to appropriate lanes. When there are multiple lanes branching off a single far recognition marker, the TCP can assist in breaking parts of the formation off to various lanes. The TCP can also assist in modifying the traffic flow when lanes have been closed for maintenance or lane expansion or by enemy scatterable mines. The guide or TCP must give the assault force commander the azimuth and distance to the final approach marker, the device used for the approach marker, and the level of the lane-marking pattern. For light forces, guides may physically escort passing units from the far recognition marker to the lane entrance. In short, the TCP gives the commander the ability to make last-minute changes in the traffic flow, thereby giving him increased flexibility to react to the enemy situation.

### **LEVELS OF LANE MARKING AND PATTERNS**

There are three standard levels of marking for breach lanes and bypasses:

- Initial.
- Intermediate.
- Full.

Each lane-marking level provides an increase in lane signature and capability. Lane requirements change as a breaching operation matures from initial breach to the forward passage of large combat forces. Initial lane-marking requirements are driven by the nature of the fight through the

## **E-2 Breach Lane Marking**

obstacle. Marking must be rapid, providing only the bare minimum signature needed to pass small units (company teams and platoons) that make up the initial assault force through the obstacle. This contrasts with the lane requirements of later phases of an offense where larger units (battalion and above) are passed to subsequent objectives. Here, the lane signature must be more extensive and more visible. Lane marking must now guide larger forces over a greater distance to the lane's entrance without interruption. Two-way traffic becomes a priority for the simultaneous forward passage of combat units as well as the return traffic (such as ambulances and empty supply vehicles) necessary to sustain the force. With the increase in traffic volume comes more diverse forces and levels of driver experience. Lane-marking limits must be absolutely clear to the most inexperienced driver or crewman. Do not assume they have a knowledge of unit SOPs. A fully developed lane must support two-way traffic and be completely marked.

Bypasses are marked using the same lane-marking patterns, marking devices, and visual cues as any other lane. The only time there is special consideration for bypass marking is when it is expanded to support two-way traffic. While lanes through an obstacle are normally expanded to the left, bypasses are expanded away from the obstacle to minimize the effort involved in expansion.

Commanders must be aware of how the lane needs of the force change with the operation so they can anticipate lane-marking and lane-capability requirements. Integrating the levels of lane marking into the overall breaching plan ensures that the unit's needs are satisfied. Forces necessary to mark and upgrade lanes must be allocated and tasked with the mission. The phases of the scheme of maneuver and service support plan are the basis for analyzing lane requirements. The following paragraphs describe lane-marking patterns in detail and provide guidelines on when the commander should upgrade lane marking and lane capability.

### Initial Lane Marking

The initial lane-marking pattern is emplaced by the breach force immediately after the lane is reduced and proofed. It signals to the assault force commander that the lane is ready for traffic to pass through. Initial lane marking is kept to a minimum, centering on those markings needed to pass immediate assault forces (company teams and smaller) through the lane to seize the initial foothold on the objective. Normally, the assault force can observe the breach and does not need the more visual signature of a mature lane marking. The initial lane-marking pattern has the following components:

- Entrance markers.
- Left handrail.
- Exit markers.
- Entrance funnel.
- Final approach marker.

To ensure that the most critical components of lane marking are emplaced first, use the sequence described in the following paragraphs. *Figure E-1, page E-4* illustrates the initial lane-marking pattern.

The entrance, left handrail, and exit markers are the first markers emplaced by the breach force since they define the location and limits of the reduced lane. The entrance markers are placed to the left and right of the reduced lane's entrance point. Entrance markers are spaced the width of the lane (4.5 meters for mounted lanes, 1 meter for dismounted lanes). Left handrail markers are placed at the left limit of the lane along the entire path. Handrail markers are placed at 15-meter intervals for mounted forces and 5-meter intervals for dismounted forces. Commanders may have to modify the intervals based on terrain, visibility, lane length and lane path. Additionally, commanders may choose to mark both left and right handrails when the lane path is lengthy or unclear (for example, through a complex obstacle). Exit markers are placed to the left and right at the end of the reduced and proofed lane.

Once the entrance, left handrail, and exit markers are placed, the breach force emplaces the entrance funnel markers and the final approach marker. These markings enhance the visual signature of the lane entrance for the assault force. If the assault force is in a position to observe the obstacle reduction, the commander does not have to wait until the entrance funnel marker and the final approach marker are set to commit the initial assault force; however, the breach force continues to install the necessary markers to improve the lane signature for larger or subsequent follow-on forces maneuvering toward the lane. Funnel markers are placed at 15-meter intervals (5 meters for dismounted forces), diagonal to the lane entrance, to form a 45-degree V as shown in *Figure E-1, page E-4*. For mounted forces, the final approach marker is centered on the lane and placed at least 200 meters from the lane entrance. For dismounted forces, the nature of the attack may preclude using a final approach marker initially; however, as soon as the mission allows, it is placed 30 meters from the entrance. The commander may modify the recommended distance for the final approach marker based on the terrain and visibility.

### Intermediate Lane Marking

Upgrading initial lane marking to the intermediate pattern is triggered by one of two key events: commitment of larger combat forces unable to directly observe the breach or the rearward passage of sustainment traffic (casualty evacuation and vehicle recovery). Intermediate lane marking has two goals. It—

- Increases the lane signature to assist in the passage of larger, more distant combat forces.
- Provides sufficient marking for two-way, single-lane traffic.

## Breach Lane Marking E-3

Intermediate lane marking builds on the initial lane pattern by adding right handrail markers, exit funnel markers, far recognition markers, and a far side final approach marker. *Figure E-2* shows the intermediate lane-marking pattern.

The commander sets the priority of marker emplacement based on the situation. If the scheme of maneuver requires the immediate passage of larger combat forces, the right handrail markers and the far recognition marker may be the priority. On the other hand, if it is necessary to ground evacuate casualties or to recover vehicles, it may require emplacing right handrail markers, exit funnel markers, and a far side final approach marker first. Intermediate lane

marking gives the commander greater flexibility. For instance, with the initial foothold seized, a commander may be driven to upgrade all four breach lanes to the intermediate lane-marking pattern. This enables him to pass a follow-on TF on three lanes while using the fourth lane for his own sustainment traffic. Establishing a network of guides becomes increasingly important to direct the flow of forward and returning forces.

Regardless of the reason for an upgrade, the first step is to emplace the right handrail markers. Right handrail markers define the rightmost limit of the reduced and proofed lane. They are placed the width of the lane as defined by the

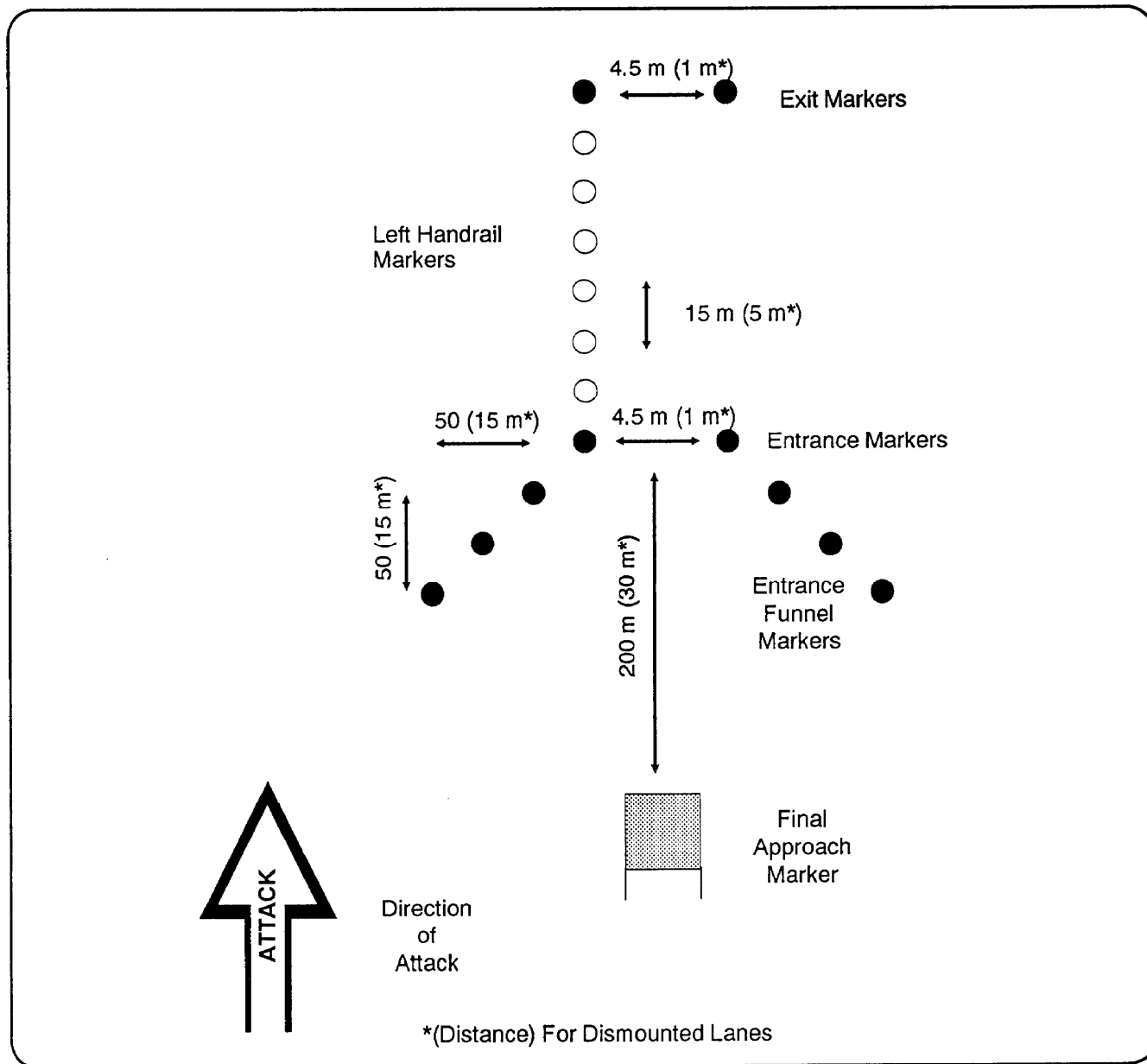


Figure E-1. Initial lane-marking pattern.

#### E-4 Breach Lane Marking

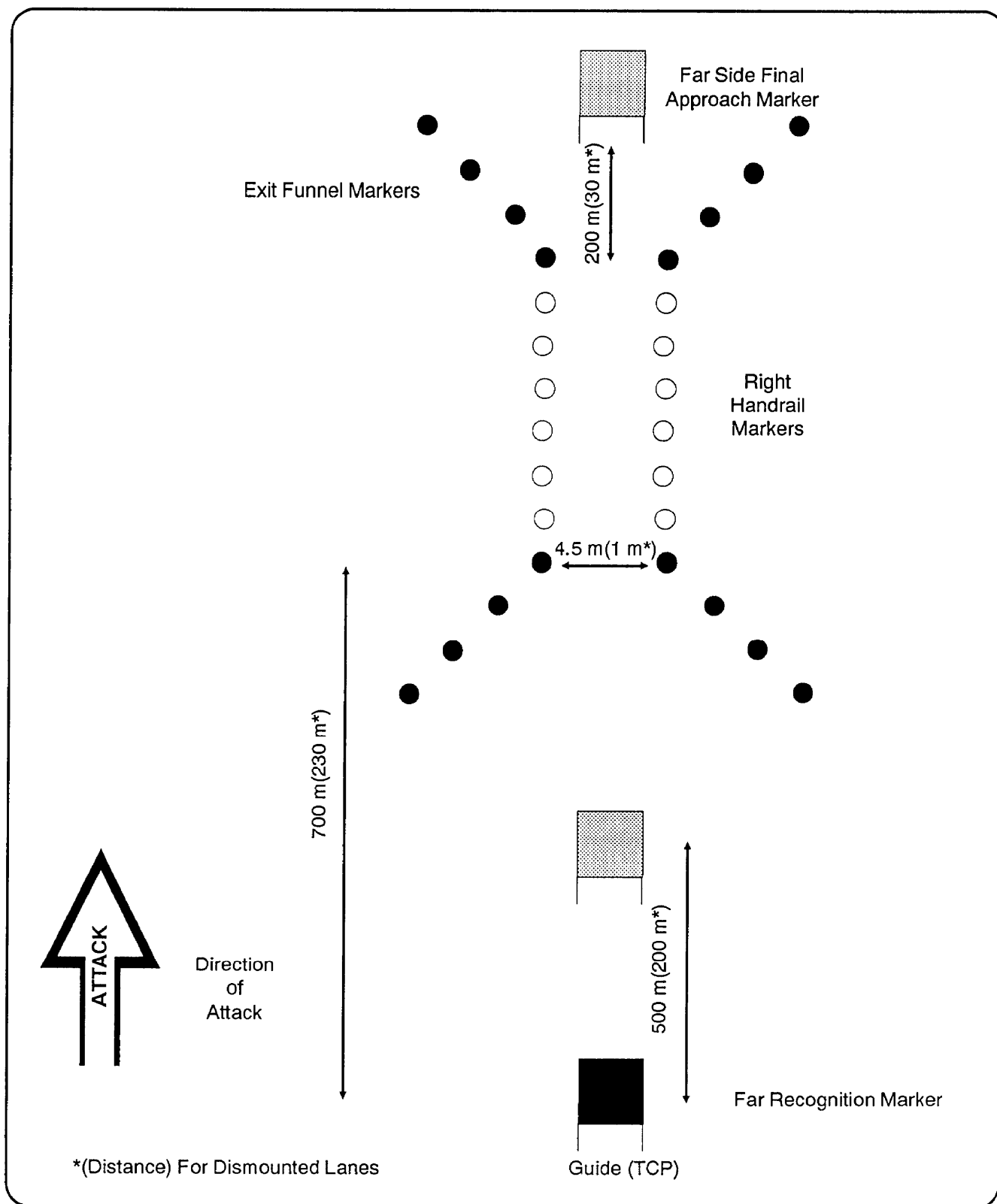


Figure E-2. Intermediate lane-marking pattern.

entrance and exit point markers. The right handrail follows a path parallel to the left handrail through the obstacle. Right handrail markers are placed at the same interval as left handrail markers.

Exit funnel markers and a far side final approach marker are emplaced to mirror the entrance markers. Exit funnel markers serve two functions. For the forward passage of large combat forces, they prevent the premature deployment of the passing force into combat formation before they are safely outside the obstacle. They also become the entrance funnel markers for rearward passing traffic, giving these forces the visual cues needed to line themselves up on the lane. The exit funnel markers are augmented by a far side final approach marker to help rearward-passing forces to clearly identify the lane from their side. The far side final approach marker is centered on the lane and placed 200 meters (30 meters for dismounted forces) from the exit (far side entrance).

A far recognition marker completes the intermediate lane-marking pattern. It provides commanders of larger combat formations with a visual signature, or series of signatures, on which to guide their movement toward the lane(s). When the assault force is moving over a greater distance to the lanes, additional far recognition markers may be required. For mounted forces, the far recognition marker nearest to the breach lane is placed 500 meters from the lane entrance or on the nearest terrain feature. Again, dismounted forces may require a system of guides instead of far recognition markers for passing combat forces; however, far recognition markers must be emplaced as soon as possible to reduce guide requirements for passing mounted sustainment traffic. This gives the assault force commander the space needed to transition his formation to companies in combat column. Far recognition markers may be emplaced before or concurrent with exit markers based on the mission and situation.

The commander collocates guides or TCPs at the far recognition marker when he feels the situation requires more positive control over traffic flow. Normally, the need to increase traffic control comes at the same time as the need for limited two-way traffic and intermediate lane marking. Commanders should plan for the use of full-time guides once they have upgraded to intermediate level marking. Guides or TCPs become mission critical during limited visibility or in restrictive terrain. They should also be used when a single far recognition marker feeds more than one breach lane. TCPs must be manned with a minimum of two soldiers and must have FM communications with the controlling headquarters. It is essential that soldiers acting as guides or TCPs know the—

- Azimuth and distance to the breach lane(s).

or

The 8-digit grid coordinate of the lane that is entered into the unit's Global Positioning System (GPS).

- Level of lane marking.
- Type of final approach marker used.
- Traffic control plan and march order.

Guides must be kept up-to-date on the status of lane marking, maintenance, and so forth.

### Full (Two-Way) Lane Marking

Expanding breach lanes to full lane marking is resource intensive and is normally not part of an initial breaching operation. A fully matured lane is one that will support uninterrupted two-way traffic. Expanding a breach lane to a full lane involves—

- Expanding the width of the lane to accommodate two-way traffic.
- Modifying the marking pattern to give forces passing forward or rearward the same visual signature.

Upgrading to a full lane is normally assigned to follow-on engineer forces, since it is usually beyond the immediate capability of engineers with forward units. In special cases, the commander may be forced to task engineers with forward units to expand and upgrade from intermediate to full lane marking; however, the trade-off is decreased support to forward units and delays associated with changing task organization. The full lane-marking pattern is also used when marking a lane through friendly obstacles along a major supply route or passage lane.

Upgrading an intermediate lane-marking pattern to a full lane begins by temporarily closing the lane, rerouting traffic, and expanding the lane width. The initial reduced and proofed lane is always expanded to the left in relation to the direction of the attack. Engineers reduce and proof the obstacle beginning at the left handrail to give a total lane width of 10 meters (5 meters each way). The expansion width requirement is the same for armored and light forces since both forces must be able to pass mounted sustainment and combat forces during this phase. When the lane is expanded through mechanical means, it is necessary to entirely remove the left handrail markers during expansion. Whenever possible, these markers should be left alone to serve as a reference point during lane expansion. If removed altogether, the left handrail must be replaced since it forms the left handrail for both forward and rearward passing forces.

Once the engineers expand the lane width to 10 meters, ensure that the entrance, exit, right handrail, funnel, and final approach markers are replaced on the return lane. All markings are the same as described in previous paragraphs. *Figure E-3* shows a full lane-marking pattern. The full lane-marking pattern has three entrance and three exit markers. Entrance and exit markers are placed the width of forward and return lanes and are visually different from other markers. Units must be trained to recognize that three entrance markers indicate a two-way traffic lane and that

## E-6 Breach Lane Marking

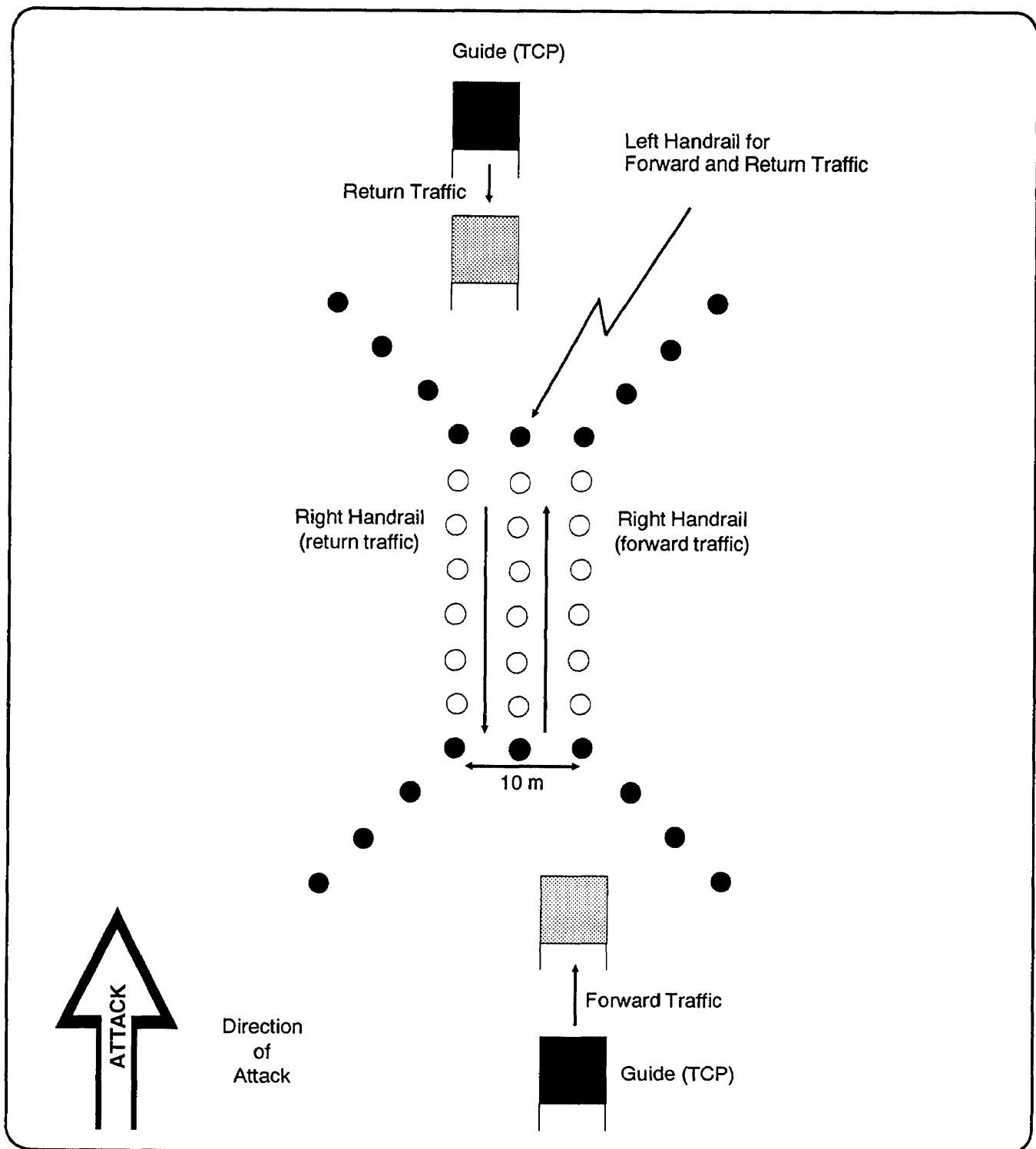


Figure E-3. Full lane-marking pattern.

they should always use the rightmost lane. Entrance and exit funnel markers are placed slightly different from previous marking patterns. In the full lane-marking pattern, funnel markers extend out from the entrance and exit

markers on the right side only. Final approach markers are placed 200 meters from and centered on entrances of forward and return lanes. This assists forces in clearly identifying the entrance points from either direction. Far

recognition markers are placed a maximum of 500 meters from the lane entrance or the nearest terrain feature from forward and return final approach markers. Again, distances may be modified based on the terrain, the visibility, and the mission.

### Commander's Guidance for Lane Marking

Table E-1 gives the commander a summary of lane-marking levels, guidelines on unit responsibilities, and events that trigger lane upgrade. The chart focuses on TF-level operations. For instance, the description of a deliberate breach assumes a TF deliberate breach. In the table, "who" refers to the unit responsible for lane upgrade

marking, and the "when" describes events that trigger the need to upgrade. "Markers" highlight a quick reference for lane-marking requirements.

### MOVEMENT THROUGH THE LANE

The standard lane patterns help the commander in two critical aspects of moving a unit through a lane(s):

- The lane markers help the force posture its formation for efficient passage through the defile that is caused by the lanes through an obstacle.
- The combination of lanes and TCPs gives the commander greater flexibility in the forward and rearward movement of forces.

Table E-1. Lane-marking levels, unit responsibilities, and trigger events.

	Breach Type	Initial	Intermediate	Full (2-Way)
Who	Deliberate	TF breach force	TF breach force	Brigade
	Covert	TF breach force	TF breach force	Brigade
	In-stride	Breaching company or team	TF mobility reserve	Brigade
	Assault	Assaulting platoon	TF assault force	NA
When		<ul style="list-style-type: none"> <li>• Lanes are reduced</li> <li>• Passing platoon- or company-size assault forces</li> </ul>	<ul style="list-style-type: none"> <li>• Passing battalion- or company-size forces</li> <li>• Passing a force which cannot see the lane</li> <li>• Passing TF combat trains</li> </ul>	<ul style="list-style-type: none"> <li>• Passing brigade- or battalion-size forces</li> <li>• Situation requires uninterrupted sustainment traffic</li> </ul>
Markers		<ul style="list-style-type: none"> <li>• Entrance/exit</li> <li>• Left handrail</li> <li>• Funnel entrance</li> <li>• Final approach</li> </ul>	<ul style="list-style-type: none"> <li>• Add: <ul style="list-style-type: none"> <li>– Right handrail</li> <li>– Funnel exit</li> <li>– Far side final approach</li> <li>– Far recognition</li> <li>– Guides/TCPs</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Expand lane width to 10 meters</li> <li>• Adjust: <ul style="list-style-type: none"> <li>– Entrance/exit</li> <li>– Left/right handrails to new width</li> <li>– Final approach</li> </ul> </li> <li>• Add: <ul style="list-style-type: none"> <li>– Far side recognition</li> <li>– Far side guides/TCPs</li> </ul> </li> </ul>



Far recognition and final approach markers in the standard lane-marking pattern help commanders of assault forces to change from combat formation to column formation smoothly before passing through the lane(s). In most cases, the situation should allow a unit to move in column formation from the outset; however, the enemy situation and terrain may demand that forces remain dispersed as long as possible. Far recognition, final approach, and entrance funnel markers are used to trigger commanders to alter their formations. Figure E-4 illustrates how formations at various levels must change to efficiently pass through the lanes. The battalion TF initially moves from its assault position in a box, V, or wedge formation depending on the number of lanes being used.

Initially, company teams and below may move in any combat formation. Once lead elements of the battalion visually identify the far recognition marker, company teams begin moving to combat column formation with platoons still deployed. Platoons change to combat column formation as they move from the far recognition marker to the final approach marker. Platoons change to column formation as they move from the final approach marker to entrance markers, using the entrance funnel markers as guides. Platoons redeploy once they pass through the exit or exit funnels.

As the attack progresses, commanders should upgrade lane marking and establish traffic control as early as METT-T will allow. The combination of upgrading lanes from the

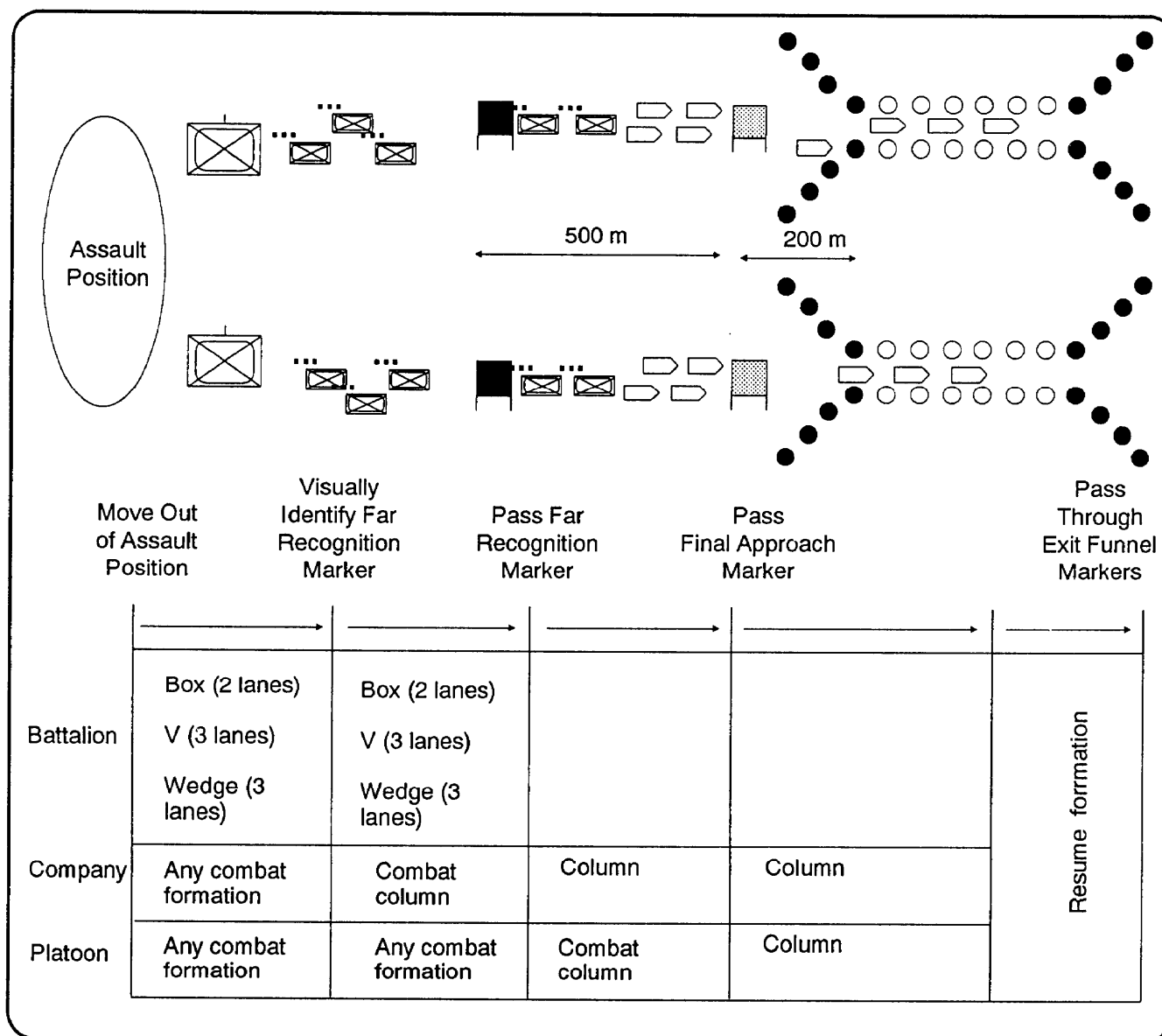


Figure E-4. Formation changes based on lane markers.

initial marking pattern and establishing TCPs gives the commander greater flexibility. Normally, TCPs are established at forward and return far recognition markers. Upgrading to a full lane capable of supporting uninterrupted two-way traffic is generally determined by the need to pass increased volumes of traffic. Consequently, the commander will need the increased control of traffic flow that TCPs afford him. TCPs at both far recognition markers become manpower intensive and require manpower dedicated to the task of traffic control.

Figure E-5 illustrates the flexibility that the combination of full lane marking and TCPs provide the commander. In this example, the force has reduced two lanes within 200 to 400 meters of each other at breaching site Red. Lane Red 1 is a full lane while lane Red 2 is marked to an intermediate level. One far recognition marker on the near and far sides can feed both lanes. The full lane marking and TCPs give the commander the ability to continue pushing combat power forward on lanes Red 1 and 2. At the same time, the far side TCP directs all return traffic to the lane Red 1.

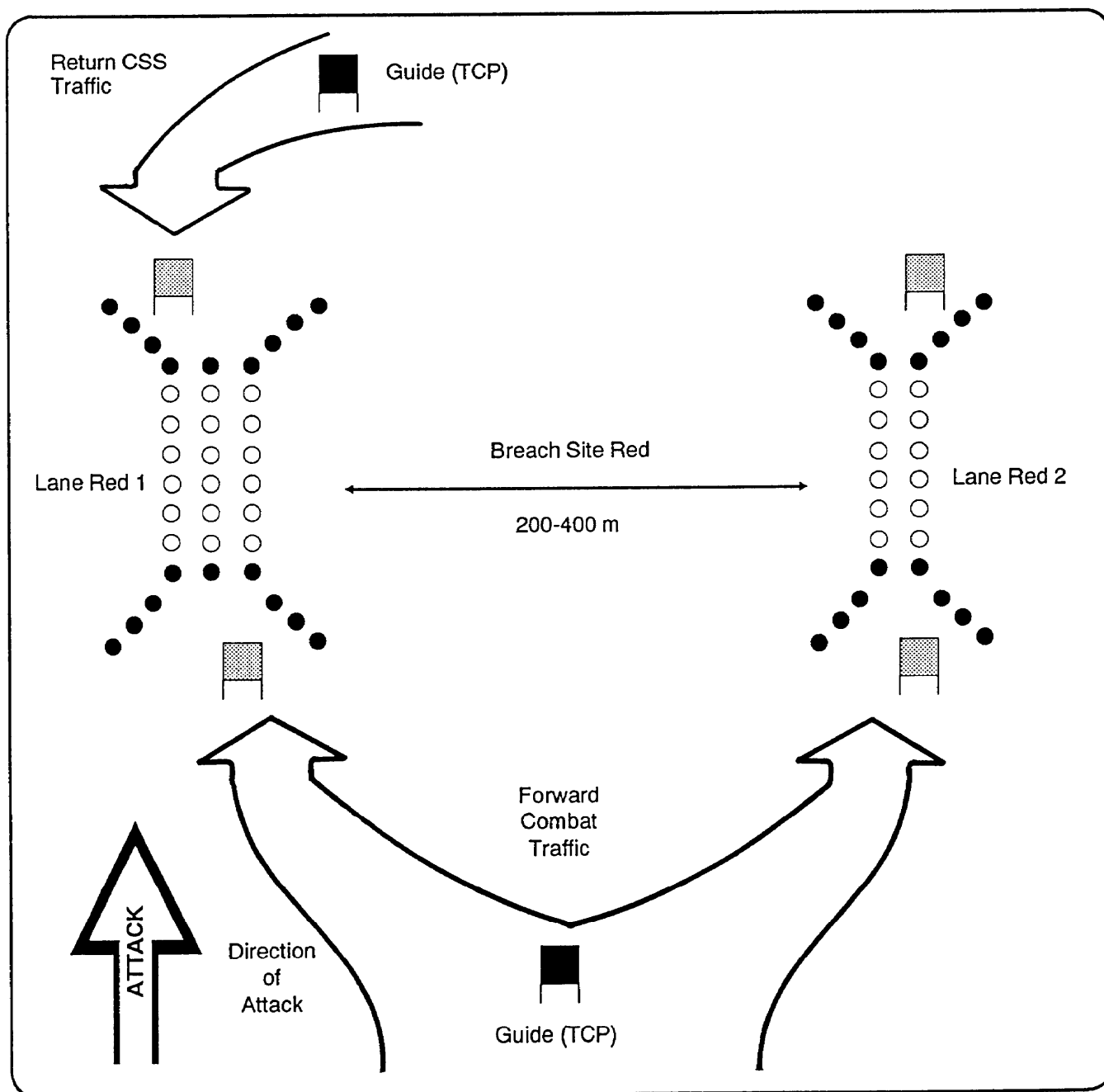


Figure E-5. Multiple lanes used at different levels.

## E-10 Breach Lane Marking

## LANE-MARKING DEVICES

Currently, the Army has no standard lane-marking device. Commanders recognize that the marking systems in the Army supply system do not meet the operational requirements of modern warfare. Those systems are the—

- Hand-Emplaced Minefield Marking System (HEMMS); national stock number (NSN) 9905-01-019-0140.
- Minefield Marking Set #2; NSN 9905-01-019-0140.
- CLAMS; NSN 2590-01-205-3082.

The majority of lane marking in the field is done using nonstandard marking devices. Before adopting a nonstandard marking device, commanders should consider the guidelines summarized in *Table E-2*.

*Figure E-6, page E-12* shows some of the devices currently used by units to make up for shortcomings in the supply system and that are easily procured or fabricated. This is by no means a complete listing; rather, it is intended to show commanders some of the options.

Some of the general requirements for lane marking areas follows:

- Markers must be able to withstand the rigors of the terrain, the weather, and the battlefield.
- Markers should be easy to modify when visibility is limited, with minimal addition of manpower and equipment.
- Enhancements for limited visibility should be a constant source rather than a pulsating strobe. Strobes do not make the marking pattern readily apparent, particularly when approaching from an angle.

## NORTH ATLANTIC TREATY ORGANIZATION (NATO) STANAG MARKING REQUIREMENTS

The following paragraphs paraphrase the breach lane-marking requirements outlined in NATO STANAG 2889. It also establishes the procedures used by US forces to modify intermediate and full lane-marking patterns to STANAG

*Table E-2. Guidelines for lane-marking devices.*

Marker	Mounted Forces	Dismounted Forces
<b>Handrail and funnel markers</b>	<ul style="list-style-type: none"> <li>• Visible by tank commander (TC) and driver buttoned up from 50 meters</li> <li>• Quick and easy to emplace, minimizing the need to expose soldiers outside the carrier</li> </ul>	<ul style="list-style-type: none"> <li>• Visible by a dismounted soldier in a prone position from 15 meters</li> <li>• Lightweight, quick and easy to emplace; a dismounted soldier should be able to carry enough markers for the lane and still be able to fire and maneuver</li> </ul>
<b>Entrance and exit markers</b>	<ul style="list-style-type: none"> <li>• Visible by TC buttoned up from 100 meters</li> <li>• Visually different from handrail and funnel markers</li> <li>• Quick and easy to emplace; may require soldiers to dismount to emplace</li> <li>• Easily man portable</li> </ul>	<ul style="list-style-type: none"> <li>• Visible by a dismounted soldier from 50 meters</li> <li>• Visually different from handrail and funnel markers</li> <li>• Lightweight, quick and easy to emplace</li> </ul>
<b>Final approach and far recognition markers</b>	<ul style="list-style-type: none"> <li>• Visible by TC (not buttoned up) from 500 meters</li> <li>• Visually different from each other</li> <li>• Visually alterable to facilitate traffic control through multiple lanes</li> </ul>	<ul style="list-style-type: none"> <li>• Visible by a dismounted soldier on the march from 100 meters</li> <li>• Visually different from each other</li> <li>• Visually alterable to facilitate traffic control through multiple lanes</li> </ul>

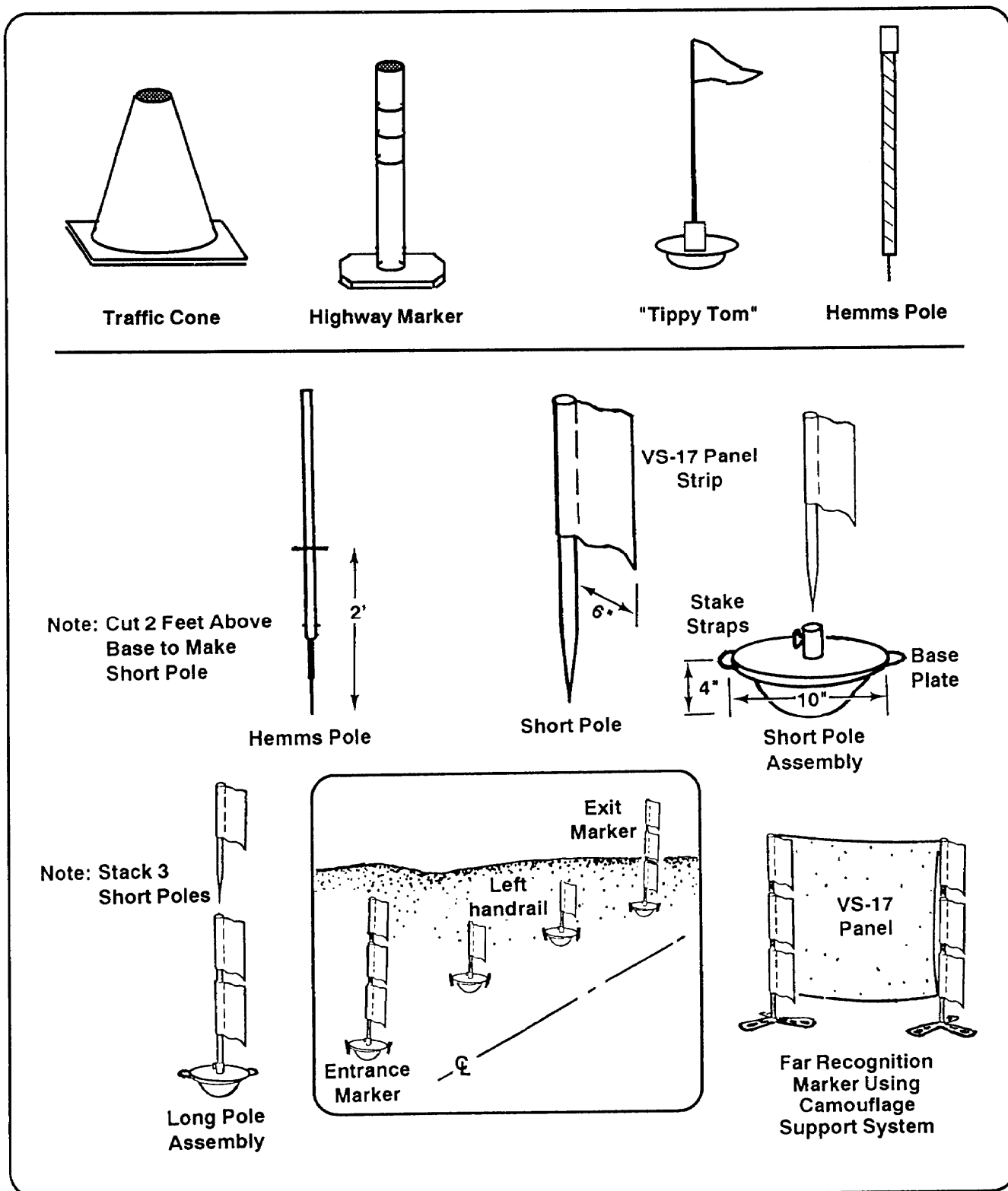


Figure E-6. Examples of nonstandard marking devices.

standard. The trend in modern warfare is increasingly toward combined operations. With the increased combined nature of warfare, commanders need to be aware of their responsibilities under NATO STANAG for marking hazardous areas, particularly breach lanes.

**The following paragraphs implement STANAG 2889.**

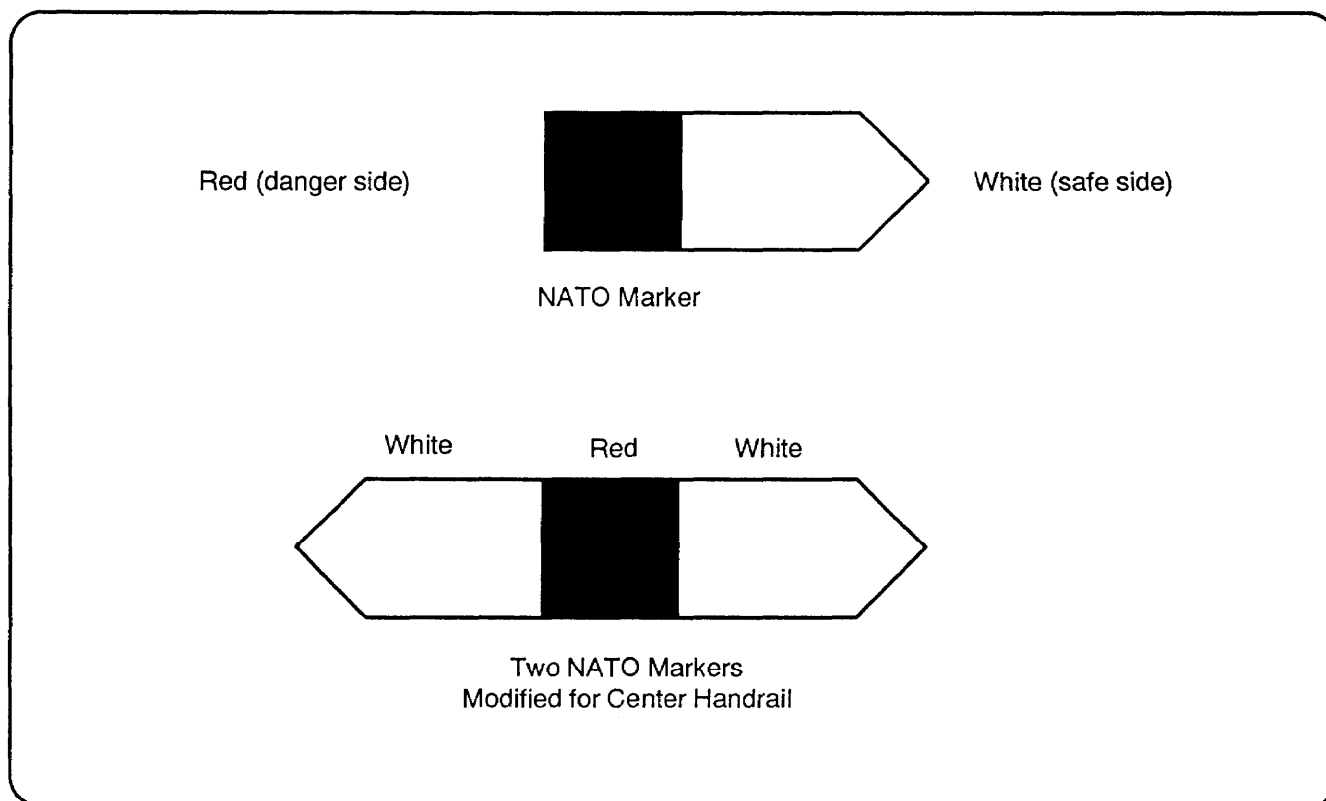
### **Commanders' Responsibilities Under NATO STANAG**

STANAG 2889 states that the type of marking device, pattern, and lighting used to mark breach lanes in forward areas is at the discretion of national authorities or the authorized commander. This gives commanders participating in a combined operation the flexibility to mark lanes consistent with their respective Army's standard. It also outlines minimum requirements for the lane-marking pattern before it is used by troops of other nations; however, commanders must plan for converting a lane to NATO standard as early as possible. When converting to NATO standard, the STANAG directs commanders to use lane-marking devices as stated below. Within an offensive operation, this will normally not occur until the lane is matured to a full lane as described previously.

### **NATO STANAG Marking Pattern and Device**

The intermediate lane-marking pattern discussed earlier satisfies the minimum lane-marking pattern that must be used before forces from another country are to pass through a lane. STANAG 2889 states that regardless of the marking device used, the lane entrance point, exit point, and left and right handrail are the minimum required lane signature. Furthermore, the STANAG requires that the entrance and exit of a lane be distinguishably different from other markers and that handrail markers be placed at intervals no greater than 30 meters. These requirements are met once lane marking is upgraded to the intermediate or full level. Therefore, once the lane is marked to the intermediate level, commanders can use the lane for allied forces to pass through without any additional marking.

STANAG 2889 requires that commanders convert marking devices to NATO standard as early as possible. Figure E-7 shows a NATO standard marking device. Minefield Marking Set #2 contains enough NATO markers and lights to mark 200 meters of lane; however, the set does not contain the long pickets and barbed wire necessary to emplace the full NATO standard marking. The NATO standard marker is placed at right angles to the direction of travel. It is placed so the white portion of the arrow points inward to the lane indicating the safe side on which to pass. The red portion is outward



*Figure E-7. NATO standard marker.*

indicating the lane limit or dangerous side of the lane. Units may fabricate NATO markers if they cannot get them through the supply system. STANAG 2889 requires that markers be large enough to be visible from 50 meters undermost daylight conditions and have a field life of 60 days.

### Conversion to NATO Standard Marking

To convert intermediate and full lane marking to NATO standard, affix NATO markers to long pickets and replace

the existing entrance, exit, funnel, and handrail markers one for one. *Figure E-8* illustrates how the NATO markers are used to convert existing intermediate and full lane-marking patterns. Two NATO markers are used at entrance and exit markings to make them distinctly different. One NATO marker is affixed to each funnel marker and to each left and right handrail marker. When converting a full lane-marking pattern, the center handrail is marked with a modified NATO marker as shown in *Figure E-8*. Since international forces

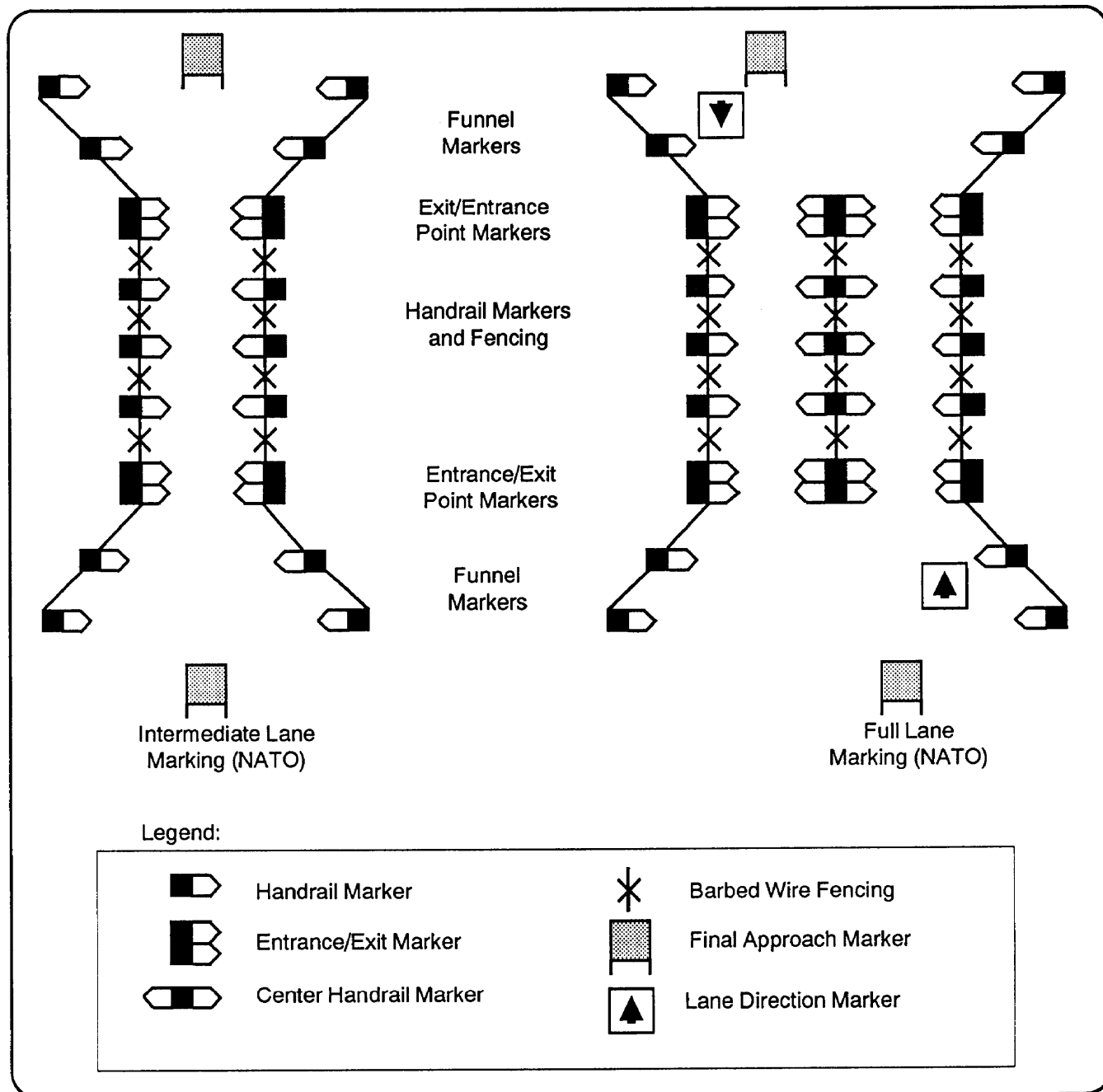


Figure E-8. NATO STANAG lane-marking conversion.

may not be accustomed to using the right lane, directional arrows must be placed to clearly identify lane traffic direction. The combination of modified center handrail marker and directional arrows at each lane entrance provides allied forces the signature necessary to distinguish two separate lanes. In addition, a barbed wire or concertina fence (one strand minimum) is laid 1 meter above the ground to connect funnel, entrance, and handrail markers and exit pickets.

NATO uses white or green lights to illuminate markers at night. Entrance and exit markers are marked with either two green or two white lights placed horizontally so the safe and

dangerous markings on them are clearly visible. One white or green light is used on funnel and handrail markers. The commander decides whether the light is placed on top of the NATO marker or placed so that it illuminates the markers (see *Figure E-9*). Lights must be visible from a minimum of 50 meters under most conditions. Light sources for nighttime markers must have a continuous life of 12 hours.

The mission to convert intermediate or full lane-marking patterns to NATO standard is normally assigned to the corps-level engineer battalions working in the division rear area. In special cases, divisional engineer battalions may be tasked

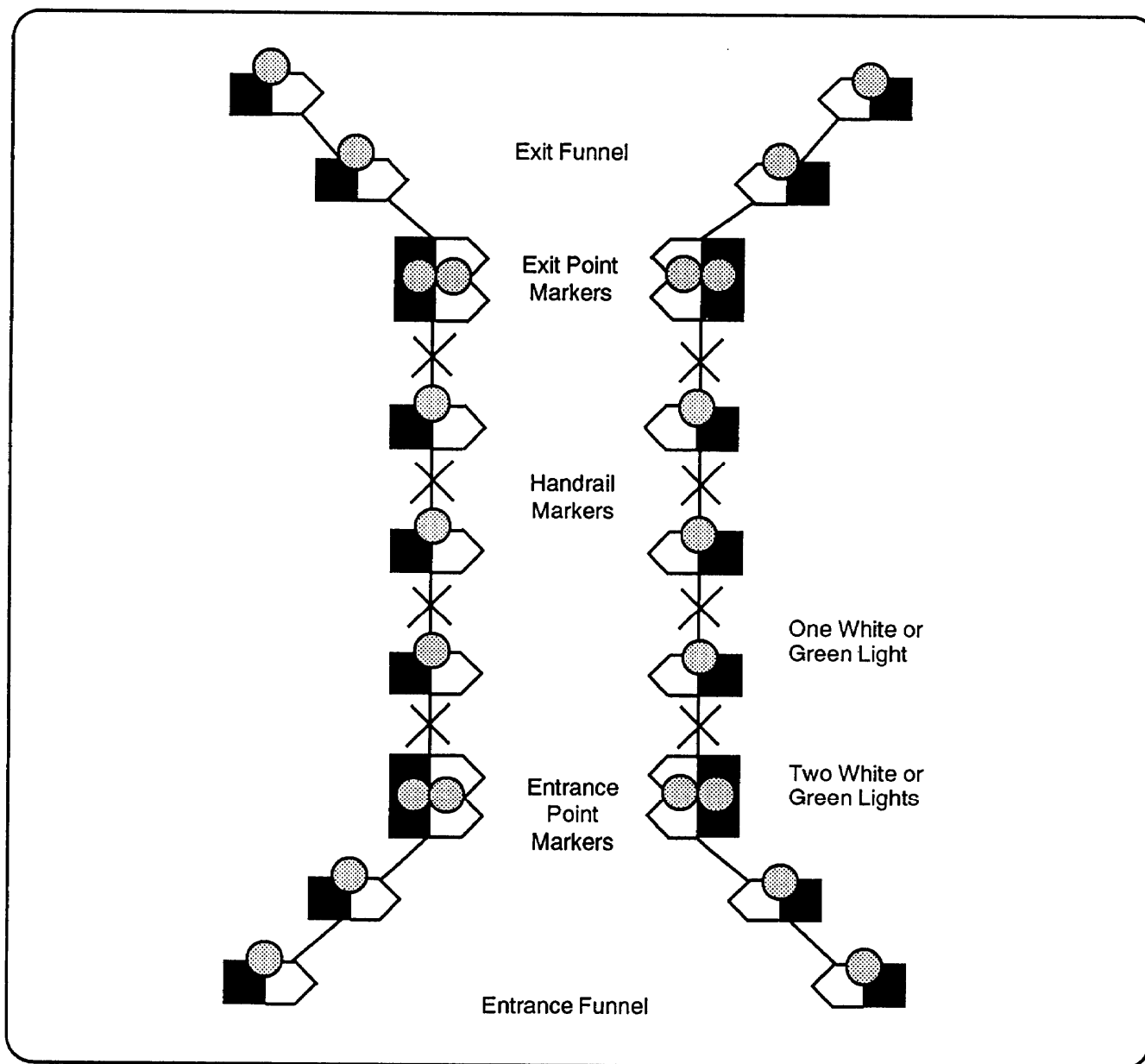


Figure E-9. NATO standard marking for limited visibility.

with NATO marking; this is the exception, not the rule. Therefore, every engineer battalion must maintain a basic load of Minefield Marking Sets #2, as well as the necessary long pickets and barbed wire. Each divisional engineer battalion will maintain eight Minefield Marking Sets #2, giving them the ability to mark 1,600 meters of lane. Engineer

battalions at the corps level and above will maintain 16 Minefield Marking Sets #2, giving them the capability to mark 3,200 meters of lane. NATO marking material will be maintained by the headquarter and headquarters company (HHC) of each engineer battalion. It is normally not distributed to companies until it is required by the mission.