



ALL TANGLED UP

HOW TO EXTRICATE A VEHICLE FROM A HIGH-TENSION CABLE BARRIER



HIGH-TENSION CABLE BARRIER SYSTEMS ARE SAVING LIVES

High-tension cable barrier systems are a safety feature being added to select stretches of Iowa highways where there is a higher occurrence of median crossover crashes. The barriers are designed to reduce median crossover crashes by keeping errant vehicles on their own side of the road.

When vehicles have become entangled in the cables, emergency service providers have asked: *What do we do if there are life-threatening injuries and we can't get to the victims because of the cables? Can the cables be safely cut to save lives?*

The answer is yes, but cutting the cables should be a last resort. There are other options for extrication that allow the cables to remain intact and continue to save other lives. When high-tension cable barriers are cut, thousands of feet of barrier could be placed out of service until repairs can be made.

BARRIER SYSTEM ELEMENTS

High-tension cable barrier systems used in Iowa have either three or four cables. Each cable is held in constant tension

in the range of 3,000 to 8,000 pounds, depending on ambient temperature and seasonal changes.

Although several different high-tension cable barrier types exist, they all use the same cable that consists of $\frac{3}{4}$ -inch-diameter galvanized steel cable with 3-by-7 construction (21 wires).

Depending on the type of system, the cables may be attached to the weak steel posts using special locking hook bolts or threaded through the posts. The barrier is installed using concrete footings in which metal tubes are cast to form sockets for the posts. After

impact, any damaged posts can be removed from the sockets and replaced with new posts.

Turnbuckles are used to achieve the appropriate tension in the system. Turnbuckles are generally installed every 1,000 feet or at lesser distances (as little as 200 feet), if required.

KEEP THE CABLES INTACT AND RELEASE TENSION

If a vehicle becomes entangled in the cable, the first instinct of emergency responders is to cut the cable to gain better access to the victims. However, there are better options and cutting the cables should be a last resort using extreme caution and proper procedures. *The alternatives to cutting the cable are listed here in order of preference.*

- 1** If satisfactory extrication time exists, Iowa Department of Transportation maintenance personnel are trained to safely add slack to cables by taking out posts and loosening turnbuckles. To seek Iowa DOT assistance during an emergency, contact the Iowa DOT's Operations Support Center 24/7 at 515-237-3330.
- 2** Reduce the tension in the system by moving the cables back to their original positions in line with the posts. This can be accomplished by driving, pushing, or pulling the vehicle back in the opposite manner that it entered the cable system.
- 3** Add slack to the cables using one of the following four methods.
 1. Lift the cables out of and/or off the posts approximately 100 feet upstream and downstream of the vehicle. A span of approximately 100 feet without any posts will allow the cables to lie on the ground.
 2. Remove the posts from their sockets approximately 100 feet upstream and downstream of the vehicle. If the cables are under extreme tension, use extra caution and secure the post with a chain or restraining device during removal.



3. Tension in the cables can also be released at the nearest upstream and downstream turnbuckles or at one of the cable end anchors, whichever is closest. Use hand tools to loosen the turnbuckle until the end of each threaded terminal reaches the inspection hole.

SAFETY WARNING: The threaded terminals should always remain visible in the inspection holes. Unscrewing the turnbuckle or cable anchor end beyond this point can be unsafe. The cables could release rapidly as the threads strip out of the connection.

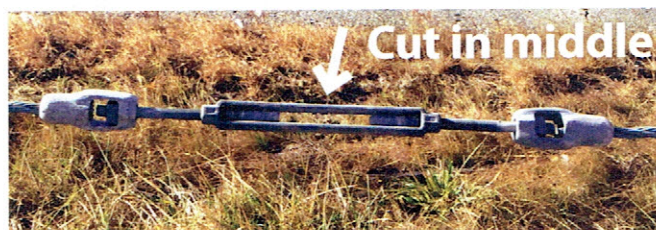
4. Cut off pieces of the vehicle.

SAFETY WARNING: Cables may release from the vehicle uncontrollably and without warning. When making the cut, make sure NOT to stand in the area between the vehicle and the normal location of the cables within the posts.

- 4 Knock down the end anchor. Most end anchors are designed to act as a lever to lift cables out of their anchor slots. The preferred method for these designs is to approach the end anchor with the front bumper of a vehicle at idle speed and knock over the vertical post. For designs without a vertical post, an extended crowbar is used to lift cables out of their anchor slots.

SAFETY WARNING: Approach and release the end anchors on the side opposite of the cables. Do not stand to the side or in front of the end anchor when knocking it over. When released, the cable ends will travel at high speeds until the tension is released and have the potential to cause injury to anyone on the side or immediately downstream of the end anchor.

- 5 The final option, preferred to cutting the cable, is cutting a turnbuckle. It is much easier and less costly to replace a turnbuckle than it is to install a cable splice or to replace a section of cable. Before cutting a turnbuckle, remove the adjacent posts in the vicinity of the turnbuckle, if possible.



Always cut in the middle of the turnbuckle. Make the cut several hundred feet from the vehicle, midway between two undamaged posts where the cables are parallel and not being subjected to multiple forces.

Cut only the minimum number of turnbuckles necessary to remove the vehicle. Make the cut standing perpendicular to the system, arms in front. Use either an abrasive blade cutoff saw or hydraulic cutters. Use gloves and safety goggles, and cut very carefully.

SAFETY WARNING: Although the cable should move only a short distance in each direction after the turnbuckle is cut, everyone except the person making the cut should stand a safe distance clear of the cable. High-tension cables are under thousands of pounds of tension, and a vehicle trapped in the system creates even higher tension forces. Therefore, cutting a turnbuckle has the potential to cause injury.

CUT THE CABLES AS A LAST RESORT

Although it can be done, cutting cables under tension should be done with caution and only as a last resort where a life-threatening situation exists, time is critical, and other alternatives for loosening the cables are not feasible. Cutting cables will require a cable splice or complete cable section replacement, which is time consuming and costly. It also disables a section of the system.

If the cable must be cut, cut only the minimum number of cables necessary. Make the cut several hundred feet from the vehicle, midway between two undamaged posts where the cables are parallel and not being subjected to multiple forces.

The cable should be securely taped with duct tape on each side near where the cable will be cut to prevent unraveling. Make the cut standing perpendicular to the system, arms in front. Use either an abrasive blade cutoff saw or hydraulic cutters. Use gloves and safety goggles, and cut very carefully. Pay particular attention when there are only a few strands remaining during the final stage of cutting.

SAFETY WARNING: Although the cable should move only a short distance in each direction, everyone except the person making the cut should stand a safe distance clear of the cable. High-tension cables are under thousands of pounds of tension, and a vehicle trapped in the system creates even higher tension forces. Therefore, cutting a cable has the potential to cause injury.

NEED CRASH SCENE EXTRICATION ASSISTANCE?

Iowa DOT maintenance personnel can provide guidance and on-site help at a crash scene 24/7. During an emergency, contact the Iowa DOT's Operations Support Center at 515-237-3300 or Iowa State Patrol through their dispatch center.

Call this number to also report a damaged or cut cable system following a crash.

MORE INFORMATION

To learn more about the location and safety benefits of high-tension cable barriers in Iowa, contact the Iowa DOT's Office of Traffic and Safety at 515-239-1557. To learn about the design of these barriers, contact the Iowa DOT's Office of Design at 515-239-1783.



Lesson 1: Introduction

Lesson Objective 1.1 - Describe the purpose of the Strategic Highway Research Program 2 (SHRP2) National TIM Responder Training Program

The National TIM Responder Training Program was created as part of SHRP2, which was authorized by Congress in 2005 to investigate the underlying causes of highway crashes and congestion in a short-term program of focused research. The TIM training program was designed to establish the foundation for and to promote consistent training of all responders to achieve the three objectives of the TIM National Unified Goal (NUG):

- Responder Safety
- Safe, Quick Clearance
- Prompt, Reliable, Interoperable Communications

The National TIM Responder Training Program was developed and reviewed by professionals from all responder disciplines and those disciplines are the target audience for the training.

Lesson Objective 1.2 - Recognize the dangers encountered by emergency responders working in or near traffic

Responder Struck-By Fatalities:

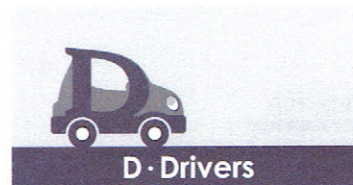
- According to data from the *2015 Law Enforcement Officers Killed and Assaulted Report*, an average of ten officers are killed each year in struck-by incidents.
- A report completed by the National Fire Protection Association in 2014 found that, on average, four firefighters are struck and killed each year.
- It is estimated that between 40 and 60 towing and recovery professionals are struck and killed each year.
- Aside from work zone deaths, transportation and public works professionals, including Safety Service Patrol operators, are also killed at incident scenes, though exact numbers are not readily available.



Examples of Responder Struck-By Crashes

At the core of many responder deaths and injuries are drivers who are inattentive, impaired, or make poor driving decisions. According to the National Safety

Council, using a mobile phone while driving is equivalent to driving impaired and texting while driving is equivalent to driving blindfolded.



- ✓ Drunk,
- ✓ Drugged,
- ✓ Drowsy,
- ✓ Distracted, or
- ✓ Just plain...Dangerous

Secondary Crashes – are those crashes that occur within the incident scene or within the queue or backup, including the opposite direction, resulting from an original incident.

Responders are not the only victims of secondary crashes. Motorists struck in traffic backups are also innocent victims.



Lesson Objective 1.3 - Define traffic incident management (TIM)

TIM consists of a planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible.

Effective TIM improves the safety of emergency responders, crash victims, and motorists, and reduces the duration and impacts of traffic incidents. TIM concepts apply to all roadways, both urban and rural, where traffic incidents might occur.

The TIM timeline lays out the events and activities that occur from the time when an incident happens to when traffic conditions return to normal. The goal of

TIM is to shorten the time duration between T0 and T6, recognizing that incremental improvements during each phase are typically easier to accomplish than drastically re-working any one aspect of TIM.

The top section of the TIM timeline illustrates two standard TIM performance measures:

- **Roadway Clearance Time (T1-T4)** – the time between the first recordable awareness of an incident by a responsible agency and first confirmation that all travel lanes are open.
- **Incident Clearance Time (T1-T5)** – the time between the first recordable awareness and the time at which the last responder has left the scene.

The number of secondary crashes is the third standard TIM performance measure identified by the Federal Highway Administration (FHWA).

TIM Timeline





Lesson 2: TIM Fundamentals and Terminology

Lesson Objective 2.1 - Define safe, quick clearance

Safe, quick clearance is the practice of rapidly, safely, and aggressively removing temporary obstructions from the roadway to:

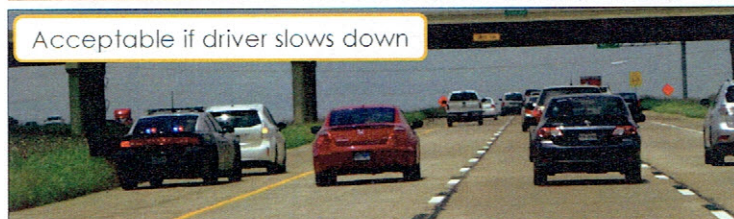
- Enhance the safety of responders and motorists
- Minimize motorist delay through traffic control and opening of lanes
- Restore the roadway to its pre-incident capacity as safely and quickly as possible

Safe, quick clearance and responder safety are NOT mutually exclusive, as a matter of fact, they complement each other. Quick clearance reduces both the exposure of responders to safety hazards and the potential for secondary crashes.

Lesson Objective 2.2 - List the principal laws that relate to responder safety and safe, quick clearance

Nationally, there are three types of laws that facilitate TIM:

- **Move Over Laws** – require drivers approaching a scene where emergency responders are present to either change lanes when possible and/or reduce vehicle speed.



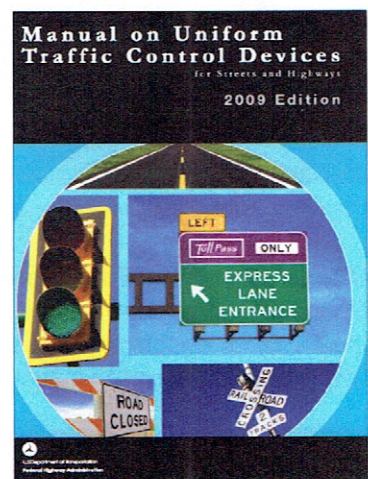
Move Over Law Compliance

- **Driver Removal Laws** – require motorists involved in minor crashes (where there are no serious injuries and the vehicle can be driven) to move their vehicles out of the travel lanes to the shoulder or other safe area.
- **Authority Removal Laws** – provide authority (and immunity from liability in general) for designated public agencies to remove vehicles and/or spilled cargo from the roadway to restore traffic flow.

Not all states have all three laws, and the exact language of the laws varies among the states that do, so it is important to become educated about your state's laws.

Lesson Objective 2.3 - Describe how the Manual on Uniform Traffic Control Devices (MUTCD) relates to TIM

The MUTCD is a national standard that is maintained by FHWA. The manual, which is revised periodically, promotes the uniformity of traffic control signs, signals, and markings from state to state. This uniformity improves safety and driver expectancy. Practitioners from transportation and public safety are involved in developing and evaluating the content of the MUTCD. States may adopt the document as is, add a state supplement, or create a state version, but the content remains mostly uniform.



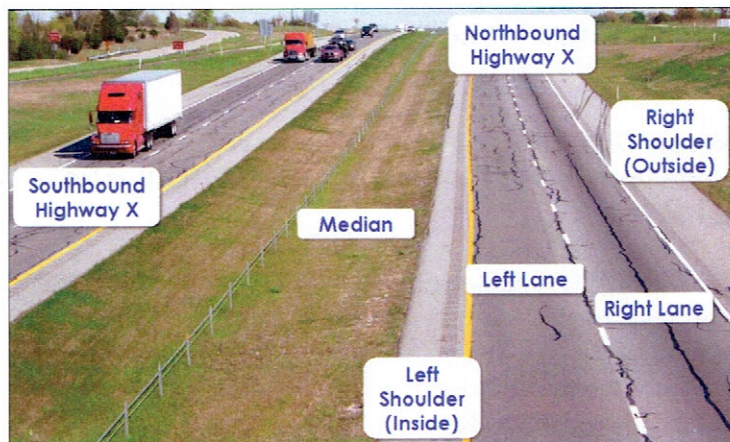
Part 6 of the MUTCD covers temporary traffic control (TTC) zones, commonly known as highway construction or work zones. A subset of Part 6 is Chapter 6I, which specifically addresses traffic incidents and Traffic Incident Management Areas. The requirements of the MUTCD as they apply to TIM are addressed throughout the National TIM Responder Training.



Lesson Objective 2.4 - Recall common response terminology, lane designations, and incident scene terminology

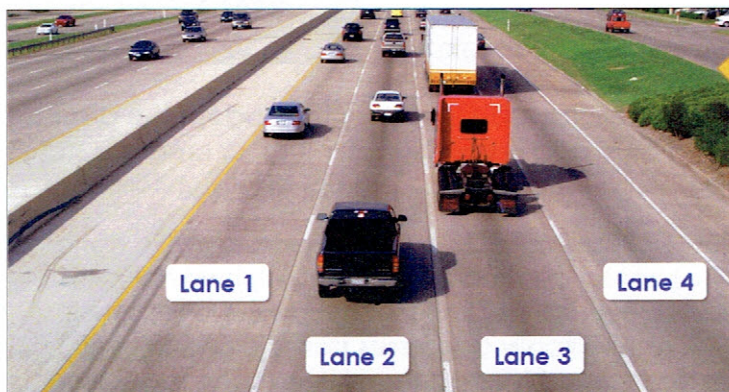
The MUTCD highlights the required use of the Incident Command System (ICS) at traffic incident scenes. In turn, ICS requires the use of uniform terminology and plain English in incident communication so that all responders and responder disciplines easily understand them. The following standardized roadway and incident scene terminology is intended to facilitate incident communications.

Common Response Terminology using Plain English – when describing highway lanes, left and right are determined from the perspective of the flow of traffic.



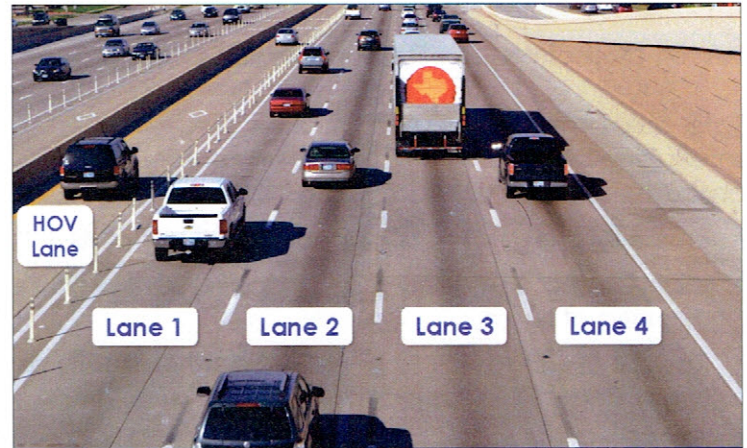
Common Response Terminology using Plain English

Lane Designation Terminology: Lane Numbering – as an alternative, a numbering system that assigns numbers 1, 2, 3, etc. from the left to right lane, again from the perspective of the flow of traffic, can be used.



Lane Designation Terminology: Lane Numbering

Note that a special use or managed lane, such as a high-occupancy vehicle (HOV) or express lane, is referred to as such and is not a numbered lane.



Lane Designation Terminology: HOV Lanes

Either plain English or numbering are acceptable, provided area responders train to both.

Also, TIM terminology is not just applicable to urban roads and freeways. The techniques apply to local streets and rural roadways too.

Upstream/Downstream – traffic that is entering or approaching the incident scene is considered upstream traffic and traffic that is departing or past the incident is considered downstream traffic.



Upstream/Downstream

Queue – a traffic queue (pronounced "Q") is the backup of traffic that results from an incident or blocked lanes. A queue may form in either direction of travel because of rubberneckers.

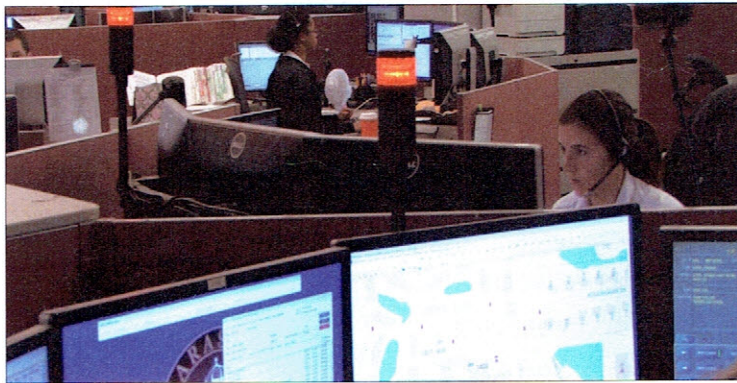


Lesson 3: Notification and Scene Size-Up

Lesson Objective 3.1 - Recognize the important role public safety communications centers play in incident response

Telecommunicators working at public safety communications centers are typically the first to be alerted to an incident and are responsible for:

- Providing a basic assessment of the situation
- Dispatching an appropriate response based on their knowledge of available resources



Public Safety Communications Center

As a conduit or connection between responders, agencies, and other resources, the accuracy, timeliness, and overall quality of information received by the communications center has a significant impact on effective TIM.

Lesson Objective 3.2 - Describe the notification and verification process

Detection – is the discovery of an incident and the first step in the TIM process. Incident detection can be a call from the parties involved in the incident, a call from a passing motorist, or by responders who happen upon them.

Verification – involves collecting as much information as possible from the individual(s) reporting the incident including the exact location, the make, model, and color of the involved vehicles, and a call back number in case more information is needed.

Notification – occurs when the communications center dispatches the appropriate response.

Notification and verification often occur concurrently. It is also worth noting that motorists may have traveled past the incident by the time they talk to the communications center, so it is not uncommon for them to give a location that is downstream of the actual incident.

A simple TIM strategy for states that have a Driver Removal Law is to have telecommunicators direct motorists to move vehicles off the roadway if there are no injuries and the vehicles are drivable.

Lesson Objective 3.3 - Recall the typical responsibilities of a Transportation Management Center (TMC)



Regional TMC

TMCs, also referred to as Traffic Operations Centers (TOCs), may be operated at the local, regional, or state level, and they serve as the hub for the collection and dissemination of incident information. TMCs are typically responsible for:

- Monitoring traffic conditions using:
 - » Closed-circuit television (CCTV) cameras
 - » Roadway detectors and congestion maps
 - » Public safety contacts via phone and/or Computer-Aided Dispatch (CAD) links



- Providing real-time traveler information using:
 - » 511 – phone systems and websites
 - » Social media platforms, such as Twitter
 - » Changeable message signs (CMS)
 - » Highway advisory radio (HAR)
- Providing traffic and incident information notification to other traffic management/communication centers, public safety partners, and the news media
- Controlling traffic management devices, such as ramp meters and/or traffic signal systems
- Monitoring traffic management devices to ensure they are functioning properly

Lesson Objective 3.4 - List the key information that should be included in a scene size-up report

Upon first arriving on-scene, an initial or windshield size-up report should be given to the communications center that includes:

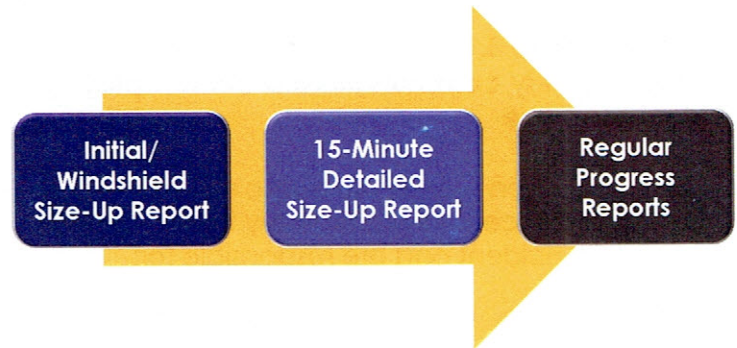
- Unit identification
- Exact location of incident
- Number and type of vehicles involved
- Degree of damage
- Number of lanes closed
- Hazards or unique safety concerns
- Establishment of Command

Windshield Size-Up Report



Unit one on-scene... location confirmed as Main Street westbound between 2nd and 3rd Ave... Minivan fire, fully involved in the right lane, impacting adjacent sidewalk... Vehicle is leaking fuel... Assuming Main Street command.

A more detailed and accurate size-up should be provided within 15 minutes of arrival at the scene. Additional progress reports should be provided at regular intervals or whenever significant changes occur.



The following information should be provided during the detailed size-up report and/or during subsequent progress reports:

- On-scene safety concerns – dangerous location, limited visibility, presence of hazardous materials
- Traffic conditions – length of traffic queue, traffic control needs, detour/alternate route needs
- Injured persons – number and extent of injuries, need for extrication
- Additional resources
 - » Towing and Recovery
 - » Helicopter EMS services
 - » Crash investigation/reconstruction
 - » Medical Examiner/Coroner

Even if additional resources are not needed immediately, the resource request should be made as soon as possible to enable a timely response.

An important component of the detailed size-up report is the incident duration classification. MUTCD Chapter 6I divides traffic incidents into three general incident classes based on the anticipated duration:

- **Minor:** < 30 minutes
- **Intermediate:** 30 minutes to 2 hours
- **Major:** > 2 hours

If the expected duration is bordering between two classifications, it is recommended that the higher (longer) classification be used to ensure that adequate resources are requested and mobilized.



Lesson 4: Safe Vehicle Positioning

Lesson Objective 4.1 - Differentiate between Move It and Work It incidents

The initial assessment, or windshield size-up, sets the stage for early decisions that need to be made at traffic incidents. One of the first decisions that responders make is whether to Move It or to Work It.

Move It – refers to moving vehicles involved in an incident to a safer location before being worked.

Work It – refers to a situation where the vehicles involved cannot be moved before being worked.

When possible, moving the incident is preferred since it clears the roadway and reduces responder exposure.

Lesson Objective 4.2 - State the MUTCD definition of safe-positioned and describe blocking

Positioning emergency vehicles to establish a safe work area is a foundational decision for responders arriving at an incident scene, and a critical element to protecting both emergency responders and motorists. Safe-positioned, as defined by the MUTCD, is the positioning of emergency vehicles at an incident in a manner that attempts to:

- Protect the responders performing their duties
- Protect road users traveling through the incident scene
- Minimize, to the extent practical, disruption of the adjacent traffic flow

The first emergency vehicle that arrives at an incident scene is responsible for positioning their vehicle as an initial block.

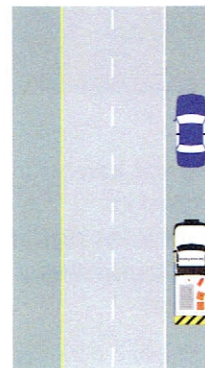
Blocking is the act of positioning a responder vehicle upstream of an incident to obstruct the flow of moving traffic in one or more lanes, and/or the shoulder.

Blocking vehicles should be positioned upstream of the incident scene so that:

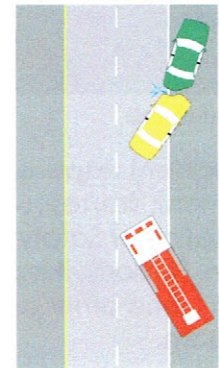
- There will be sufficient distance for the vehicle to roll-ahead without hitting the incident area should it get struck
- But not so much so that errant vehicles will travel around the blocking vehicle and strike responders

Blocking begins with just those lanes that are involved in the incident, including the shoulder, and can be accomplished with the responder vehicle positioned parallel to travel lanes or angled.

Parallel Blocking



Angled Blocking



A block can be to the left, as illustrated in the angled blocking example above, or to the right. Blocking towards available lanes provides a visual cue to approaching traffic. However, a block should provide maximum protection for responders, as is the case when a fire apparatus blocks to the right to protect the pump operator at a vehicle fire. Any responder vehicle can provide a block, but large, heavy vehicles typically provide the best blocks.



Angled Blocking



When positioning a response vehicle, drivers should work on the assumption that the unit may be hit by a vehicle approaching from upstream. Turning a vehicle's wheels so that they are not facing the incident space is a recommended practice referred to as critical wheel angle. Using the critical wheel angle may help divert a responder vehicle, which is struck from the rear, away from downstream responders.



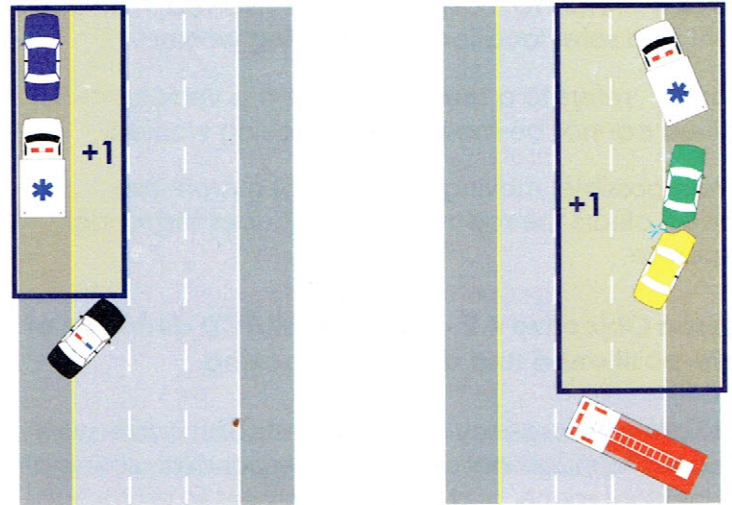
Critical Wheel Angle

During incident response, it is preferred that law enforcement, fire/rescue, and department of transportation or Safety Service Patrol vehicles position upstream. Similarly, it is preferred that ambulances, tow trucks, and other support units position downstream.

The order of vehicle arrival will not be the same for every incident, which can make it difficult to always achieve the preferred vehicle positioning. Allowing space for later arriving vehicles and/or a willingness to reposition vehicles as needed is important to creating a safe scene.

Lesson Objective 4.3 - Define Lane +1 blocking and describe the need for it

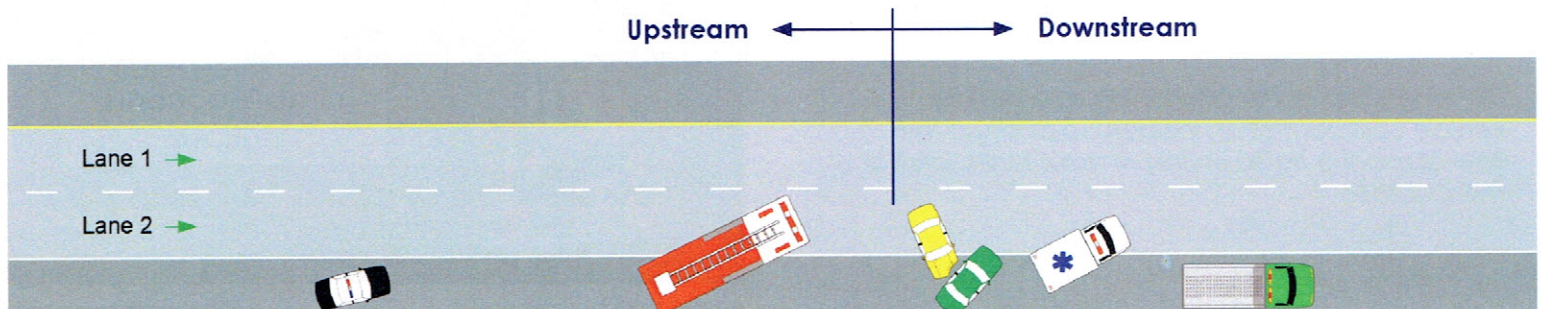
In order to protect responders and motorists at an incident scene, it may be necessary to close additional lanes for a short time. This protocol is referred to as Lane +1 blocking and occurs when responders block the involved lane(s), including the shoulder, plus one additional lane to provide a protected lateral space for safety. Patient treatment and movement, extrication, firefighting, crash investigations, and recovery operations are all examples of situations that may require Lane +1 blocking.



Lane +1 Blocking

Once response activities no longer require the extra space for safety, blocking should be reduced to the involved lanes only. A good rule of thumb is to take only as many lanes as you need for as long as you need them and then give them back as soon as safely possible.

Preferred Vehicle Positioning





Lesson 5: Scene Safety

Lesson Objective 5.1 - Describe how emergency vehicle markings can improve scene safety

Making responder vehicles more visible improves safety by reducing the chances they will be hit at incident scenes.

Conspicuity – refers to the ability of a vehicle to draw attention to its presence, even when other road users are not actively looking for it.

Vehicle markings are passive treatments that complement emergency lighting by using:

- Contrasting colors that make the vehicle stand out
- Fluorescent colors to increase daytime visibility
- Retro-reflective materials to maximize nighttime visibility

National Fire Protection Association (NFPA) 1901 *Standard for Automotive Fire Apparatus* and 1917 *Standard for Automotive Ambulances* governs the application of retro-reflective markings on fire apparatus and ambulances respectively. The standards include requirements for retro-reflective markings on the front, rear, and sides of the vehicles, as well as on the inside of any doors.

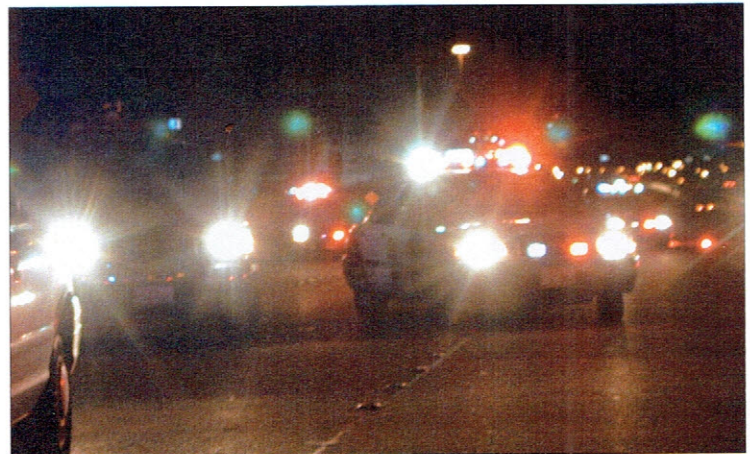


Examples of NFPA Compliant Emergency Vehicle Markings

Unlike fire apparatus and ambulances, there is no standard in the United States for emergency vehicle markings for any other responder disciplines. However, other responder disciplines are increasingly using high-visibility markings, such as chevrons on the rear of their vehicle, to promote conspicuity and enhance safety.

Lesson Objective 5.2 - Describe recommendations for emergency-vehicle lighting as set forth in the MUTCD

Section 6I.05 of the MUTCD specifically covers the use of emergency-vehicle lighting and recognizes that the use of emergency-vehicle lighting is essential, especially in the initial stages of a traffic incident, for the safety of responders and motorists approaching the incident. However, while an important tool for warning drivers, most emergency-vehicle lighting does little to augment traffic control or guide drivers, therefore more is not always better where emergency-vehicle lighting is concerned. The use of too many lights at an incident scene can be distracting and can create confusion for approaching road users (and other responders), especially at night.



Potentially Distracting Forward-Facing Emergency-Vehicle Lighting

The MUTCD recommends that the use of emergency-vehicle lighting be reduced if good traffic control has been established at a traffic incident scene. When multiple responder vehicles are present, only the rear-most (upstream) vehicles and blocking vehicles should continue the use of emergency (warning) lights after appropriate traffic control is in place. Reducing forward-facing lights is an important part of TIM as it minimizes distractions to motorists approaching from the opposite direction. Additionally, any floodlights or vehicle headlights that are not needed for illumination should be turned off at night.



Lesson Objective 5.3 - Describe high-visibility safety apparel requirements for incident responders

MUTCD Section 6D.03 states:

*"All workers, including emergency responders, within the right-of-way of a roadway who are exposed either to traffic (vehicles using the highway for purposes of travel) or to work vehicles and construction equipment **SHALL** wear high-visibility safety apparel (HVSA)..."*

HVSA worn by incident responders must meet, and be labeled as meeting, the ANSI/ISEA 107-2015 standard. Responders must wear a Type R (Roadway) or Type P (Public Safety), Class 2 or Class 3 vest. Vests labeled with previous ANSI/ISEA standards, including 107-2004, 207-2006, 107-2010, and 207-2011, are still considered compliant until replaced. As revisions are made to the ANSI/ISEA standard, they are made compliant with the MUTCD by memorandum from FHWA.



Type R, Class 2 (left) and Class 3 (right) Work Vests



Type P, Class 2 Vest

Type P is specifically for emergency responders and provides additional options for responders who have competing hazards or require access to special equipment. Type P vests also have a five-point breakaway function available as an additional safety feature.

MUTCD Section 6D.02 specifically addresses the use of HVSA by law enforcement and states that when uniformed law enforcement personnel are used to direct traffic, to investigate crashes, or to handle lane closures, obstructed roadways, and disasters, HVSA shall

be worn. The MUTCD does not require the use of HVSA for law enforcement activities such as traffic stops. Firefighters and other responders are exempt from MUTCD HVSA requirements when they are engaged in emergency operations that directly expose them to flame, fire, heat, and/or hazardous materials.

Lesson Objective 5.4 - Describe safe practices for working around or avoiding the Zero Buffer

A Zero Buffer occurs when there is limited or no buffer space between on-scene vehicles and any active lane of traffic. Responders who are required to enter a Zero Buffer should do so with great caution and immediately seek a safer place away from moving traffic.



Zero Buffer

All responders are encouraged to remain on the non-traffic side of response vehicles as much as possible.

General Safety Considerations

- ✓ Always wear your seat belt
- ✓ Never trust approaching traffic in either direction
- ✓ Never turn your back to approaching traffic
- ✓ Maintain an awareness of:
 - Where you are
 - Where you can go (escape route)
 - Where you can't go (bridges, on-coming traffic, etc.)
- ✓ Never stand between vehicles
- ✓ Instruct civilians where to stay, out of harm's way



Lesson 6: Command Responsibilities

Lesson Objective 6.1 - Describe both the need and the requirements for establishing and participating in the Incident Command System (ICS)

Clearing incidents safely and quickly depends on developing coordinated, multi-agency operations that are supported by integrated communications. Coordination results when all responders from all disciplines are trained and can effectively operate under ICS at highway incidents.

ICS is a standardized, on-scene, all-hazards incident management concept that allows users to adopt an organizational structure for handling an incident without being hindered by jurisdictional boundaries. The goals of ICS are:

- Safety of responders and others
- Achievement of tactical objectives
- Efficient use of resources

In Section 6I.01 of the MUTCD, it is emphasized that the National Incident Management System (NIMS) requires the use of ICS at traffic incident scenes.

Within ICS, the Command function is carried out by an Incident Commander or Unified Command, and is supported by Command Staff and General Staff. The Command Staff includes:

- **Public Information Officer** – responsible for serving as the go-between for Command and the media, and for relaying information on the incident and response efforts.
- **Safety Officer** – responsible for monitoring scene safety and developing preventative safety measures. The Safety Officer has the ability to immediately stop any action that is deemed unsafe or too high a risk. The Incident Commander can over-ride the orders after consultation with the Safety Officer and involved personnel.
- **Liaison Officer** – responsible for coordinating with representatives from cooperating and assisting agencies and organizations.

The leaders of the individual sections are known as the General Staff and individually as Section Chiefs. For most incidents, all on-scene responders typically fall under the Operations Section.

ICS General and Command Staff





Lesson Objective 6.2 - Describe when it is appropriate to implement Unified Command

Single Command – when one individual is designated as Incident Commander and has complete responsibility for incident management.

Unified Command – a joint management and authority structure in which two or more individuals share the role of Command.

Unified Command typically is fulfilled by a team of individuals already having authority within their discipline or responding agency. Unified Command allows agencies to:

- Work together without affecting authority, responsibility, or accountability
- Manage an incident together by establishing a common set of incident objectives and strategies

Unified Command is most appropriate for major incidents involving multiple agencies.



Unified Command

Lesson Objective 6.3 - Identify the need for and use of Staging Areas

Large-scale traffic incidents may require an Incident Command Post and/or a staging area.

Incident Command Post – the field location at which the primary tactical-level, on-scene incident command functions are performed.

Staging Area – the location established where resources can be placed while awaiting a tactical assignment.



Staging Area

Staging areas allow for the organization of personnel and equipment to be readied for immediate use at the incident scene. Staging areas also allow for resources and/or personnel that are ready, but ultimately not needed, to immediately depart and return to service.

After-Action Reviews (AARs)

PURPOSE

To evaluate the decisions made and actions taken during an incident and to identify both best practices and opportunities for improvement

TYPICAL FORMAT

1. Review basic incident details
 - » Utilize pictures, maps, and/or video to illustrate incident scene
 - » Consider utilizing tabletop exercise materials to reenact incident
2. Roundtable discussion – agency perspectives
 - » Discuss issues and/or areas of concern
 - » Identify solutions/enhancements
 - » Avoid finger pointing
3. Identify at least one action item per AAR



Lesson 7: Traffic Management

Lesson Objective 7.1 - Describe the four main components of a Traffic Incident Management Area

A Traffic Incident Management Area is a type of temporary traffic control zone that is described in MUTCD Part 6. While there are similarities between a highway work zone and a Traffic Incident Management Area, the time available to plan and the availability of resources results in significant differences between the two. Despite differences, the four main components of a Traffic Incident Management Area are the same as any temporary traffic control zone:

- **Advance Warning Area** – established upstream of the incident to alert drivers of the upcoming incident scene. All advance warning devices should also be upstream of any traffic queues so that warning is given to road users before encountering stopped traffic.
- **Transition Area** – section of roadway where drivers are redirected out of their normal path. Transition Areas usually involve the strategic use of tapers, which can be set up using cones or flares.
- **Activity Area** – section of the roadway where incident response activities take place and is comprised of the:
 - » **Upstream (Longitudinal) Buffer Space** – separates the Transition Area from the Incident Space and provides a recovery area for errant vehicles.

No vehicles should be positioned within the Upstream Buffer Space.

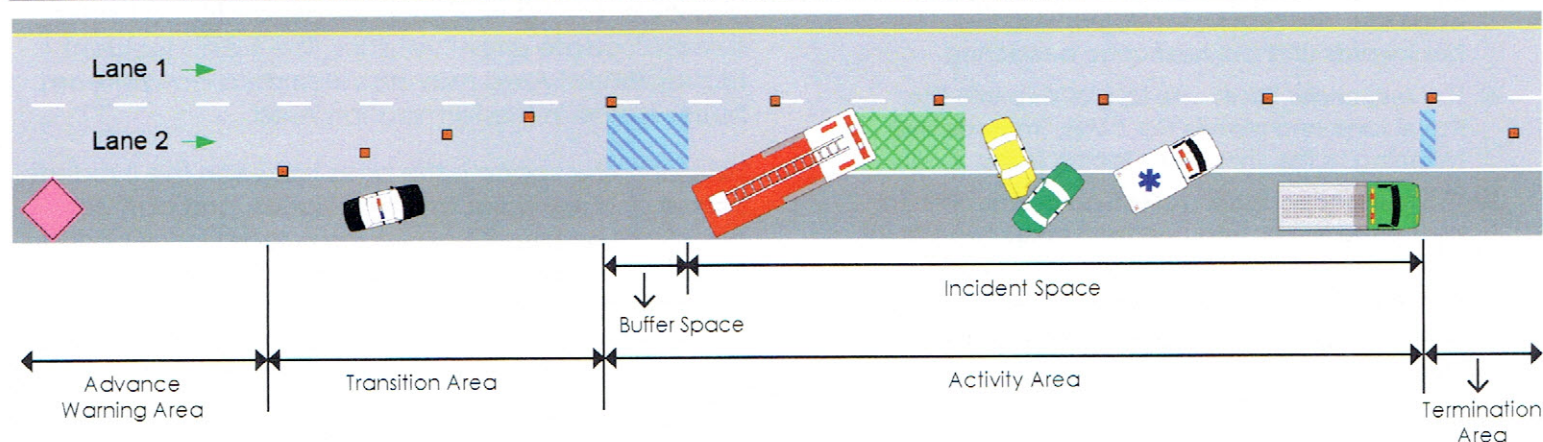
- » **Incident Space** – location where the incident has occurred and emergency responders are working. A blocking vehicle should be positioned at the upstream end of the Incident Space to protect workers from impacts by errant vehicles.
- **Termination Area** – used to notify drivers that the Traffic Incident Management Area is ending and they may resume normal driving. The Termination Area includes the downstream buffer space and taper, which is in place to protect emergency responders working at the end of the Incident Space.

Lesson Objective 7.2 - Identify conditions at an incident scene that would require the Advance Warning Area be extended

Wet roads can double the average motorist's stopping distance over that for dry road conditions and poor visibility can lengthen driver reaction time. Therefore, additional or extended advance warning may be necessary during adverse conditions, such as rain, snow, ice, smoke, fog, or darkness.

Additional or earlier advance warning may also be necessary due to limited sight distances created by roadway geometries, such as hills, curves, bridges, or inter-

Traffic Incident Management Area





sections. A well-positioned responder vehicle, upstream of the incident scene, can serve as advance warning until signs or other traffic control devices are in place.

Lesson Objective 7.3 - Describe the need for, and how to set up, a taper

Tapers are used in Transition Areas to redirect drivers out of their normal path. Tapers can be set up using cones, flares, reflectors, or other channelizing devices. Channelizing devices used to establish a taper are typically placed no further apart in feet than the speed limit (i.e., in a 35 mph zone the cones would be placed 35 feet apart). However, responders can also use roadway skip lines or 10 walking paces to establish uniform spacing when setting up a taper.

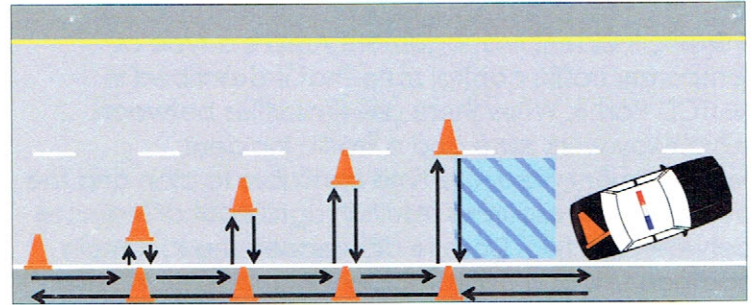


Traffic Cones

Taper Setup Methodology

1. The responder retrieves available cones from the trunk placing one a reasonable distance from the responder vehicle on the edge line, allowing for a buffer
2. Walking along the shoulder, facing traffic, a cone is subsequently placed on the edge line at each skip line (alternatively, they can be placed every 10 paces)
3. When the last cone has been placed on the edge line, the responder begins walking backwards until the next cone is reached
4. The responder takes one lateral step into the travel lane and places the cone, immediately returning to the shoulder – facing traffic
5. The responder again walks backwards until the next cone is reached and then takes two lateral steps into the travel lane to place the cone, immediately returning to the shoulder
6. The steps are repeated until all cones are deployed

Using this methodology while maintaining situational awareness and following personal safety best practices, like never turning your back on traffic, helps minimize the exposure of the responder. One emerging concept to consider, when possible, is to use an upstream responder vehicle to provide a protective block while tapers are being setup or taken down.



Taper Setup

Lesson Objective 7.4 - Identify and describe the two types of buffers that may be established at an incident scene

At an incident scene, the two types of buffers that may be established as part of the Traffic Incident Management Area are longitudinal buffer spaces and lateral buffer spaces. The Upstream (Longitudinal) Buffer Space covers the distance between the Transition Area and the Incident Space. By definition, it is a recovery area for errant vehicles, so no responder vehicles should be parked in the Upstream Buffer Space.

In work zone settings, the length of the longitudinal buffer is based on the stopping sight distance of a vehicle traveling at the posted speed limit. However, the Upstream Buffer Space in TIM applications will typically be fairly short due to the limited availability of channelizing devices. When additional resources are available, the buffer should be expanded to better accommodate errant vehicles. The Traffic Incident Management Area may also include a downstream buffer space in the Termination Area.

Lateral buffer space is the area between the Incident Space and the adjacent travel lanes, and can be beneficial because it allows more room for responders to work. The lateral buffer space can be increased through the use of Lane +1 blocking when necessary. When lateral buffer spaces are used it is recommended that the entire lane be closed and that partial lane closures be avoided.



Lesson 8: Special Circumstances

Lesson Objective 8.1 - Identify the safety concerns related to responding to an incident involving a vehicle fire

A vehicle fire presents a danger zone that specifically includes the area directly in front of and behind the burning vehicle where projectiles, like pistons, may launch from the vehicle. Non-firefighting responders should remain clear of all sides of a burning vehicle, and remain uphill and upwind of the incident. Additionally, the smoke created by a vehicle fire and the steam created while extinguishing the fire can affect both responder and motorist visibility at the incident scene. It is sometimes necessary to close additional lanes while a fire is burning or being extinguished.



Projectile Dangers at Vehicle Fires

Lesson Objective 8.2 - Describe how to identify what hazardous material is being transported

Hazardous materials (hazmat) can be identified through labels, markings, or placards. Labels are placed on the actual item or the individual package containing the material. Markings are placed on the boxes that the materials are transported in. Placards are placed on the outside of the trucks (or other vehicles) transporting the material. If available, the vehicle's bill of lading, or shipping papers, can also be referenced to identify the type of material(s) being transported.

Placards, which should be placed on each side and each end of the transport vehicle, are color-coded based on the class of hazardous material being transported. The placard, or an orange panel placed below the placard, should include a four-digit number that can be referenced to identify the hazardous material using the Emergency Response Guidebook (ERG). The ERG is an excellent resource for all incident responders and, in addition to the printed version, electronic versions are now available for computers and mobile devices.



Emergency Response Guidebook and App

How to Use the ERG

1. Identify the material using either the:

- ID number (4-digit) from the placard, orange panel, shipping document, or package
- Name of the material from a shipping document or package

2. Identify 3-digit guide number

- ID Number Index (yellow)
- Name of Material Index (blue)

3. Turn to the numbered guide (orange) and read carefully



Agencies should be capable of the following actions when hazardous materials are involved in a traffic incident:

- Identify reportable quantities
- Determine what response is required
- Understand the capabilities of local responders

Individual responders should limit themselves to only working on spills or leaks of a magnitude that are within their capabilities, training, and equipment. Dedicated hazmat teams should be used to deal with those incidents which fall outside of the capabilities of on-scene responders.

Lesson Objective 8.3 - Recount good practices for responding to an incident involving a vehicle fluid spill

Common small vehicle fluid spills can be mitigated following these steps as long as responders are following their state's related policies and procedures:

1. Stop leaking material at the source
2. Contain and limit the spill from spreading
3. Apply available absorbents
4. Remove material from travel lanes
5. Gradually restore traffic flow



Spill Response for Vehicle Fluids

It is important to make every effort to stop the spill from reaching any type of waterway, including catch basins, sewers, and/or storm drains. Additionally, many tow companies carry absorbent and other equipment that may assist with spill mitigation. It is recommended that responders maintain an understanding of the capabilities of local tow providers.

Lesson Objective 8.4 - Describe the primary goal of a crash investigation and the importance of preserving short-lived evidence

The foundation of traffic crash investigations involves the collection of information that ultimately helps understand when, where, and why crashes occur. Investigations also help to identify who is at fault, enabling vehicle repairs and other compensation. Additionally, crash investigations ensure that individuals who might have committed a crime through their driving actions can be brought to justice.

It is the responsibility of all incident responders to ensure that the incident scene is preserved by refraining from removing, moving, or eradicating physical evidence. Responders should take only those actions needed to complete their own area of responsibility with minimal disturbance of the scene unless authorized or assigned. Remember, all debris should be considered evidence until law enforcement personnel indicates otherwise.

Short-Lived Evidence – evidence that will most likely be lost, destroyed, or compromised once the scene has been cleared. Examples of short-lived evidence include tire marks, debris fields, gouges, scrapes, fluid trails, blood, hair, and fibers. Critical short-lived evidence can disappear when walked on by responders, driven over, flushed away with water, or unintentionally swept away with a broom.



Short-Lived Evidence – Tire Print and Hair

To assist with evidence preservation, responders should:

- Document occupant seating location/position, seat belt usage, and air bag deployment
- Note the presence of drugs, open containers, or other suspicious substances or activities
- Remove and turn over ignition keys to the investigator



Lesson 9: Clearance and Termination

Lesson Objective 9.1 - Describe quick clearance strategies for both minor incidents and incidents that involve tractor trailers and/or spilled cargo

For minor incidents, if an involved vehicle is still functional, having the driver move it out of travel lanes is a simple quick clearance strategy. If the vehicle is not operational or is damaged, a responder vehicle with a push bumper can clear it out of the roadway. When a tow truck is required, the request must be made as soon as possible, even if the vehicle has been relocated to the shoulder.



Quick Clearance – Push, Pull, Drag, or Drive

Typically, when a commercial vehicle has spilled cargo, the trucking company and/or insurance provider must be contacted, and they may request that the cargo be salvaged. However, salvage operations can result in significant clearance and traffic delays. If authority removal legislation is in place, determine if the vehicle and/or spilled cargo can be pushed to the shoulder to open travel lanes more quickly.



Spilled Cargo

Safe, Quick Clearance Strategies

- ✓ Working with a sense of urgency to reduce the exposure to risks for both responders and motorists
- ✓ Utilizing Unified Command and incorporating safe, quick clearance into the incident objectives
- ✓ Completing tasks concurrently whenever possible
- ✓ Regularly assessing traffic control and on-scene activities to determine if additional lanes can be opened
- ✓ Utilizing all available resources for clearance activities
- ✓ Thinking outside of the box and considering how things could be done differently

Lesson Objective 9.2 - List the type of information that needs to be provided to towing and recovery to facilitate their response

During incident response, tow operators play an invaluable role in promoting quick clearance by removing damaged vehicles. Tow operator responsibilities include loading vehicles and departing the scene as quickly as possible, transporting occupants from towed vehicles to a safe location away from the incident, and handling financial negotiations off-site.



Towing and Recovery

Tow operators depend on getting timely, accurate information from those on the scene. The Towing and Recovery Association of America (TRAA) has devel-



oped a Vehicle Identification Guide to assist non-towing responders who are responsible for requesting tow services. The guide lists the information that towing dispatchers need to secure the appropriate towing vehicle, including:

- Year, make, and model of vehicle
- DOT classification
- Location and scene access
- Reason for tow
- Additional vehicle or crash details

The towing industry is supportive of realistic training standards and supports several training programs nationwide. In addition to the TIM training, joint training provides an opportunity for other responders to better understand the capabilities of their towing and recovery partners.



Joint Training

Lesson Objective 9.3 - Describe the importance of performing response tasks concurrently as it relates to safe, quick clearance

It is important for responders to communicate and coordinate their individual activities on the scene, and to perform them concurrently, not sequentially, whenever possible. Like the analogy of an auto racing pit crew, every team member works simultaneously to accomplish the overall goal of the team. Each discipline can work cooperatively to achieve their respective tasks, in many cases at the same time.

Concurrently completing tasks includes requests for additional resources. Resource requests should be made as soon as possible, even if the resources are not needed immediately, to enable a timely response. For example, even if a crash investigation is required at the scene, the towing and recovery provider should

still be notified early so that they can plan their response accordingly.



Concurrent Response Activities

Lesson Objective 9.4 - Describe the major activities that take place during termination and identify safety related considerations for scene breakdown

Termination is the final stage of incident response and includes demobilizing and removing all equipment, personnel and response vehicles, and restoring traffic flow to normal.

It is recommended that responder vehicles that are no longer required leave the scene as soon as practical to minimize exposure to traffic and distraction to passing motorists. However, it is critical that the remaining responder vehicles reassess the scene and reposition their vehicles as necessary to keep the scene protected, as well as to open travel lanes when it is safe to do so.

During demobilization, it is important to dismantle the scene from the Termination Area backwards to the Advance Warning Area. Responders also need to maintain an awareness of the potential for frustrated motorists that may be particularly aggressive and drive at high speeds.

Termination Checklist

- ✓ **Protect towers while they finish up**
- ✓ **Remove temporary traffic control devices**
- ✓ **Lift the detour or alternate route**
- ✓ **Let communications centers and TMC know that lanes are open**
- ✓ **Make sure all personnel are accounted for**
- ✓ **Check with Incident Commander prior to leaving**

LAW ENFORCEMENT VEHICLE IDENTIFICATION GUIDE

CLASS 1 - LIGHT-DUTY

(6,000 lbs. or less GVWR - 4 tires)*



CLASS 2 - LIGHT-DUTY

(6,001 - 10,000 lbs. GVWR - 4 tires)*



Class 1 through 2 include passenger cars, light trucks and mini vans, full size pickups, sport utility vehicles, full size vans

CLASS 1 AND 2 - LIGHT-DUTY TOW

Gross Vehicle Weight Rating (6,000 to 10,000 lbs.)

Passenger cars, small SUVs and pickup trucks

- | | |
|---|--|
| <input type="checkbox"/> Year, make and model? | <input type="checkbox"/> 4x4 or AWD? |
| <input type="checkbox"/> Number of occupants? | <input type="checkbox"/> Keys? |
| <input type="checkbox"/> Full-size pickup or van? | <input type="checkbox"/> Trailer? |
| <input type="checkbox"/> Is it loaded? | <input type="checkbox"/> What is the load? |

VEHICLES IN THESE CLASSES USUALLY HAVE FOUR TIRES.

CLASS 3 - LIGHT- OR MEDIUM-DUTY

(10,001 - 14,000 lbs. GVWR - 6 tires or more)*



CLASS 4 - MEDIUM-DUTY

(14,001 - 16,000 lbs. GVWR - 6 tires or more)*



CLASS 5 - MEDIUM-DUTY

(16,001 - 19,500 lbs. GVWR - 6 tires or more)*



CLASS 6 - MEDIUM-DUTY

(19,501 - 26,000 lbs. GVWR - 6 tires or more)*



Class 3 through 6 include a range of mid-sized to larger vehicles including delivery trucks, utility vehicles, motor homes, package parcel trucks, ambulances, small dump trucks, landscape vehicles, small flatbed and stake-type trucks, refrigerated and box trucks, small and medium-duty buses (school and local transit buses.)

CLASS 3, 4, 5 & 6 - LIGHT- OR MEDIUM-DUTY TOW

Gross Vehicle Weight Rating (10,001 up to 26,000 lbs.)

- | | |
|--|--------------------------------|
| <input type="checkbox"/> Year, make and model? | |
| <input type="checkbox"/> Body type - pickup truck, box truck, flatbed, step van | |
| <input type="checkbox"/> What is the load and is it damaged? | |
| <input type="checkbox"/> Pickup, van, shuttle bus or motor home? | |
| <input type="checkbox"/> Number of occupants? | <input type="checkbox"/> Keys? |
| <input type="checkbox"/> Vehicle description is critical to determine the proper tow vehicle | |

VEHICLES IN THESE CLASSES USUALLY HAVE SIX TIRES.

This card is produced and distributed by the Towing and Recovery Association of America.

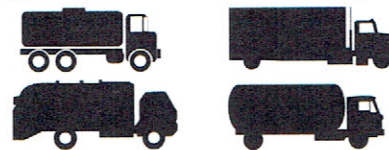
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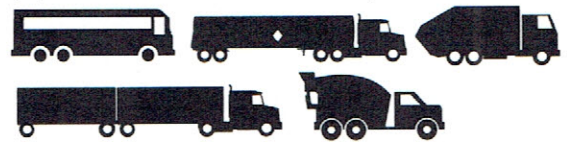
CLASS 7 - HEAVY-DUTY

(26,001 - 33,000 lbs. GVWR - 6 tires or more)*



CLASS 8 - HEAVY-DUTY

(33,001 lbs. and over GVWR - 10 tires or more)*



Class 7 and 8 include a range of heavier vehicles including large delivery trucks, motor coaches, all tractor-trailer combinations, refuse trucks, construction vehicles, etc.

CLASS 7 AND 8 - HEAVY-DUTY TOW

Gross Vehicle Weight Rating

(Class 7 - 26,001 to 33,000 lbs.)

(Class 8 - 33,001 and up to state limit)

- | | |
|--|--|
| <input type="checkbox"/> Year, make and model? | <input type="checkbox"/> Two or three axle truck or tractor-trailer? |
| <input type="checkbox"/> Bus or motor home? | <input type="checkbox"/> What is the load and is it damaged? |
| <input type="checkbox"/> Number of occupants? | <input type="checkbox"/> Keys? |

STRAIGHT TRUCKS, BUSES OR MOTOR HOMES IN THESE CLASSES WILL USUALLY HAVE SIX TO TEN TIRES. TRACTOR AND TRAILER COMBINATIONS WILL HAVE FOURTEEN OR MORE TIRES.

MOTORCYCLES - LIGHT-DUTY TOW

Sports motorcycle - off road/basic street type

Performance motorcycle - "racing" model type

Touring motorcycle - large, heavy road touring type

Custom or 3-wheel motorcycle



TRAILERS - LIGHT-, MEDIUM- OR HEAVY-DUTY TOW

- | | |
|---|--|
| <input type="checkbox"/> Is it a truck and trailer to tow or just a trailer to tow? | |
| <input type="checkbox"/> Number of axles and what is it hauling or is it designed to haul? | |
| <input type="checkbox"/> Type of load or weight of load? | |
| <input type="checkbox"/> If a tow, does the trailer have a ball, pintle or a fifth wheel hitch? | |

MOTOR HOMES - LIGHT-, MEDIUM- OR HEAVY-DUTY TOW

Class C - usually built on a van or pickup type truck chassis

Class A - usually built on a medium to large truck or bus chassis



LOCATION:

All locations are considered to be on the right hand shoulder unless advised the incident is in a lane of travel, in the center divider or off the road.

Locations should always be given so the tow truck can access the scene safely.

Freeway locations should always be given going in one direction, such as southbound south of a specific landmark or intersection.

REASON FOR THE TOW:

Service call: Specify the reason, fuel, tire, etc.

Tow: Specify the reason

Storage: Arrest or impound tow

☐ Is the vehicle stripped, burned, flat tires or no wheels?

Wreck: Condition of the vehicle

☐ Is the vehicle/truck overturned?

☐ Are lanes blocked?

☐ Is the vehicle off the road? ☐ How far?

☐ Any special problems at the scene or special equipment needed?

* Note: The Gross Vehicle Weight Rating (GVWR) of the vehicle to be towed or recovered can be found on the identification label on the vehicle's driver's side doorframe. The number of pounds listed on the label can then be compared with the DOT Classification Vehicle Type Chart for the correct DOT class.

