FIRE AND RESCUE DEPARTMENTS
OF NORTHERN VIRGINIA
FIREFIGHTING AND
EMERGENCY OPERATIONS
MANUAL

OPERATING PROCEDURES FOR ROADWAY INCIDENTS

Fourth Edition

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PREFACE

The most common emergency responses involve operations at a vehicle accident scene and other types of emergency incidents occurring on roadways and highways. These situations often present dangerous conditions and can result in unfavorable department member outcomes.

The purpose of this manual is to provide officers and emergency responders with a uniform guide for safe roadway incident operations. The manual is intended as a guideline for decision makers and can be modified as necessary by incident officers to address specific conditions.

The key changes in the fourth edition of *Operating Procedures for Roadway Incidents* involve significant content reorganization to improve document structure.

INTRODUCTION

Each year, many significant incidents occur on Washington metropolitan roadways. Whether these occur on an interstate highway or a secondary road, they present an ever-present potential for department member injury or death. The primary objectives for any roadway incident operation involve the following actions:

- Establish a safe operating area (i.e., work area) to prevent emergency worker injuries.
- Provide emergency care and transportation for the sick or injured.
- Establish a water supply.
- Protect the environment.
- Restore normal traffic flow.
- Keep as many traffic lanes open as possible.
- Preserve evidence for investigators.
- Use the Incident Command Systems to manage resources.

ICs must work to conclude all activities blocking traffic lanes as quickly as possible to promptly restore traffic flow.

ICs should also prioritize establishing a water supply officer at incidents requiring firefighting operations. Foam units, tankers, and units with large-diameter hose will likely be needed for incidents requiring more water than engine companies typically carry.

Sources of water vary greatly, ranging from hydrants located on or near the highway to static water sources that may be quite remote from the scene. Personnel conducting district familiarization should regularly preplan to identify available water source locations. Each section of limited access highway should have a preincident plan or a street map showing available water sources.

Restoring the roadway to normal, or as near to normal as possible, creates a safer environment for motorists and emergency responders. Additionally, swift resolution improves public perception of involved agencies and reduces time and dollar losses resulting from the incident.

GLOSSARY

The following key terms and definitions were used in this manual:

Advance warning – Advance warning refers to a set of notification procedures used to advise approaching motorists to transition from normal driving status to the temporary emergency traffic control measures ahead of them.

Block – A block involves positioning a fire department apparatus at an angle to traffic lanes, creating a physical barrier between upstream traffic and the work area.

Buffer space – Buffer space refers to the distance between moving traffic and the personnel and vehicles in the protected work area.

Downstream – Downstream indicates the direction of traffic moving away from the incident scene.

Incident space – Incident space is the area at a vehicle-related roadway incident shielded by the block. This space is also commonly referred to as the *work area*, which is the prevalent term used in this manual.

Taper – Taper refers to the act of merging several lanes of moving traffic into fewer moving lanes.

Transition zone – A transition zone involves the roadway lanes where approaching motorists change their speed and position to comply with traffic control measures established at an incident scene.

Upstream – Upstream refers to the direction of traffic approaching the incident scene.

Work area – Work area is also known as *incident space* and refers to the area at a vehicle-related roadway incident shielded by the block.

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EMERGENCY INCIDENT RESPONSE

Emergency response to incidents on limited-access highways should include at least one unit traveling in each direction. Many times, callers are excited and may incorrectly report their travel direction. A unit responding from each direction eliminates any delay caused by misinformation.

When responding to incident locations reported to be in or near restricted access lanes separated by physical barriers (e.g., high occupancy vehicle lanes), jurisdictions should use the nearest traffic entry point to determine the appropriate response units.

When units respond together in the same direction, they should remain in single file. This avoids confusing highway motorists about how to appropriately yield the right-of-way to emergency apparatus.

Once an incident location has been determined, vehicle operators should act as a slow-moving roadblock by reducing apparatus speed from a distance to slow traffic in anticipation of units stopping. Vehicle operators should also reduce apparatus speed when using the road shoulder with due regard for the safety of those who may inadvertently pull into their vehicle's path.

When the shoulder must be used for response, apparatus operators must use extreme caution and be aware of

- road signs,
- debris,
- guard rails,
- oversized or stopped vehicles, and
- standing water.

Vehicle operators should only use designated median strip crossovers marked "AUTHORIZED VEHICLES ONLY" when they can complete the turn without obstructing the flow of traffic in either direction or when all traffic movement has stopped.

Vehicle operators should enter highway access and egress ramps in the normal travel direction unless the unit officer can confirm that oncoming traffic has been stopped and that no civilian vehicles will be encountered on the ramp. Due to the inherently reduced number of travel lanes associated with access and egress ramps, apparatus positioning should incorporate a patient transport corridor to facilitate the rapid arrival and departure of emergency medical services (EMS) units.

The use of U-turn access points between Jersey barriers presents an extreme hazard and should occur only when necessary for immediate lifesaving measures.

When responding to incidents in or near high occupancy vehicle lanes, personnel should consider establishing safe working areas by using additional units to block traffic lanes on the nonincident side of the flexible delineator markers. When the responding apparatus's route of travel requires crossing the flexible delineator markers, the apparatus operator should reduce speed and pass

through the markers at a shallow angle. The apparatus operator should remain vigilant of the involved traffic patterns.

Unless a roadway is completely shut down, fire and EMS crews should avoid crossing lanes of traffic on foot, especially lanes with traffic moving in the opposite direction from the lanes where their apparatus is parked. Any action requiring members to operate in a nonshielded environment should be avoided when possible.

Crossing Jersey barriers, bridge railings, or other physical barriers designed to keep vehicles on the roadway can be physically challenging and extremely dangerous, so crew members should avoid doing so when possible.

ICs must quickly determine whether units responding in the opposite travel direction should continue to the incident scene. If their assistance is not needed, ICs should communicate via radio transmission that these units should return to in-service status.

APPARATUS POSITIONING

The apparatus driver and the officer take joint responsibility for apparatus placement. Proper apparatus positioning at an incident scene ensures easy access for other responding resources, establishes a safe work area, and contributes to an effective overall operation.

Positioning on Limited Access Highways

As soon as a unit arrives on the scene, the officer should provide the communications center with an accurate location, using directional references such as north, east, south, or west and noting whether an incident is prior to or after a landmark such as an exit. Additionally, to clearly identify an incident's roadway location, lanes should be identified (i.e., inside travel lane, middle travel lane(s), and outside travel lane; see Figure 1).

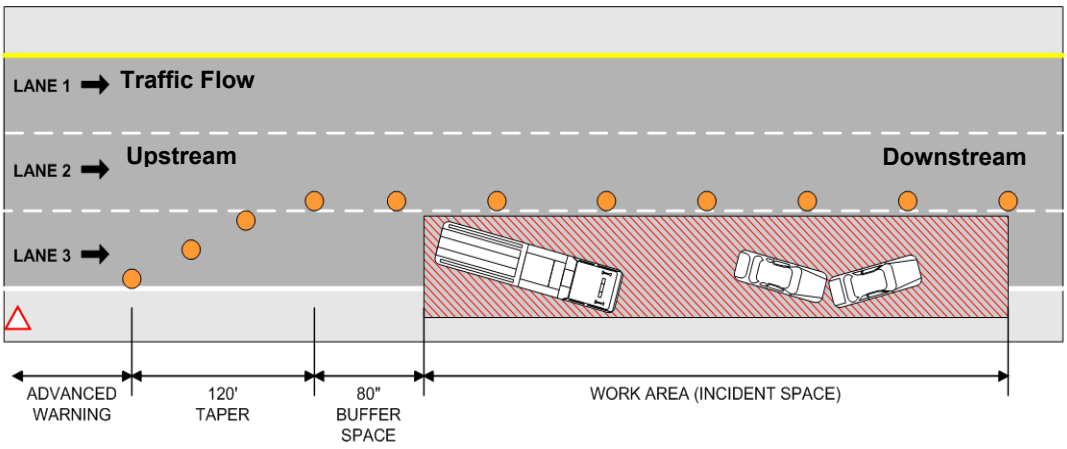


Figure 1. Lane designations and incident scene legend. Lane 1 = inside travel lane; Lane 2 = middle travel lanes; Lane 3 = outside travel lane.

The officer of the first arriving suppression unit should establish a work area allowing EMS units and the rescue company—or other company responsible for extrication—to safely position in proximity to the incident.

The first-arriving engine should position prior to the incident. This can also be considered behind the incident based on the traffic flow. The engine must be close enough to the involved vehicles to provide a protective hose line, but far enough away to allow room for other units to operate. This engine should serve a shielding function for members operating on the incident scene.

The engine company driver should place the vehicle at an angle to the lanes with the front wheels rotated away from the incident and the pump panel facing toward the work area to protect the pump operator. This is known as a "fend-off" position. In the event a motorist strikes the engine, the engine will provide a barrier, and in the unlikely event the engine moves upon impact, it will travel away from the work area.

At intersections or where the incident may be near the middle of a street, two or more sides of the incident may need protection. All exposed sides should be blocked. With limited numbers of

apparatus, the IC should prioritize blocking from the most critical to the least critical side. When possible, traffic should be channeled to one side of the incident only.

Based on the number of vehicles involved and the roadway configuration, the work area may require more than one engine company for adequate protection. Additional engine companies or the rescue company, if not needed for extrication, may be used for blocking. Drivers should place blocking apparatus at least 50 ft behind the first operating unit to create a safe work area.

The rescue or extrication company should position in front of the first-arriving engine in the most advantageous tactical position for extrication functions. The rescue company should position within the area shielded by the first-arriving engine company.

EMS units should position past the incident but within the work area in a manner allowing for rescue company functions, patient loading, and rapid egress from the scene. EMS units should position within the shielded work area.

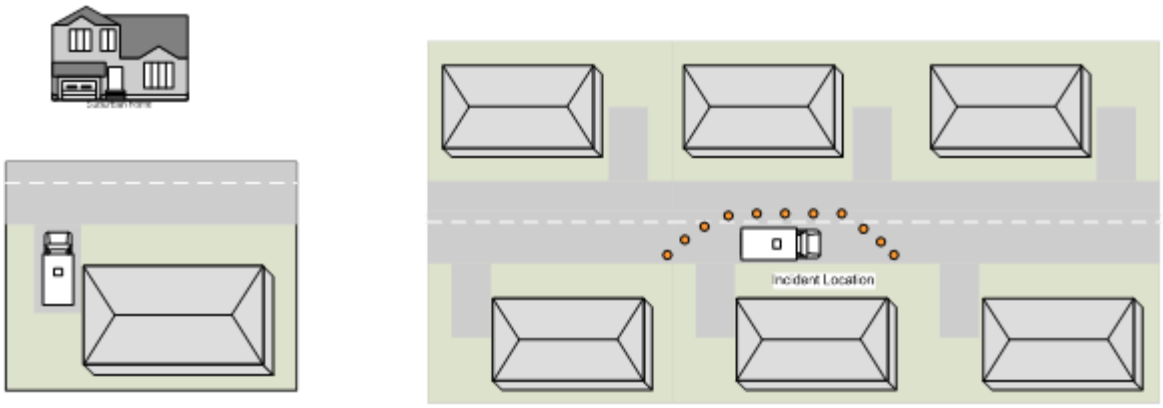
Command and staff vehicles should position past the incident but within the work area in a manner that facilitates command functions without interfering with rescue company functions and patient loading into EMS vehicles. Command and staff vehicles should position within the shielded work area.

If units arrive prior to the first due engine company, they must alter the positioning plan according to scene safety. The first-arriving unit, regardless of type, will take the position normally taken by the first-arriving engine company to shield the scene for members, patients, and witnesses. The first due engine will take the blocking position behind the first-arriving unit when it arrives on-scene.

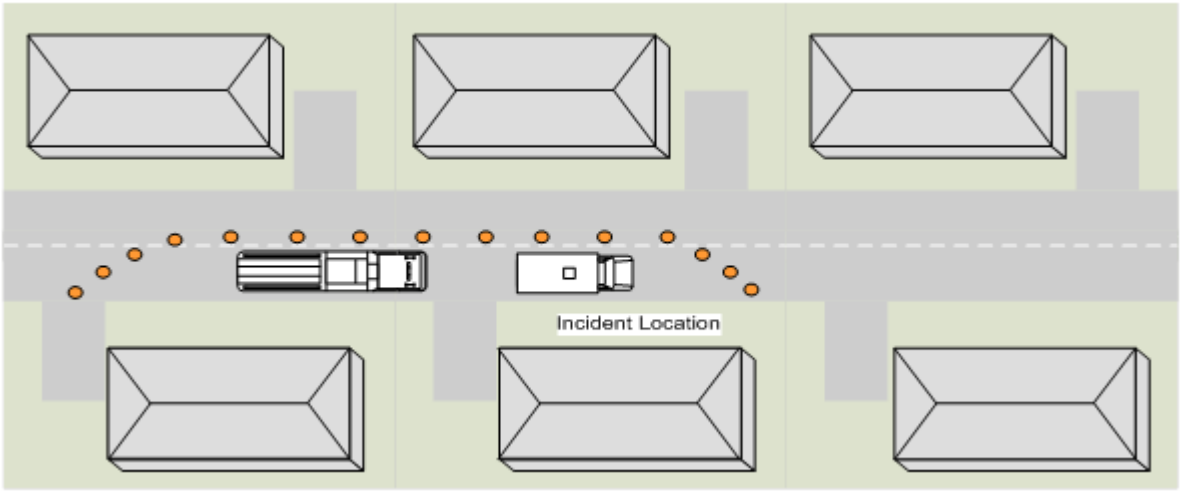
Positioning for EMS Incidents on Residential Roadways

The vulnerability of EMS units on residential roadways has led to the need for standardized positioning.

EMS units should take the priority position in front of the incident address with access to the driveway. If an EMS unit is operating on-scene without a suppression unit, they should position off the roadway in a driveway (preferred) or place cones to facilitate traffic flow around the emergency vehicle and responders (see Figure 2).

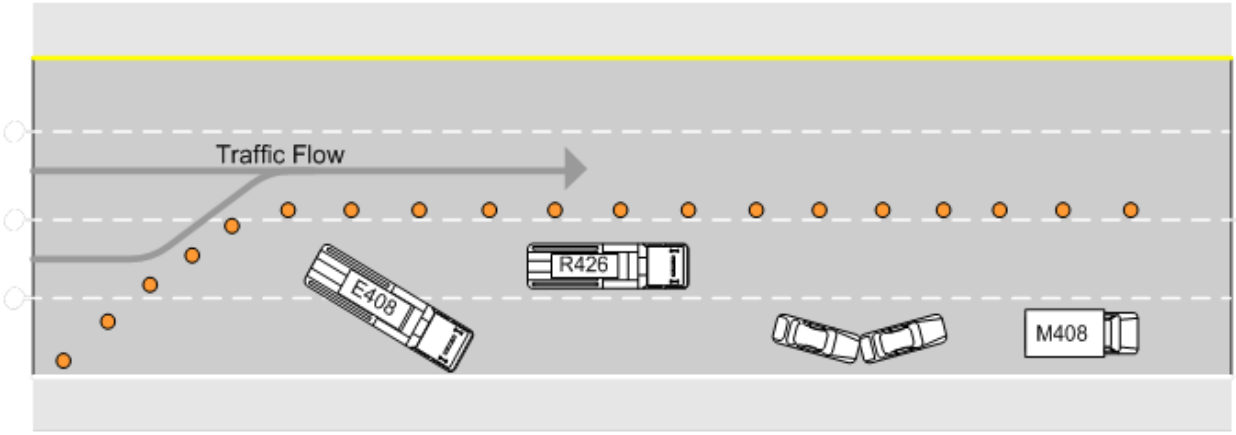


Suppression units, when responding with EMS units, should position to shield the back of the EMS unit. If the suppression unit arrives prior to the EMS unit, it should position so the EMS unit can park in front of the address when it arrives. This may require the suppression unit to stop short of the address or pull past the address if traveling from the opposite direction. If necessary, the suppression unit driver should take the time to place cones and facilitate traffic flow (see Figure 3). Suppression units should remain in position on-scene until the EMS unit has left to transport the patient.



Establishing a Safe Work Area

After arriving on-scene and positioning in a fend-off position, the operator of the first arriving suppression unit should utilize vehicle-mounted directional arrows and place flares or traffic cones along the working area, extending downstream to channel traffic away from the incident (see Figure 4).



Early in an incident, ICs should consider requesting Virginia Department of Transportation (VDOT) traffic control for incidents on highways and interstates. Buffer and taper zones require personnel to operate—often alone—in areas unprotected by blocking apparatus, so when possible, personnel should wait for VDOT or their contracting traffic control service to arrive on-scene and create these zones.

Personnel who place cones or flares should do so while facing oncoming traffic. If crew members cannot directly observe personnel engaged in this task, ICs should account for them in short intervals to ensure they have not been struck or injured.

If an incident requires personnel to channel traffic around a curve, hill, or ramp, they should place the first cone or flare prior to the hill or curve. The intent is to warn oncoming traffic of a hazard ahead. The rest of the cones should be placed diagonally across the lanes around the work zone.[1]

Positioning of Other Emergency Vehicles

Drivers of vehicles other than those needed in the operation or used as physical barriers for the work area should park together in a designated place. When an incident requires multiple EMS transport units, drivers should consider positioning them diagonally in the protected area to facilitate easy egress from the scene to the hospital (see Figure 5).

[1] U.S. Department of Transportation, *Manual on Uniform Traffic Control Devices* [23 CFR 655, Subpart F., 2009], http://mutcd.fhwa.dot.gov/

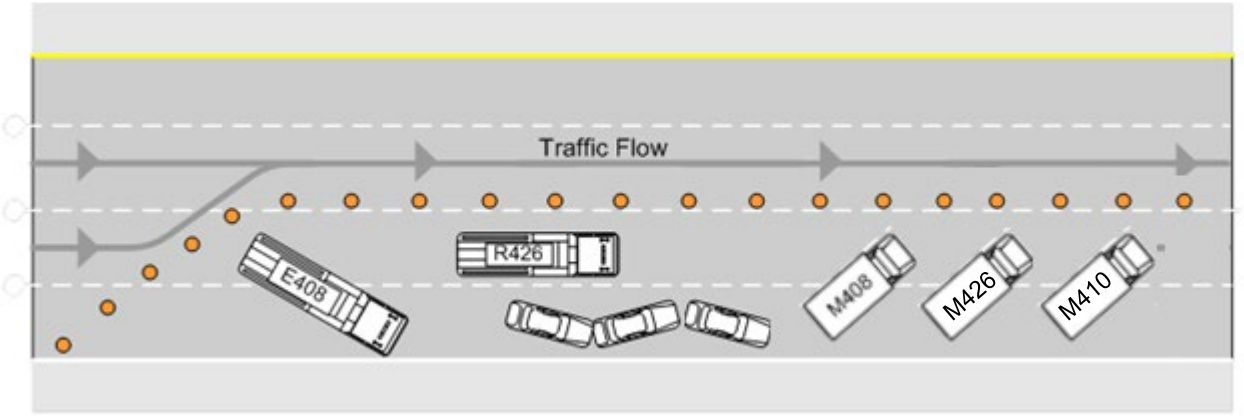


Figure 5. Sample multiple emergency medical services transport unit positioning.

SAFETY CONSIDERATIONS

The safe management and mitigation of roadway incidents require coordination of resources among fire and rescue departments, police departments, the Virginia State Police, and VDOT.

Personnel Safety

Personnel operating within a roadway or whose operational positioning exposes them to moving traffic should wear high-visibility safety apparel that meets the requirements outlined in the ANSI/International Safety Equipment Association 107-2010 publication entitled *American National Standard for High-Visibility Safety Apparel*.

Personnel engaged in roadway operations that expose them to fire, heat, or hazardous materials should wear reflective turnout gear as specified and regulated by the *National Fire Protection Association 2112* standard. Once personnel have mitigated the incident, they may don approved high-visibility apparel in lieu of turnout gear.

Incident Work Area Safety

When exiting their apparatus, personnel should perform the following tasks:

1. Don appropriate protective clothing or traffic vests.
2. Ensure adjacent traffic has stopped or slowed.
3. Exit on the work-area side of the apparatus, if possible.
4. Ensure their travel path is clear of debris or other hazardous obstacles.

All personnel must continuously maintain situational awareness. While operating on-scene, personnel should remain aware of incident factors that impact safe, quick clearance. Any changes that could negatively impact life safety, incident stabilization, and property or environmental conservation should be brought to the IC's attention through the chain of command. As soon as possible, unsafe conditions should be mitigated and communicated to all those potentially impacted.

To avoid errant or distracted drivers, when personnel are operating immediately adjacent to moving traffic or at the edge of the protected work area, they should remain alert and face traffic. When incident operations require personnel to focus efforts without monitoring traffic, designated traffic lookouts should be assigned to watch for developing hazards and provide warnings. Personnel should always have an escape plan to avoid errant drivers. When developing an incident action plan, ICs, lookouts, and safety officers should remember the acronym LCES, which stands for lookouts, communications, escape routes, and safety zones.

OPERATIONS

Firefighting Operations on Roadways

Vehicle fire and other roadway fire operations may require personnel to block additional travel lanes for attack line deployment and to establish a safe working area. Personnel should don appropriate personal protective equipment during all roadway firefighting operations. Caution should be exercised when smoke reduces visibility.

The IC should give early consideration to requesting additional engines and tankers during commercial vehicle and electric vehicle fires. These incidents routinely require a large amount of water to extinguish. Although standpipes and associated fire department connections can be found on some bridges and overpasses and should be noted on pre-incident plans, personnel should incorporate these systems in primary water supply plans as they are not required by code to be near fire hydrants.

If taking the primary blocking position behind a roadway fire could expose the engine to fire extension, the driver may position at an increased distance from the work area.

Roadway incidents involving flammable liquid tanker trucks and other potentially large-scale events may require establishing expanded incident work areas or closing entire roadways to accommodate potential extension, limit exposure for uninvolved civilian vehicles, and provide the necessary space for firefighter safety.

Visibility Considerations

Emergency warning lights may be turned off when all three of the following conditions occur: daylight hours, all involved vehicles and emergency vehicles have been moved out of traffic lanes onto the highway shoulder, and traffic is congested and passing slowly. However, when emergency warning lights are turned off, emergency flashers must be activated.

Visibility becomes a more significant concern with nightfall. As the human eye adapts to the dark, the color red blends into nighttime surroundings and becomes more difficult to see. This presents a problem because fire department warning lights are red.

Glare recovery time refers to the amount of time required for the human eye to recover from the effects of glare once light passes through the eye. When the eye moves from light to dark, vision recovery takes at least 6 seconds. When moving from dark to light, vision recovery takes 3 seconds. At 50 mph, a vehicle travels approximately 75 ft per second. After experiencing glare, a vehicle driver will travel 450 ft in the 6 seconds it takes for them to fully regain their night vision.

The headlights on the apparatus can temporarily blind vehicle drivers who are approaching fire and rescue apparatus. If not needed to illuminate the scene, apparatus drivers should turn off their vehicle’s headlights when parked at incidents. This is extremely important when operating

on roadways at night. Studies have shown that at a distance of 2.5 car lengths, oncoming vehicle headlights completely blind the opposing drivers.

Drivers approaching an incident will experience the problem of glare recovery, which means they drive by the incident scene blind. Wearing protective clothing and traffic vests does not help the blinded driver see members standing in the roadway.

The best combination of lights to provide maximum night visibility is as follows:

- red warning lights on,
- headlights off,
- fog lights off,
- pump panel lights on,
- rear and front spotlights on and directed onto a traffic cone, and
- traffic directional boards operating.

Smoke migration, hose stream overspray, and steam conversion can also hinder roadway incident visibility. Uninvolved vehicles may attempt to move through migrating smoke without the ability to see cones, flairs, fire department vehicles, or personnel. Smoke migrating across uninvolved roadway lanes can lead to additional vehicle accidents. Migrating smoke can be especially significant in parking garages with less natural ventilation than in the open air. Personnel should remain aware of this dynamic and request additional traffic control as needed.

CLEARING TRAFFIC LANES

Virginia's Incident Clearance Law (also known as the "Move It" law) requires motorists involved in injury-free crashes with drivable vehicles to move the vehicles to the least traffic-obstructing location possible. In accordance with this law, personnel should instruct drivers involved in property-damage-only accidents to remove their vehicles from travel lanes while waiting for the police to arrive. Expediting the removal of damaged or disabled vehicles from the travel lanes enhances the roadway's overall safety level and reduces associated congestion and delay.

When possible, EMS units should move from the roadway as soon as practical. In some cases, an EMS unit might be able to load patients and move them to a nearby parking lot to perform care before transporting them to a hospital. This reduces the ambulance, its crew, and the patients' exposure to accident scene hazards while also facilitating the roadway's reopening.

Reducing or shutting down traffic lanes can create other problems and safety concerns. When operational phases (i.e., extrications, medical care, and suppression) are completed, the apparatus drivers must reposition their vehicles to allow traffic flow in as many lanes as possible.

Unnecessarily closing or prolonging traffic lane closure greatly increases the risk of a secondary incident occurring in the traffic backup. One minute of stopped traffic causes an additional 4-min travel delay.

Roadway helicopter landings can cause major traffic backups, so ICs should consider moving the landing zone to a location off the roadway. However, if the IC deems a roadway landing unavoidable, then the landing zone should be set up per jurisdictional policy and in the safest configuration possible.

ICs should coordinate with law enforcement officers to open traffic lanes and return units to in-service status as soon as practical while considering the safety of all involved emergency service personnel.

UNIFIED COMMAND

Managing large-scale highway incidents is a team effort. The Senate of Virginia's Joint Resolution No. 233 expresses the importance collaboration between law enforcement organizations, VDOT, and fire and rescue departments for safe and effective highway incident management. Representatives from public/private roadways and highways (e.g., Dulles Greenway, Dulles Access Road, Dulles Toll Road, high occupancy toll lanes) should also be consulted during incidents on these roadways. The question is not who is in charge, but who is in charge of what.

Unified Command allows all agencies with jurisdictional authority or functional responsibility for an incident to provide joint management direction through a common set of incident objectives and strategies incorporated into a single incident action plan. Unified Command is appropriate at a multijurisdictional incident (e.g., a collision that crosses city and county lines) or a multidepartmental incident (e.g., a collision on an interstate) that brings responders from fire, EMS, law enforcement, VDOT, and other agencies. Not all agencies with jurisdictional authority or functional responsibility are included in Unified Command; however, cooperating or assisting agencies may participate in the response and may be included in the incident command system structure.

TRAFFIC INCIDENT LEVELS

VDOT has adopted a 3-level system to describe roadway incident travel impacts (see Figure 6). ICs should consider the incident's magnitude and communicate the most suitable impact level to the appropriate communication center. Communication centers should then notify the VDOT operations center of the traffic incident level so VDOT can deploy the appropriate traffic resources and provide motorist alerts.

Traffic incident levels		
Level 1	Minor	Impact to the traveled roadway estimated to be less than **30 min** with no lane blockage or with minor lane blockage.
Level 2	Intermediate	Impact to the traveled roadway estimated to be **30 min to 2 hr** with lane blockages but not full roadway closure.
Level 3	Major	Impact to the traveled roadway estimated to be **more than 2 hr,** OR the roadway is closed in any single direction; significant area-wide congestion is expected.

Figure 6. Virginia Department of Transportation traffic incident levels.