

Safe Operations at Roadway Incidents



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- Based on a 6 part series of articles by Ron Moore in Firehouse® magazine
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Photos by Ron Moore

If this is how you currently operate while working in or near moving traffic, you are a prime candidate to be the next "Struck-by" incident.

Don't think it can't happen to us!

2002 U.S. "Struck-by" Line-of-Duty Deaths

March 20, 2002: Gluckstadt, MS — Firefighter struck and killed. Working an MVA on an interstate, struck by motorist while crossing the road.

March 25, 2002: Greenvale, NY — Two firefighters struck. One killed and one seriously injured. Driver under the influence ran through road barricades and struck them at the scene of a training exercise.

April 11, 2002: Russell, KS — Fire chief struck and killed by a fire truck responding to the scene of a motor vehicle accident. The chief was directing the engine where to position at the scene. The brakes failed and crushed the chief between the rear of an SUV involved in the first accident and the front of the engine.

June 8, 2002: Wildwood, FL — Firefighter and doctor struck and killed. Four others injured when a group of people helping victims of an MVA were struck by a tractor-trailer that lost control on wet roads approaching the scene.

July 1, 2002: Esko, MN — One firefighter killed and five others injured while battling a car fire on I-35, about 35 miles south of Duluth. Two firefighters, a police officer, and two civilians were injured, when a northbound pickup truck towing a camper-trailer in the left lane failed to slow down enough as it approached the emergency vehicles. The truck slammed into a car that had slowed, causing the car to careen over to the right shoulder, glance off of a squad car and then hit the burning car parked in front of it.

Aug. 13, 2002: Wichita West, TX — A firefighter was killed when he was run over by the brush truck he was working on, after it was struck by a pickup. The pickup drove through heavy smoke from the grass fire and hit the fire truck while it was attempting a U-turn, a legal maneuver for the emergency vehicle. The impact knocked the firefighter off the cage on the front bumper, officials said. The fire truck ran over him, and he was killed instantly.



No one else thought it would happen to them, either.

Yes, It does happen!!



- Line-of-duty death statistics show working in or near moving traffic places responders at a significant risk of injury or death.

It's not just us!



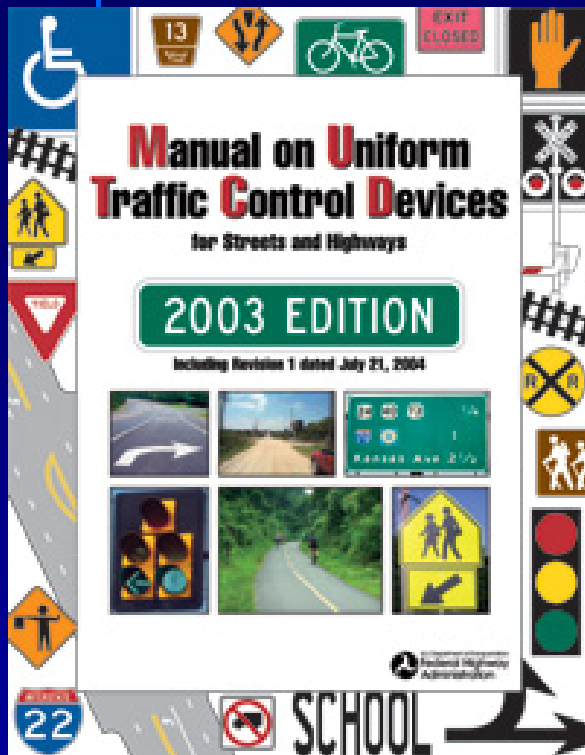
Don't be lulled into complacency just because the Police are on scene.

What can we do?



Manual on Uniform Traffic Control Devices

MUTCD



- The Federal Highway Administration publishes the **MUTCD**
- The **MUTCD** is adopted by reference in accordance with Title 23, United States Code, Section 109(d) and Title 23, CFR part 655.603
- The **MUTCD** is approved as the **National Standard** for designing, applying, and planning traffic control devices.
- All traffic control devices we use and actions we take as emergency responders must comply with **MUTCD** standards

Temporary Traffic Control Zone (TTC)

- A **Temporary Traffic Control (TTC) Zone** is an area of a highway where road user conditions are changed due to a work zone or an incident.
- Any incident that affects normal traffic flow on a roadway legally creates a **TTC Zone**.
- The primary purposes of temporary traffic control at a highway incident are:
 - To move traffic safely & efficiently through and around the incident
 - To reduce the likelihood of secondary crashes
 - To insure the safety of those working in or near moving traffic

Traffic Incident Management Area

- A **Traffic Incident Management Area** is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a road user incident, natural disaster, hazardous material spill or other unplanned event.
- It is a type of **Temporary Traffic Control Zone** and extends from the first warning device (sign, light or cone) to the last **TTC** device or where vehicles return to the original lane assignment and are clear of the incident.

Type of Traffic Incidents

- **Minor** – Expected duration under 30 minutes
- **Intermediate** – Expected duration of 30 minutes to 2 hours
- **Major** – Expected duration of more than 2 hours.

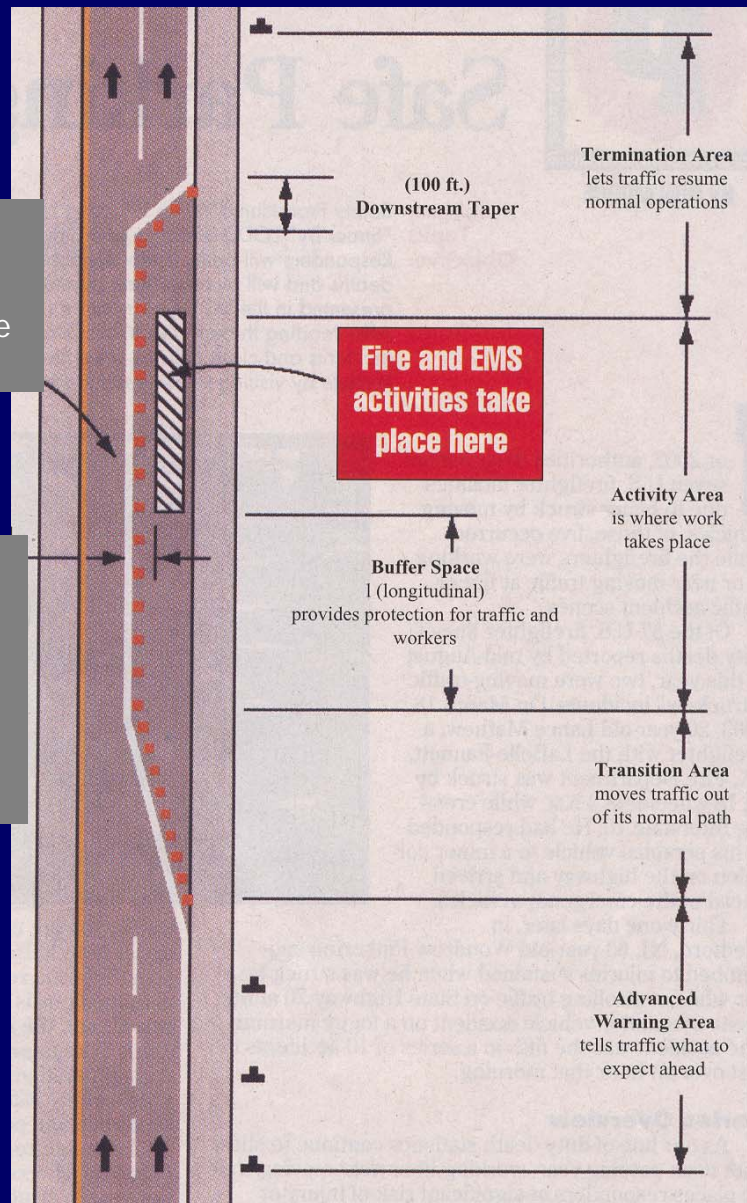
Get In – Do Your Job – and Get Out in Less Than 30!

According to Section 6G-2 of the newly revised *Manual on Uniform Traffic Control Devices* (MUTCD), if we want our on-scene activities to be considered temporary and of short-duration, then they cannot exceed 30 minutes. MUTCD calls this a minor duration traffic incident. If we are there longer than that, then it is considered that we have established an intermediate (30 minutes to two hours) or major duration (more than two hours) work zone and additional, more stringent DOT regulations and highway management requirements apply.

For example, an intermediate-duration work zone requires advance warning for a minimum of a half mile before the same incident scene that would only require 300 feet of warning if we were there for just a short time; say 20 minutes or less. In addition, advance warning for a short-duration work zone can legally be just one vehicle with a flashing light to notify approaching traffic of the hazards ahead of them. The same crash scene, once we are there longer than one hour legally becomes an intermediate-duration work zone and may require as many as 75 or more cones plus warning signs to comply with the DOT advance warning guidelines.

—Ron Moore

MUTCD Temporary Traffic Control Zone



The 4 components of a Temporary Traffic Control Zone:

1. **Advanced Warning Area**
 1. Tells traffic what to expect ahead
2. **Transition Area**
 1. Moves traffic out of it's normal path
3. **Activity Area**
 1. Where work takes place
 1. Buffer space
 1. Longitudinal
 2. Lateral
 2. Work space
4. **Termination Area**
 1. Lets traffic resume normal flow.

Advanced Warning Area

- The section of roadway where drivers are first informed about the incident they are approaching.
 - Advanced warning may vary from a single sign or warning light on a vehicle to a series of signs, cones, flares or emergency vehicles far in advance of the actual incident scene.
 - On urban streets, DOT guidelines consider effective placement of the first warning that a motorist encounters to be a distance in feet equal to 8 times the posted speed limit. (ie. $8 \times 40 = 320$ feet)
 - On rural highways, normally characterized by higher speed limits, that distance can be almost one mile.
- The most current NFPA 1500 requires a retro-reflective highway safety sign be deployed as advance warning. This fluorescent pink sign must contain the wording "Emergency Scene Ahead".



Advanced Warning Area

(CONTINUED)

Recommended Advance Warning Distances



- **Urban Street – Low posted speed limit**
300 feet before incident area
- **Urban Street – Higher speed limit**
1,050 feet before incident area
- **Rural Road**
1500 feet before incident area
- **Expressway / Freeway**
5,140 feet before incident area

Transition Area

- Section of the highway where traffic is redirected out of the normal driving path
- Transitions are through a process of channelization.
- Fire/Rescue typically uses traffic cones, flares and vehicles to create a “merging taper” to move traffic past an incident.



MUTCD states that temporary traffic control at incident sites should be designed on the assumption that drivers will only reduce their speed if they clearly perceive a need to do so.

Activity Area

The Most Critical Area at a Highway Incident

■ Comprised of:

- **Work Space** – area reserved for emergency response personnel, where work activities including; EMS, Fire Safety, and Extrication tasks takes place
- **Buffer Space** – distance between workers and moving traffic
- **Traffic Space** – lanes of highway that traffic use to drive past the incident



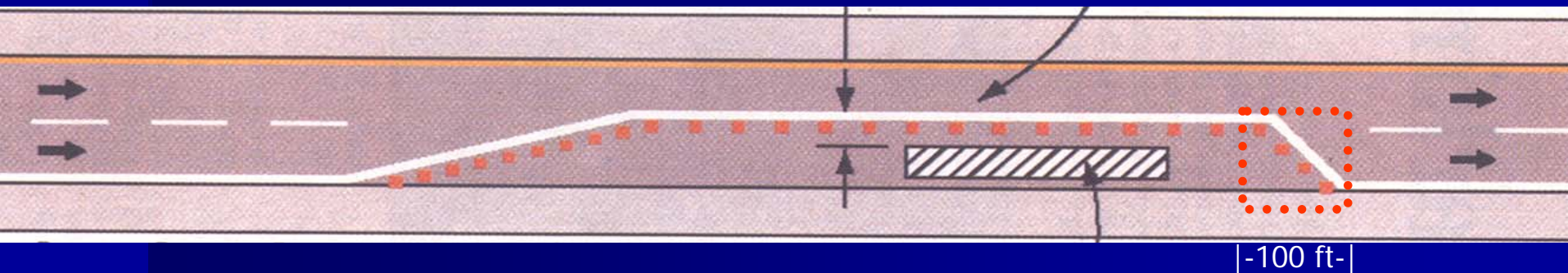
Work
Space

Buffer
Space

Traffic
Space

Termination Area

- This area is where drivers are allowed to return to their normal travel paths and resume normal speeds.
- It begins as the drivers pass the work area and proceed away from the scene.
- A downstream taper ~ 100 feet in length



Highway Terminology

- Standardized names have been developed to identify specific features of any roadway.
- First arriving unit officers can use these standardized terms at a highway incident to direct the placement of apparatus and personnel
- Common highway terminology will reduce confusion, improve responder safety, and make operations at the scene more efficient

* Terminology *

Lanes of the Roadway

- Lanes of a roadway can be identified numerically

Lane Numbering Information:

The lanes for Maryland State Highways are referred to by number for identification purposes. For your travel direction, start from the left shoulder or median and the first travel lane (left lane) is lane 1, lane 2 would be to the right of that and so on.



Note: Other states number from right to left

Terminology

(continued)

- **Right & Left** – Facing in the direction of traffic flow, Left is always the driver's left and right is to the driver's right.
- **Inside & Outside** – Inside refers to the driver's left side of the highway and is commonly used to refer to the middle median or divider. Outside is the far right of the traveled lanes.
- **Upstream & Downstream** – Upstream is the area of the highway or any moving traffic that is approaching the incident. Downstream refers to the area that is past the incident scene.
- **Block** – Positioning apparatus at an angle across one or more lanes of traffic to shield the activity area.
- **Activity Area** – The area on the downstream side of a blocking apparatus.
- **Taper** – When emergency responders use signs, cones, flares, or blocking apparatus to direct approaching traffic from the normal traffic lanes into fewer lanes

Traffic Blocking Procedures

- The process of blocking is done by the apparatus driver just as the vehicle comes to a stop.
- The intent is to physically block the incident lane or shoulder plus one additional lane.
- Normally this duty is assigned to the engine company, although some jurisdictions dispatch ladder companies just for this purpose.



Ladder Trucks are bigger and heavier affording more protection.



Ambulance Positioning



- All ambulances must be positioned in a protected location at a highway incident scene.
- Many line-of-duty deaths have occurred during patient loading; a time when everyone is looking into the ambulance with their back turned to upstream traffic
- The downstream protected activity area created by the block of a major apparatus is the first place to consider.
- The goal being to maximize protection of the patient loading area at the back of the vehicle, the driver should complete a slight right or left block to place the rear of the vehicle away from moving traffic.

North

Incident Scene

Lane 3 NB

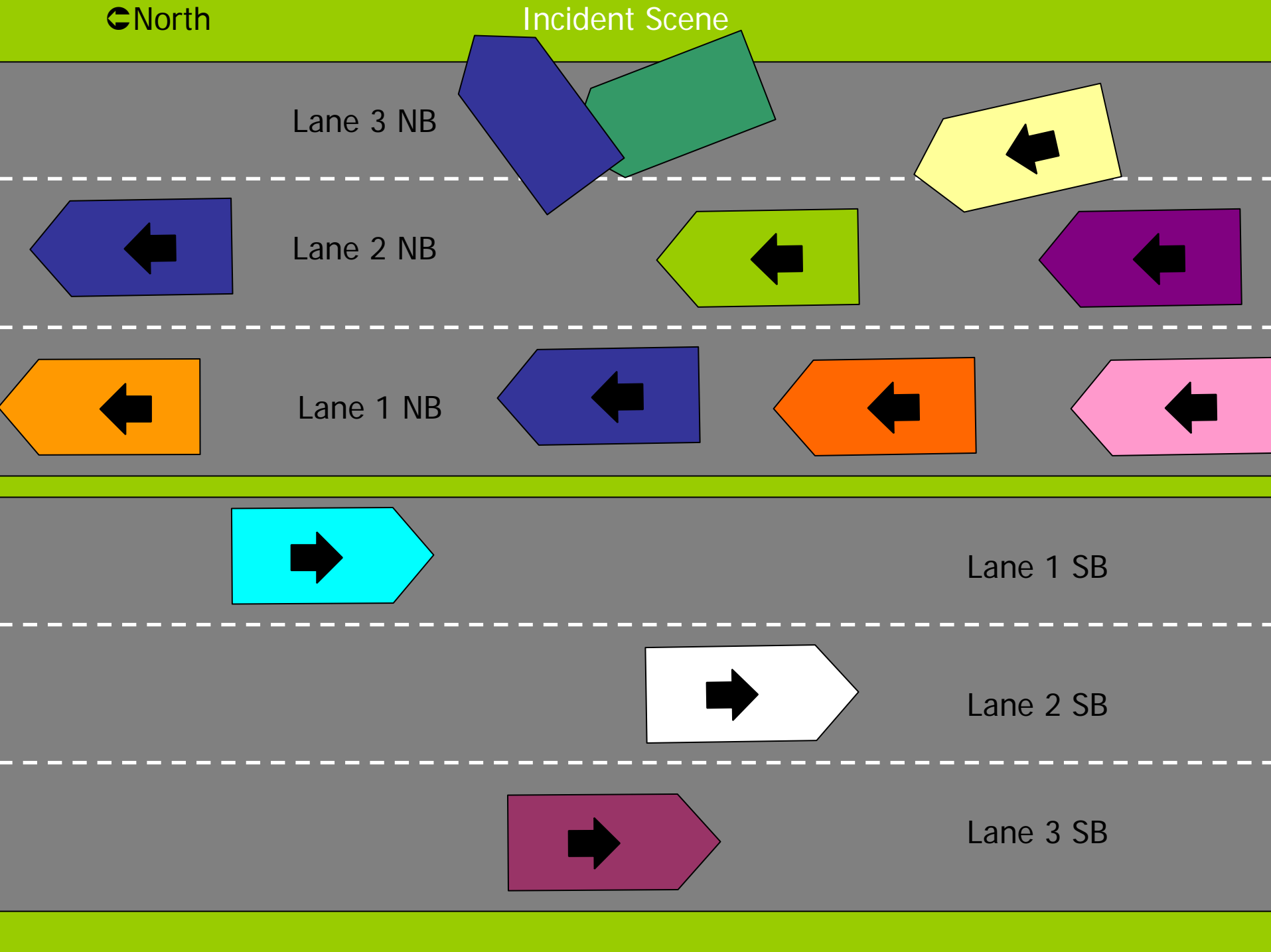
Lane 2 NB

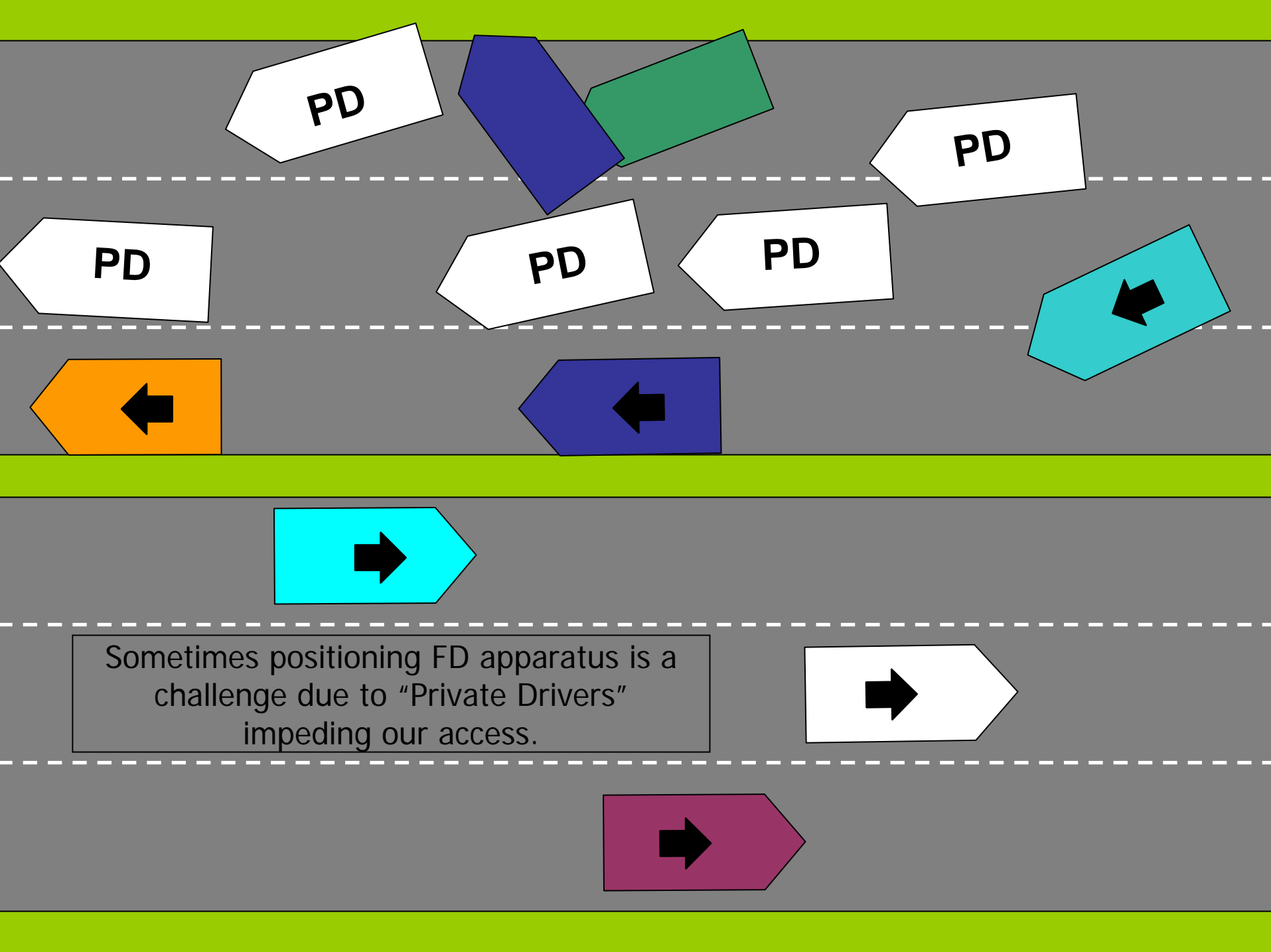
Lane 1 NB

Lane 1 SB

Lane 2 SB

Lane 3 SB





PD

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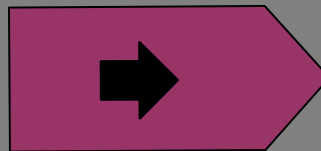
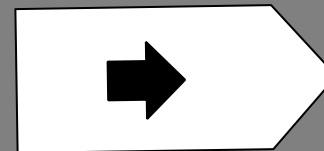
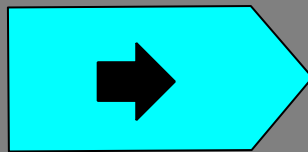
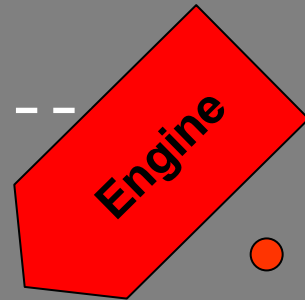
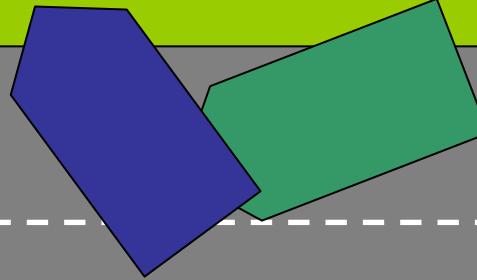


Sometimes positioning FD apparatus is a challenge due to "Private Drivers" impeding our access.



North

Place the Apparatus



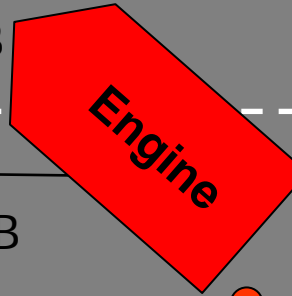
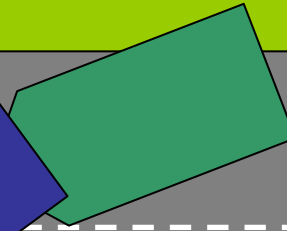
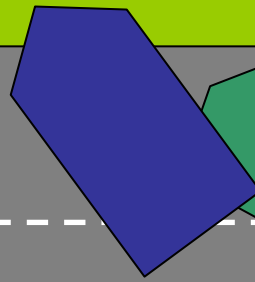
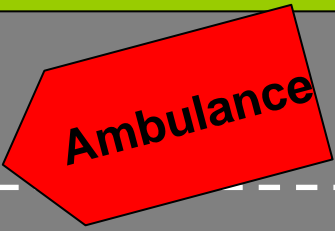
Lane 1 SB

Lane 2 SB

Lane 3 SB

North

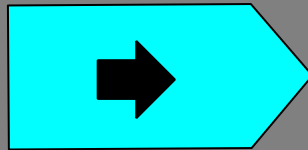
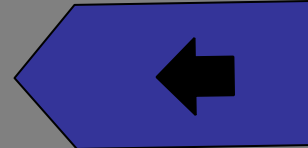
~ 150 feet



Lane 3 NB

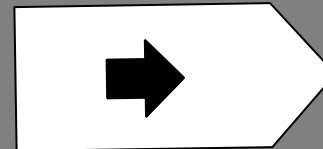
Lane 2 NB

Lane 1 NB

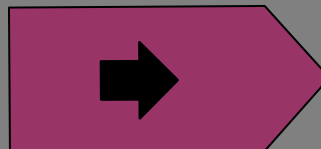


Lane 1 SB

If deploying hand lines, place the pump panel & operator on the down stream side for protection.



Lane 2 SB

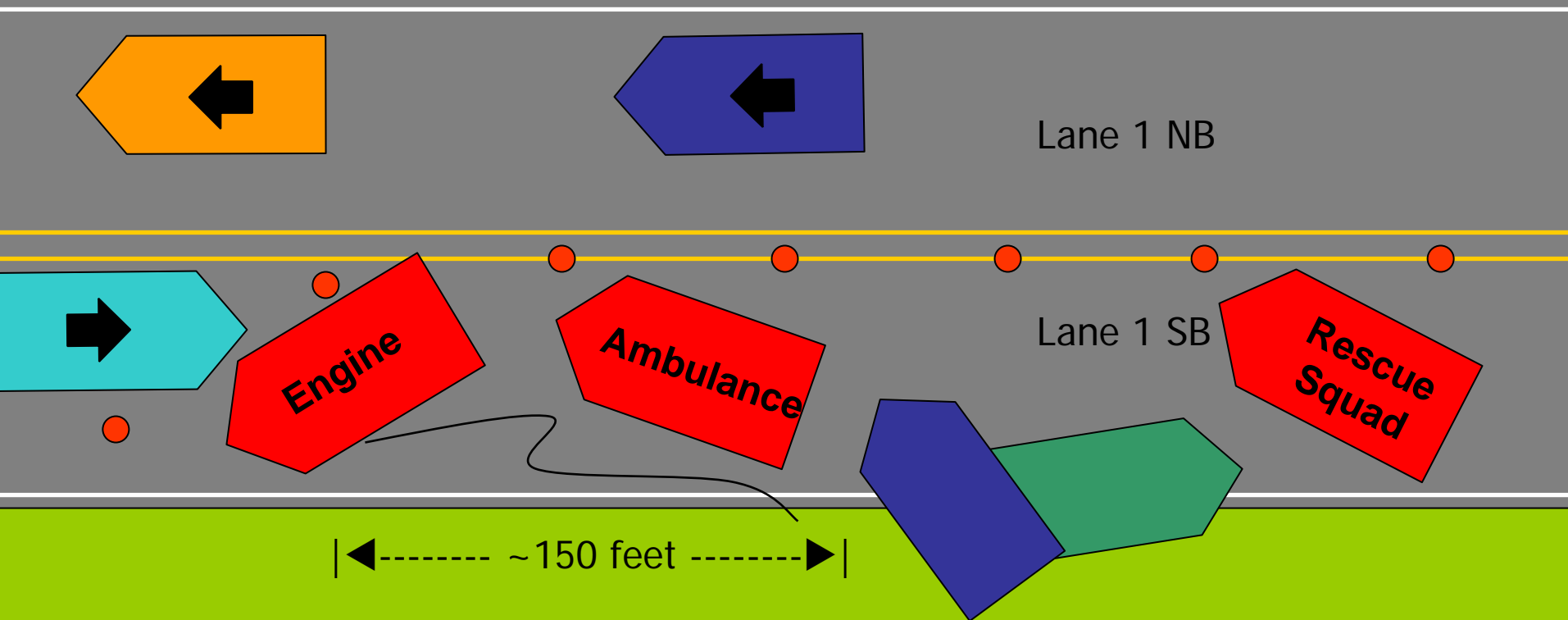


Lane 3 SB

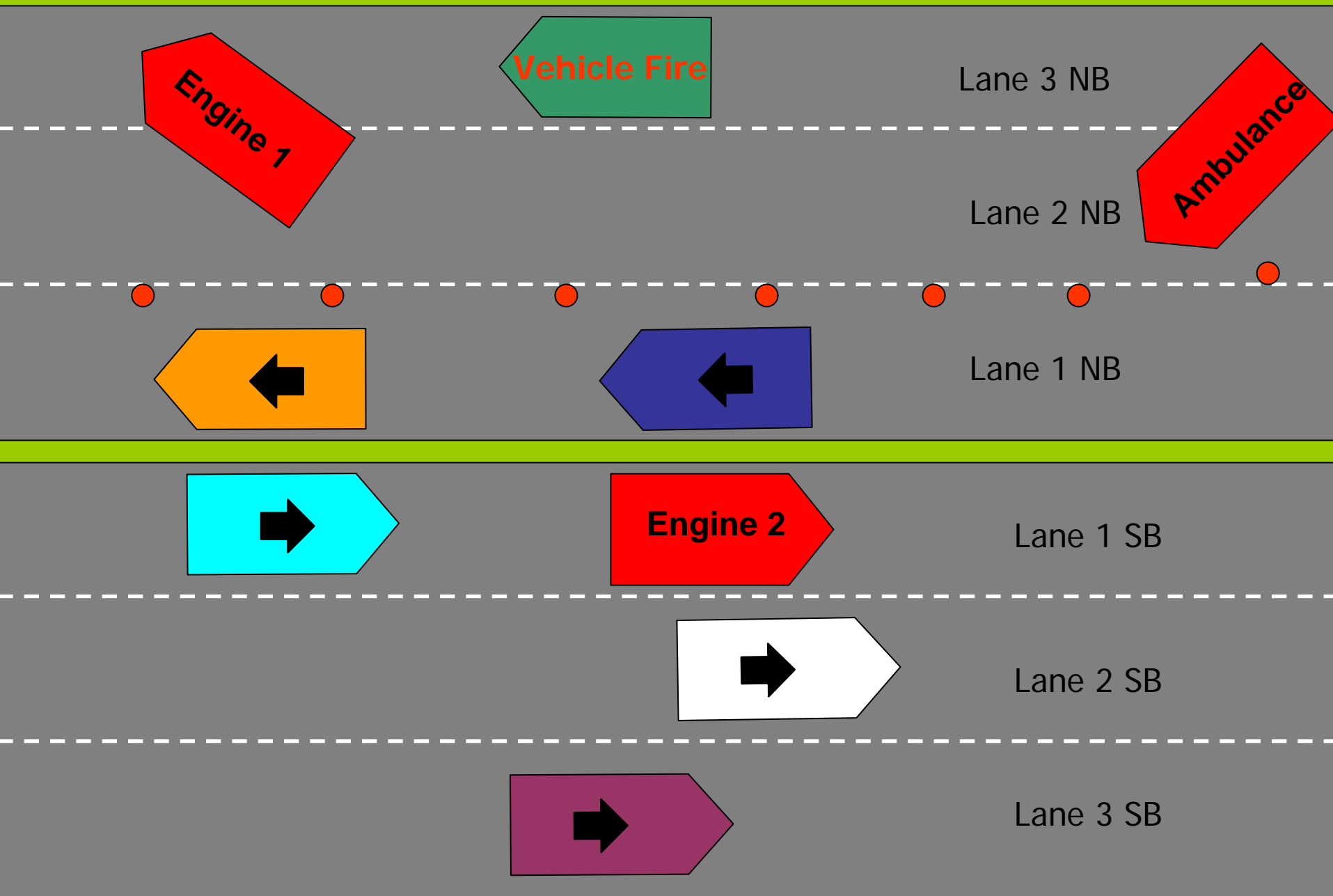
☰ North

Approaching from the opposite direction on a 2 lane roadway.

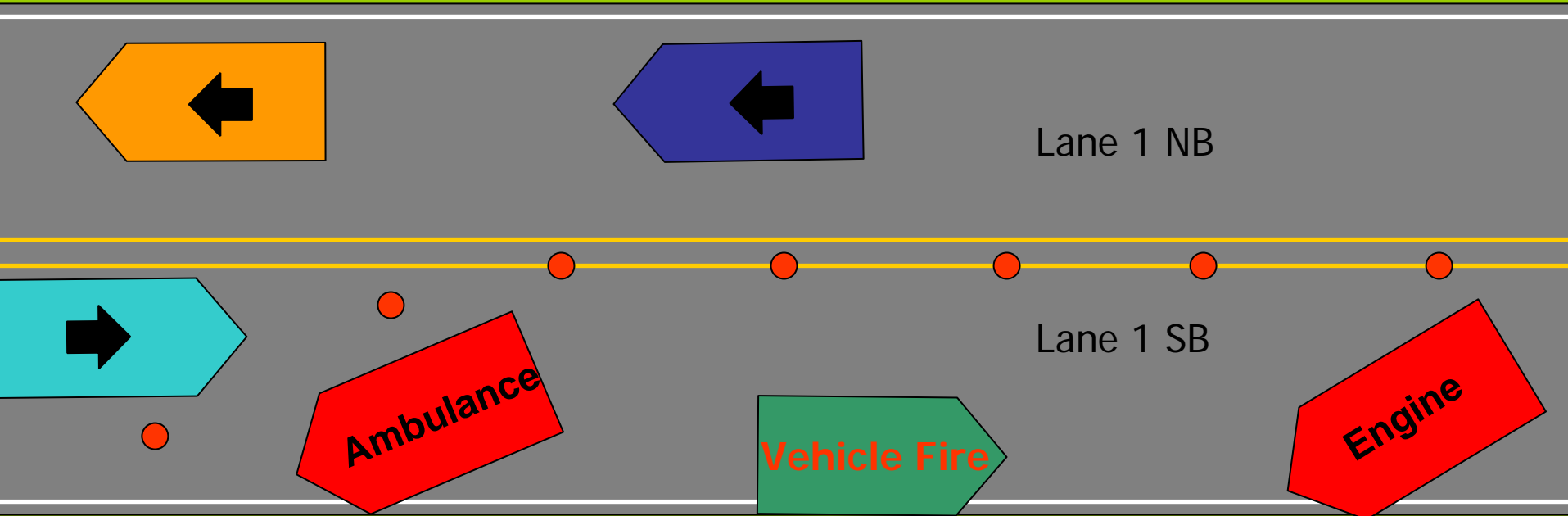
Correct positioning is a judgment call based on many factors including direction of approach, wind, topography and type of incident.



North



☰ North



Consider:

- Wind Direction
- Topography

Critical Wheel Angle

- All vehicles at a highway incident scene must be parked with their front wheels turned to their "Critical Wheel Angle"
- This requires the steering wheel to be turned all the way to the left or right; whatever is required to turn the wheels away from the protected area.
- In the event that this blocking vehicle is struck in the rear, having the wheels turned away will hopefully move the colliding vehicle away from the rescuers at the scene.

It does work !



Apparatus Lighting

- Once on the scene in a blocking position, the operator must initiate stationary light shedding procedures.
 - Shut off headlights or flashing highbeams if they will blind oncoming traffic.
 - Shut off white colored strobe warning lights.
 - If safe for rescuers, consider shutting off forward facing warning lights to reduce distraction of oncoming traffic.
- Apparatus built to current NFPA standards will automatically shut off some lighting and will have amber lighting on the rear. Highway safety engineers strongly advocate the use of amber warning lights at highway incidents.



Arrow Bars

- Arrow Bars should be turned on & set to the proper signal pattern, however:
 - The series of amber lights are easily overwhelmed by all the other lights
 - These units do not have a large arrowhead & are typically ineffective as signaling and warning lights.

Special Safety Equipment

- PPE & Traffic Safety Vests
- Helmets
- Signs
- Traffic Cones
- Flares
- Apparatus Chevron Striping



PPE & Safety Vests

- MUTCD states workers shall wear bright highly visible clothing when working in or near moving traffic.
- The International Safety Equipment Association published the American National Standard for High-Visibility Safety Apparel (ANSI/ISEA 107-2004) standard in October 2004.
 - This is a recommended national standard developed to guide employers when choosing worker safety apparel.
 - This standard recommends class III garments for emergency workers whenever operating in or near moving traffic.
- In lieu of a safety vest, full structural PPE is acceptable assuming the reflective trim is in good working order.

Safety Vests



ANSI Non-Compliant – Parking lot attendants & warehouse workers



ANSI Class I Compliant – Traffic < 25 MPH
& worker not distracted



ANSI Class II Compliant – Traffic > 25 MPH
& worker occasionally distracted



ANSI Class III Compliant – Traffic > 50 MPH
& worker distracted by tasks



Helmets



- Fire, Rescue and EMS personnel should wear protective head gear
- Structural fire helmets are appropriate for fire department personnel.
 - Affords head protection
 - Reflective trim aids motorists in recognizing personnel are operating near traffic.



Signs



- NFPA 1500 now requires deployment of a special advance warning sign when we work in or near moving traffic.
 - Fluorescent pink is the newly designated DOT color to indicate emergency situations on highways.
 - MUTCD specifies minimum size should be:
 - 36" X 36" for roadways with moderately low volumes & speeds
 - 48" X 48" for roadways with highway speeds



Traffic Cones & Flares



- Even those orange cones have DOT specifications.
- The function of a line of traffic cones is to warn approaching traffic of a change in their normal traffic pattern.
 - Called a taper
 - Guides motorists through the required lane changes or detours.
 - When deployed they should be closer together than the speed limit in feet. i.e., closer than 45 feet when used on a 45 mph roadway
- To be MUTCD compliant, cones for night incidents or where speeds are >45 mph must be 28" tall with 2 reflective bands
- Flares may be used in place of or, to increase visibility, in conjunction with traffic cones.

Apparatus Chevron Striping



- Officially classified by DOT as "vertical panels".
- To comply with MUTCD the chevron pattern should slant downward at 45 degrees toward the bottom rear corner of the tailboard.
- The pattern should resemble an inverted V with the point of the V at the top center of the apparatus.



Limited Access Highways



- aka: Interstate, Expressway, Thruway, Tollway
- A multi-lane, divided highway having a high posted speed limit, lots of traffic day & night, few access points to get on or off, few if any intersections is technically a **Limited-Access Highway**.
- I95, I270, I370, I495
- More Firefighters have been struck and injured or killed on limited access highways than any other type of roadway.

Safety on Limited Access Highways

- Never allow traffic flow through your incident scene.
 - Past or around is OK, but never through.
 - If involved vehicles are on both sides of the roadway, shut it down until you no longer need to cross between.
- Use the opposite direction Engine for a second upstream block.
 - Only if not needed to block for the opposite direction Ambulance
 - This crew is dedicated as a safety crew, not to work at the incident scene

Do It Right & Go Home in the Morning



Summary

- For Minor Duration Incidents (<30 min.)
 - Apparatus safe parking & block
 - Deploy advance warning sign per NFPA
 - Deploy cones and/or flares
 - Totally clear scene in 30 minutes or less
- For Intermediate or Major Incidents (>30 min.)
 - As above plus:
 - Notify local highway department
 - Establish appropriate buffer and transition areas
 - Establish extended advance warning area

References

- **Firehouse®** magazine, University of Extrication, Ron Moore
 - Safe Parking: Part 1, October 2003
 - Safe Parking: Part 2, Highway Terminology, November 2003
 - Safe Parking: Part 3, Traffic Blocking Procedures, December 2003
 - Safe Parking: Part 4, Personal Survival Skills, January 2004
 - Safe Parking: Part 5, Special Safety Equipment, February 2004
 - Safe Parking: Part 6, Limited Access Highways, March 2004
- **Manual on Uniform Traffic Control Devices for Streets and Highways**
 - USDOT, FHA, 2003 Edition, Revised 11/2004
- **ANSI/ISEA 107-2004 Standard**
 - American National Standard for High-Visibility Apparel

References

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- **Road to Safety, Frank Dealy**
 - FireRescue® magazine, November 2001
- **Protecting Emergency Responders on the Highway**
 - A White Paper, Howard S. Cohen, Editor

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For Further Information for MCFRS Personnel :

- Policy 26-07 AM
 - Use & Wearing of Traffic Safety Vests During Incidents on Arterials, Highways, and Streets
- Policy 24-04
 - Vehicle Accident Response Policy