EMERGENCY VEHICLE ACCIDENT PREVENTION 3.0

STUDENT GUIDE

WFC EVIP 3.0 PROGRAM SUMMARY

WFC EVIP PROGRAM REQUIREMENTS

This program was designed to produce safer Emergency Vehicle Operators (EVO) in all size departments. Also the program is designed to:

- Meet the required CDL exemption in RCW 46.25.050 for apparatus over 26,001 lbs.
- Meet the training requirements under WAC 296-305-04505 Automotive apparatus operational rules.
- Meet the annual training requirements for WAC 296-305-05502 (2) Training and Member Development.

EVIP STUDENT INSTRUCTOR CERTIFICATION

To conduct a WFC EVIP Course, instructors (EVIP Student Instructors) must take a Train-the-Trainer, taught by Authorized Instructor Trainers, offered through the Washington State Fire Chiefs Association. The EVIP Train-the-Trainer course will cover curriculum, forms, and documentation requirements for EVIP Student Instructors to present the material to local departments.

Instructor recertification is required every 5 years. WFC will issue a Train-the-Trainer Certificate with an expiration date of no more than 5 years.

- WFC EVIP Train-the-Trainer Certificate **(WFC-TTTCERT-18-EV)**
- WFC EVIP Sample EVIP Certificate **(WFC-CERT-18-EV)**

WFC EVIP OPERATOR CERTIFICATION REQUIREMENTS

To receive initial certification Emergency Vehicle Operators must:

- Classroom coverage of EVIP 4 Unit Curriculum.
- Pass a 25-50 question written test (80% to pass).
- Correctly complete visual and operational checklist.
- Successfully complete the EVIP rodeo to the minimum requirements (may cover smaller classes of vehicles by weight).
- Successfully complete the EVIP road test to the minimum requirements (may cover smaller classes of vehicles by weight).
- Carry an AHJ issued certificate of successful EVIP completion while driving emergency vehicles.

WFC EVIP OPERATOR RECERTIFICATION REQUIREMENTS

EVOs must re-certify annually by completing the following:

- Review 2 EVIP Modules.
- Perform the EVIP road test on largest class of vehicle driven (may cover smaller classes of vehicles by weight).
- Carry an AHJ issued certificate of successful EVIP completion while driving emergency vehicles.

WFC EVIP 3.0 PROGRAM SUMMARY

CLASSROOM CURRICULM

- Student Guide
- Unit 1 EVIP Program Overview (30 Minutes)
- Unit 2 Legal Requirements (45 Minutes)
- Unit 3 Response Challenges and Strategies and Tactics (60 Minutes)
- Unit 4 Physical Forces that Impact Vehicle Dynamics (75 Minutes)
- Test

FORMS

- Visual and Operational Checklist Forms **(WFC-PTI-18-S, WFC-PTI-18-EV)**
- Skills Rodeo **(WFC-RODEO-18-EV)**
- Road Test **(WFC-ROAD-18-EV)**
- EVIP Test **(WFC-TEST-18-EV)**
- EVIP Test Answer Sheet and Operation Skills Assessment **(WFC-ANS-18-EV)**

EVIP PROGRAM DOCUMENTATION

EVIP Student Instructors must keep a roster, all completed skills sheets, and the EVIP test answer sheet for each student as documentation of completed classes. Documentation is subject to audit by WFC.

AHJs must issue certificates or cards with the for EVIP operators to carry while driving emergency vehicles. These cards must contain the AHJ, operator name, expiration date, and class(es) of vehicles approved to operate.

EVIP APPROVED PROGRAM POLICIES AND PROCEDURES

The WFC will adhere to the Emergency Vehicle Incident Prevention Program Policies and Procedures while administering the EVIP program.

Approval for this program is by recommendation from the WSP Fire Bureau of Protection and approval of the Department of Licensing. The program must be reviewed every 5 years.

WFC EVIP PROGRAM 3.0

UNIT 1 WFC EMERGENCY VEHICLE INCIDENT PREVENTION (EVIP) PROGRAM OVERVIEW

PROGRAM OBJECTIVES

- The Emergency Vehicle Operator (EVO) will be able to list and describe the appropriate sections of the Washington State Law as it applies to emergency operation. *Unit 1,2*
- The EVO will be able to define:
    - True Emergency
    - Specific Exemptions
    - Emergency Mode
    - Due regard *Unit 2*
- The EVO will be able to describe the elements of a recommended emergency vehicle operator training program. *Unit 1,2*
- The EVO will be able to describe and list common response challenges and causes of collisions. *Unit 3*
- The EVO will able to describe Strategies and Tactics related to successfully meeting response challenges. *Unit 3*
- The EVO will be able to recognize that human factors contribute to collisions. *Unit 3*
- The EVO will understand the importance of vehicle maintenance, inspections & records. *Unit 3*
- The EVO will be able to list the physical forces effecting vehicle operation and their relationship to vehicle speed and size. *Unit 4*
- The EVO will be able to demonstrate accurate and safe driving techniques by successfully completing a rodeo, road course, and visual and operational checklist of emergency vehicle classifications they operate.

EMERGENCY VEHICLE OPERATIONS TRAINING IS REQUIRED ANNUALLY

WAC 296-305-04505 (8)

Automotive apparatus operational rules.

All **operators of emergency vehicles** shall be **trained in the operations of apparatus before they are designated as drivers** of such apparatus. The training program shall be established by each fire department. Once trained, all operators shall familiarize themselves with **any apparatus** prior to operating such apparatus even for brief periods of time.

WAC 296-305-05502 (2)

Training and member development.

Training on specific positions/duties deemed by the fire department critical to the safety of responders and the effectiveness of emergency operations (such as driver operators or support personnel) shall be provided at least **annually.**

EMERGENCY VEHICLE INCIDENT PREVENTION (EVIP) CERTIFICATION

A Department of Licensing approved program is required for Emergency Vehicle Operators that do not have a commercial driver's license (CDL) for vehicles with a gross weight of over 26,001 lbs or towing a trailer over 10,000 lbs to operate those vehicles.

RCW 46.25.010 Definitions

(6) "Commercial motor vehicle" means a motor vehicle or combination of motor vehicles used in commerce to transport passengers or property if the motor vehicle:

(a) Has a gross combination weight rating or gross combination weight of 11,794 kilograms or more (26,001 pounds or more), whichever is greater, inclusive of any towed unit or units with a gross vehicle weight rating or gross vehicle weight of more than 4,536 kilograms (10,000 pounds or more), whichever is greater; or

RCW 46.25.050 Commercial driver's license required — Exceptions, restrictions, reciprocity.

(1) Drivers of commercial motor vehicles must obtain a commercial driver's license as required under this chapter…. However, this requirement does not apply to any person:

(b) Who is a firefighter or law enforcement officer operating emergency equipment, and:

(i) The firefighter or law enforcement officer has successfully completed a **driver training course approved by the director**; **and**

(ii) The firefighter or law enforcement officer **carries a certificate** attesting to the successful completion of the approved training course;

NOTE: CDL EXEMPTION MAY ONLY APPLY WHILE DRIVING IN WASHINGTON STATE.

Check your local mutual aid agreements for reciprocity of CDL exemptions.

EMERGENCY VEHICLE INCIDENT PREVENTION (EVIP) - Training Curriculum and Certification sponsored by the Washington State Fire Chiefs as an approved course for the CDL exemption. If you use another approved course, you must follow their Instructor training and operator training requirements instead.

Firefighters who successfully complete the course and **carry** their certification are exempt from CDL licensing requirements.

EVIP training ***also*** meets the *WAC 296-305-04505 (8)* requirements for training for the driving of smaller Emergency Vehicles if the Authority Having Jurisdiction (AHJ) approves it as such.

EVIP TRAINER CERTIFICATION

EVIP Instructors must have taken a Train-the-Trainer after 2014, the class is offered through the Washington State Fire Chiefs.

Instructor recertification is required every 5 years.

Instructors must keep documentation of classes and AHJ must issue certificates for EVIP operators.

EVIP Student Instructors must keep documentation of classes and AHJ must issue certificates for EVIP operators who complete the course within 30 days.

EVIP OPERATOR CERTIFICATION REQUIREMENTS

To receive certification Emergency Vehicle Operators (EVO) must:

- Classroom coverage of EVIP Curriculum.
- Pass a 25-50 question written test (80% to pass.)
- Correctly complete visual and operational checklist.
- Perform the EVIP rodeo to the minimum requirements.
- Perform the EVIP road test to the minimum requirements.
- Carry an AHJ issued certificate of

successful EVIP completion while driving emergency vehicles.

To re-certify annually, EVO must re-certify by completing the following:

- Review 2 EVIP Modules.
- Perform the EVIP road test on largest class of vehicle driven (covers smaller classes of vehicles by weight).
- Carry an AHJ issued certificate of successful EVIP completion while driving emergency vehicles.

National Traffic Incident Management Course (TIM) 8 Hour Course Recommended

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 reduces the duration and impacts of traffic incidents and improves the safety of motorists, crash victims and emergency responders.

This training covers many TIM recommended procedures and techniques, including:

- TIM Fundamentals and Terminology

- Notification and Scene Size-Up

- Safe Vehicle Positioning

- Scene Safety

- Command Responsibilities

- Traffic Management

- Special Circumstances

- Clearance and Termination

- Telecommunicators

UNIT 2 – LEGAL REQUIREMENTS

SPECFIC EXEMPTIONS

- EV operators are subject to ALL traffic regulations unless given specific exemptions.
- A specific exemption is a statement in your state statute giving the EV operator certain privileges as set forth in the law not ordinarily permitted.
- They ALWAYS contain a clause providing for the safety of other motorists.

TRUE EMERGENCY

A situation in which there is a high probability of death or serious injury to an individual(s) or significant property loss and actions by the emergency vehicle driver may reduce the seriousness of the situations.

EMERGENCY MODE

The emergency mode utilizes warning lights and siren during a response to a true emergency.

DUE REGARD

Even when specific exemption is made, you may be held criminally/civilly liable for your actions if you do not exercise due regard for the safety of others.

This means that while performing similar duties and under similar circumstances, a reasonably careful person would act in the same manner.

DUE REGARD must be used when SPECIFIC EXEMPTION is taken while responding to a TRUE EMERGENCY in the EMERGENCY MODE.

EMEGENCY EXEMPTIONS PRINCIPALS

1) You are asking permission to be exempt from some traffic laws, it is not guaranteed.
2) Laws will trump the exemption if you are in an accident.
3) You must balance your sense of urgency with public safety.
4) If you never arrive, you can't be part of the solution.

EMERGENCY VEHICLE RESPONSE ONLY PRIVILEGES

RCW 46.61.035

Authorized emergency vehicles.

RCW 46.61.035 (1) The driver of an authorized emergency vehicle, when responding to an emergency call or when in the pursuit of an actual or suspected violator of the law or when responding to but not upon returning from a fire alarm, may exercise the privileges set forth in this section, but subject to the conditions herein stated.

AKA TRUE EMEGENCY

RCW 46.61.035 (2) The driver of an authorized emergency vehicle may:

(a) Park or stand, irrespective of the provisions of this chapter;

(b) Proceed past a red or stop signal or stop sign, but only after slowing down as may be necessary for safe operation;

(c) Exceed the maximum speed limits so long as he or she does not endanger life or property;

(d) Disregard regulations governing direction of movement or turning in specified directions.

AKA SPECIFIC EXEMPTIONS

RCW 46.61.035 (3) The exemptions herein granted to an authorized emergency vehicle shall apply only when such vehicle is making use of visual signals meeting the requirements of RCW 46.37.190, except that: …(b) authorized emergency vehicles shall use audible signals **when necessary** to warn others of the emergency nature of the situation but in no case shall they be required to use audible signals while parked or standing.

AKA RESPONDING IN EMERGENCY MODE

RCW 46.61.035 (4) The foregoing provisions shall not relieve the driver of an authorized emergency vehicle from the duty to drive with due regard for the safety of all persons, nor shall such provisions protect the driver from the consequences of his or her reckless disregard for the safety of others.

AKA DUE REGARD

AUTHORIZED VEHICLES

RCW 46.04.040

“Authorized emergency vehicle" means any vehicle of any fire department, police department, sheriff's office, coroner, prosecuting attorney, Washington state patrol, ambulance service, public or private, which need not be classified, registered or authorized by the state patrol, or any other vehicle authorized in writing by the state patrol.

WA STATE LAW - CDL EXEMPTION

RCW 46.25.050 Commercial driver's license required — Exceptions, restrictions, reciprocity.

Drivers of commercial motor vehicles must obtain a commercial driver's license as required under this chapter (for 26,001 pounds)…. However, this requirement does not apply to any person:

(b) Who is a firefighter or law enforcement officer operating emergency equipment, and:

The firefighter or law enforcement officer has **successfully completed a driver training course approved by the director**; and

The firefighter or law enforcement officer **carries a certificate attesting** to the successful completion of the approved training course;

AKA SUCCESSFUL COMPLETION OF APPROVED TRAINING COURSE AND CARRIES A CERTIFICATE

EVIP OPERATOR CERTIFICATION REQUIREMENTS

To receive certification Emergency Vehicle Operators (EVO) must:

- Classroom coverage of EVIP Curriculum.
- Pass a 25 question written test (80% to pass.)
- Correctly complete visual and operational checklist.
- Perform the EVIP rodeo to the minimum requirements.
- Perform the EVIP road test to the minimum requirements.
- Carry an AHJ issued certificate of successful EVIP completion while driving emergency vehicles.

To re-certify annually, EVO must re-certify by completing the following:

- Review 2 EVIP Modules.
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- Carry an AHJ issued certificate of successful EVIP completion while driving emergency vehicles.

THERE ARE LAWS, AND THERE ARE LAWYERS

- *"….nor shall such provisions protect the driver from the consequences of his or her reckless disregard for the safety of others."*
- The specific exemption provides almost no protection to the emergency vehicle operator from legal, civil or criminal action if there were to be an accident.
- Meeting the minimum legal requirements for an EVIP program will not shield your department if reckless disregard for the safety of others is shown by your operators.

NATIONAL STANDARDS

Though not specifically required by Washington State Law, the Washington Fire Chiefs Emergency Vehicle Incident Prevention program recommends Authorities Having Jurisdictions (AHJs) develop Standard Operating Procedures and/or Guidelines for their departments based on the following National Fire Protection Association standards:

- NFPA 1002-Fire Department Vehicle Driver/Operator Professional Qualifications.
- NFPA 1451- Fire Service Vehicle Operations Training Programs
- NFPA 1500- Firefighter Occupational and Safety Standard.

These are not laws, but generally recognized standards, that may be referenced in determining negligence if an accident occurs.

ELEMENTS OF NEGLIGENCE

Negligence is the legal standard to which departments or operators are held to for civil and criminal charges.

Negligence:

Legal deficiency or wrong which results whenever a person fails to exercise that degree of care which a prudent person would exercise under similar circumstances.

The four steps must be proven to prove negligence.

- Duty
- Breach of Duty
- Injury or Death
- Breach of the duty caused injury or death

The negligence may be slight, ordinary, or gross.

Similar Circumstances:

Because there are National Standards (NFPA) that relate to Emergency Vehicle Operations, Training, and Operator qualifications, departments may be held to standards they are not legally required to follow if there was a lawsuit against and operator and the department.

Though not adopted or a legal requirement, departments may be held to NFPA standards under the umbrella of 'prudent person' or 'similar circumstances'.

WHEN LAWSUITS ARE FILED

"Even if you win the case, the effects of such a battle will have a long lasting impact on yourself, your department and the community you are there to protect."

Each year we see departments that are devastated when events like this happen. It impacts everything from fund raising to tax increases and members wishing to join.

AHJ DRIVING POLICIES

Though not specifically required by Washington State Law, the Washington Fire Chiefs Emergency Vehicle Incident Prevention program ***recommends*** Authorities Having Jurisdictions (AHJs) develop ***specific procedures*** for their departments.

STANDARD OPERATING PROCEDURES

In addition to a Risk Management plan for emergency response, departments need to develop Standard Operating Procedures (SOP). Emergency Vehicle operators need to be familiar with their department's SOPs for operating emergency vehicles.

SOP's are designed to get the crew and equipment to the scene safely.

AHJ Procedures/Guidelines should cover the following topics:

- Risk Management
- Use of Personal Electronic Devices
- Backing Apparatus
- Collision Investigation
- Drug and Alcohol Policy
- Highway Safety- Vest Use
- Intersection Navigation
- Limitation of Warning Devices
- Motor Vehicle Record Check
- On-the-Quiet Response
- Priority Dispatching
- Responding in Private Vehicles
- Seatbelt and Hearing Protection Use Policy
- Speed Limitations
- Traffic Incident Management – Optimum Vehicle Placement
- Traffic Preemption
- Lane Travel
- Vehicle Inspection and Maintenance
- **Emergency Vehicle Operator Selection and Qualifications**

Note: All SOP/SOGs need enforcement to be effective.

PRIVATE VEHICLE RESPONSE

You cannot "respond" under the emergency response RCW exemption in your personal vehicle.

Green lights do not entitle the responder to the exemptions afforded emergency vehicles.

RCW 46.37.185 GREEN LIGHTS

Green light on firefighters' private cars.

Firefighters, when *approved by the chief* of their respective service, shall be authorized to use a green light on the *front of their private cars when on emergency duty only.* Such green light shall be visible for a distance of two hundred feet under normal atmospheric conditions and shall be of a type and mounting approved by the Washington state patrol. The use of the green light shall *only be for the purpose of identification* and the operator of a vehicle so equipped ***shall not be entitled to any of the privileges*** provided in RCW 46.61.035 for the operators of authorized emergency vehicles.

RCW 46.61.210 CITIZENS RESPONSE TO EMERGENCY VEHICLES

RCW 46.61.210 Operations of Vehicles on approach of Emergency Vehicle.

(1) Upon the immediate approach of an authorized **emergency vehicle** making use of audible and visual signals meeting the requirements of RCW 46.37.190, or of a police vehicle properly and lawfully making use of an audible signal only the driver of every other vehicle shall yield the right of way and shall immediately drive to a position parallel to, and as close as possible to, the **right-hand edge or curb of the roadway clear of any intersection and shall stop and remain in such position** until the authorized emergency vehicle has passed, except when otherwise directed by a police officer.

OTHER WASHINGTON STATE EMERGENCY VEHICLE/EMERGENCY OPERATOR LAWS

- RCW 46.37.184 Red Flashing Lights on Fire Department Vehicles
- RCW 46.61.605 Limitations on Backing
- RCW 46.37.190 Warning Devices on Vehicles Other Drivers Yield and Stop
- RCW 46.37.380 Horns, Warning Devices, and Theft Alarms
- RCW 46.37.185 Green Light on Firefighters' private cars
- RCW 46.37.670 Signal Preemption Devices
- RCW 46.37.194 Authorized Emergency Vehicles
- RCW 46.37.195 Sale of Emergency Vehicle Lighting
- RCW 46.61.210 Operations of Vehicles on approach of Emergency Vehicle
- RCW 46.61.212 Approaching Stationary Emergency Vehicles
- RCW 46.61.264 Pedestrian Yield to Emergency Vehicles

OTHER WASHINGTON STATE EMERGENCY APPARATUS LAWS

- WAC 296-305-04501 Automotive Fire Apparatus Design and Construction
- WAC 296-305-04503 Automotive Fire Equipment
- WAC 296-305-04505 Automotive Fire Operational Rules
- WAC 296-305-04507 Fire Apparatus Maintenance and Repair
- WAC 296-305-04510 Aerial Apparatus

UNIT 3 RESPONSE CHALLENGES, STRATEGIES, AND TACTICS

WHY WE CARE

Motor vehicle collisions accounted for Line of Duty Deaths (LODD) 25% of all emergency related deaths:

- #2 Leading Cause of LODD
  - ➢ 1,000 Firefighter Injuries a year
- #1 Cause of Legal Actions against Departments

And we could kill the people we want to protect.

CHALLENGES VS. STRATEGIES AND TACTICS

Review at a series of **CHALLENGES** to safely operating Emergency Vehicles (EV).

Recommend *STRATEGIES AND TACTICS* for each type of challenge Emergency Vehicle Operators (EVOs) face.

Note: Slides have **challenges** bold font and *Strategies and Tactics are* italicized.

DEFENSIVE DRIVING STRATEGIES

Scan, Identify, Anticipate, Decide, Execute

CAUSES OF INCREASED INJURIES AND FATALITIES IN COLLISIONS

Inconsistent seat belt use.

- *Require 100% Seat Belt Policy.*

Open cabs contribute to ejections

- *Update Equipment to current NFPA equipment standards, if possible.*

Vehicles with high center of gravity

- *Engineer or modify to lower center of gravity*
- *Additional Operator Training*
- *Keep heavy trucks on road*

DISCUSSION: OPERATOR SELECTION

Operator Candidate Qualities to Review:

- Attitude
- Knowledge
- Mental Fitness
- Judgment

What makes a good operator?

- Physical Fitness
- Age
- Habits
- Driving Characteristics
- Common Sense
- Are they trainable?

DISCUSSION: AHJ OPERATOR SELECITON POLICIES

- Not all people have the proven skills and abilities to operate emergency vehicles
- Responsibility of AHJ to assure proper selection of emergency vehicle operators
- Ultimately falls back on the AHJ
- Policies in place must be reviewed and effective
- Affects operating budget, insurance costs and public relations if a collision occurs

WFC EVIP PROGRAM 3.0

CHALLENGE: OPERATOR ERROR

Causes include:

Inattention

Fatigue

Inexperience

- *Develop a culture where officers are empowered to make decisions on driver readiness*
- *Respond with less vehicles*
- *Do not respond code to every call*

CHALLENGE: OPERATOR SKILL LEVEL

Unexpected Hazards

- *Avoid tunnel vision*
- *Avoid auditory occlusion*
- *Always scan surroundings*
- *Identify an escape route*
- *Maintain a cushion between you and other vehicles*

Depth perception & ability to maneuver

- *Skills training, road test, and rodeo*

Reacting, braking, and stopping distance

- *Increase following distance, reduce speed*

Controlling weight transfer

- *Baffles and engineering controls*

Adjust to adverse conditions

- *Training and experience in non-emergency settings*

CHALLENGE: DISTRACTED DRIVING

Distracted driving from the following increases your chances of an accident:

Use of a cellular device

- *Have a cellular policy and enforce it*

Looking for address

- *Have partner lookup address*

No pre-planned route to common calls

- *Pre-planning*

CHALLENGE: ROAD CONDITIONS

Sunrise/Sunset obstructing visibility

Traffic Volume/Patterns

Unusual Things

Road Characteristics

Surface

Shoulders

Curves

Crown

Dips

Vegetation

Bridges

- *Familiarize all operators with response routes and challenges.*

CHALLENGE: WEATHER

Snow, rain, sleet, hail, wind and standing water on roadways

- *Slow Down*
- *Use AWD Vehicles*
- *Do not drive through standing water without assessing depth/hazards*

CHALLENGE: OTHER MOTORISTS

Inattentive Drivers:

- 20 % of other drivers are DWI/DWAI
- 80% of all drivers are doing something else
- 70% of new drivers have an accident in the first year of licensing

- Most drivers make short left hand turns.
- Road Rage

Unpredictable motorist actions

- *Anticipate randomness of other motorists*

Emergency warning lights and warning devices cause additional stress on drivers.

They may become confused or panicky.

Often they show unexpected behavior by stopping or swerving into other lanes of traffic

- *Use emergency mode only when responding to a true emergency.*

CHALLENGE: VEHICLES ENTERING ROADWAY

Collisions may be caused by Emergency Vehicles Entering Roadway.

- *Look left, than right, than left again before entering a roadway.*
- *Time to plan an escape route out of the emergency.*
- *Always have a cushion.*
- *When you see a hazard, think about what you would do to avoid or minimize any accident.*
- *Always be prepared to take action based on your plan.*

CHALLENGE: ENTERING HIGHWAY

Merging Collisions may result from Emergency Vehicles entering highways at high speeds.

- *Decision: decide which way you want to go.*
- *Intent: signal your intention, let others know what you are about to do.*
- *Check: check your mirrors, lean forward in your seat to reduce the blind spot.*
- *Execute: make your merge a gradual one, do not perform maneuvers that cause excessive swaying of the apparatus.*

DICE

CHALLENGE: BACKING OF APPARATUS

Collisions while backing up an apparatus account for a large portion of EV accidents.

- *Never back unless you have to.*
- *Use a spotter.*
- *If you back up, do it slowly.*
- *Back as if you expect to hit something.*
- *Keep looking back until completely stopped.*
- *Your ground guide should position himself/herself at the left rear of the tanker where eye contact can be made with the EVO in the mirror.*
- *If you cannot see the spotter- STOP!*
- *Use Standard Apparatus Communication*
  - Stop
  - Forward or Reverse
  - Left or Right
  - Diminishing Clearance

CHALLENGE: INTERSECTIONS

Contributing factors to the dangers in intersections are:

Traffic Volume

Right of Way

Traffic Control Devices

Siren Use

Pedestrians

Dangers of Crosswalks

- *Use extreme caution when traveling through intersections.*
- *Remove foot from accelerator and cover brake while approaching.*
- *Reduce speed when approaching intersection.*
- *Come to a full & complete stop against a stop signal, if possible.*
- *If visibility is blocked or unclear always stop.*
- *Make eye contact with other drivers and pedestrians.*

CHALLENGE: EMERGENCY VEHICLES APPROACHING INTERSECTION

Two apparatus approaching at the same time may cause a collision.

- *Use Communication*
- *Technology*

CHALLENGE: RAILROAD CROSSINGS

Approaching uncontrolled Rail Crossings

Fires near Railroad tracks

Train emergencies

- *Stop at uncontrolled crossings, look and listen*
- *Don't shift gears on tracks*
- *If you are stuck, ditch the rig*
- *Know the length of your EV and don't try to 'beat' a train*

CHALLENGE: U-TURNS

Missed addresses and U-Turns create additional hazards for other motorists.

- *Two-Point turns.*
- *Three-Point turns.*
- *Go around the block.*
- *Make Corrections slowly and calmly with a clear purpose.*
- *Follow your jurisdiction's policies/guidelines on change of address or missed locations.*

CHALLENGE: WHEEL LEAVING ROADWAY

Distractions and swerving can cause an EV to leave the roadway.
The size of the EV can make correction difficult. At times, the EVO may overcorrect and cause a collision.

- *Do not panic.*
- *Maintain control of the steering wheel.*
- *Take your foot off the accelerator, but do not brake.*
- *Allow the Vehicle to slow down on its own.*
- *When the vehicle reaches a slow, safe speed, turn the wheel to the left and gently steer back onto the roadway.*
- *Be careful not to overcorrect.*

CHALLENGE: BLOWN TIRE

A blown tire can cause the sudden loss of control of a vehicle.

- *Maintain foot on gas and slowly drive it out to a stop.*

CHALLENGE: SPEED

The number one factor in accidents is often excessive speed of the EVO, causing:

Being unable to negotiate curves.

Being unable to stop before hitting another object or entering an intersection.

Losing control due to weight shift.

Losing control due to right side wheels leaving road surface.

Losing control from poor road conditions.

- *SLOW DOWN!*

CHALLENGE: EQUIPMENT FAILURES

Equipment failures can cause a loss of:

- ***Brakes***
- ***Control***
- ***Equipment***

Only allow qualified personnel to respond

Preventative Vehicle Checks

Use a checklist at least weekly

Use ASE certified mechanic for repairs and yearly inspection

Proper inspection and maintenance of apparatus is needed for the safety of the operators. A systematic approach is crucial for the success of maintenance programs. Maintenance and inspection records need to be documented. Failure to notice the indicators could result in a bad situation, serious crash and even death.

DISCUSSION: RECORD KEEPING AND MAINTENANCE

Proper maintenance is needed for the safety of the operators. A systematic approach is crucial for the success of maintenance programs. Maintenance and inspection records need to be documented.

- Daily Inspections
- Basics
- Brakes
- Fluids
- Belts
- Tires
- Follow recommended maintenance intervals:
- Pump test
- Ladder test
- Preventative Maintenance
- 3rd Party Inspections

When a deficiency or repair needs to be made, the apparatus needs to be tagged and taken “Out of Service”.

DISCUSSION: VISUAL AND OPERATIONAL INSPECTION

WFC EVIP program requires each emergency vehicle operator (EVO) to accurately complete a Visual and Operational Checklist annually as part of the certification process.

The process should be systematic and thorough and should resemble the AHJs preventive maintenance program. (WAC 296-305)

These checklists can also serve as part of WAC 296-305

See forms WFC-PTI-18-S or AHJ equivalent.

WAC 296-305-04507 FIRE APPARATUS REPAIR AND MAINTENANCE

(1) If at any time a fire apparatus is found to be in an unsafe condition, it shall be reported immediately to the officer on duty.

(2) If in the driver or duty officer's determination, the apparatus cannot be used in a safe manner, it shall be taken out of service until it has been restored to a safe operating condition.

(3) All repairs to the suppression components of emergency vehicles of the fire department shall be done by an emergency vehicle technician, ASE certified technician or factory qualified individual. Repairs, maintenance or routine work to non-suppression systems of suppression apparatus or other fire department vehicles and their equipment shall be done by personnel qualified in the specific area of repair. Fire service pumps with a capacity of 499 gallons per minute or less and not used for interior structural firefighting operations are exempt from this requirement.

(a) A preventive maintenance program shall be instituted and records maintained for each individual apparatus in order to record and track potential or on-going problems.

(b) Apparatus shall be maintained and tested in accordance with the manufacturer's recommendations.

REVIEW - OPERATORS CAN IMPROVE DRIVING PERFORMANCE BY:

- *Use qualified, rested drivers whenever possible.*
- *Respond in as few as apparatus as possible.*
- *Drop code whenever possible.*
- *Wear your seatbelts.*
- *Anticipate distracted drivers.*
- *Make eye contact with other motorists and pedestrians when at all possible.*
- *Accelerate and brake slowing.*
- *Slow down overall response speeds.*
- *Use a spotter when backing up the vehicle.*
- *Use consistent hand signals while backing vehicle to avoid confusion.*
- *Perform preventative vehicle checks.*
- *Use ASE Certified Mechanic, Emergency Vehicle Technicians, or a factory authorized mechanic for repairs and inspections.*

UNIT 4 PHYSICAL FORCES THAT IMPACT VEHICLE OPERATIONS

OBJECTIVE

The EVO will be able to list the physical forces effecting vehicle operation and their relationship to vehicle speed and size. *Unit 4*

PHYSICAL FORCES THAT IMPACT VEHICLE OPERATIONS

- **Speed (Acceleration)**
- **Force/Momentum**
- **Friction**
- **Centripetal Force**

SPEED

Excessive speed puts the EV driver in the position of:

- Being unable to negotiate curves.
- Being unable to stop before hitting another vehicle.
- Being unable to stop before entering an intersection.
- Losing control due to weight shift.
- Losing control due to right side wheels leaving road surface.
- Losing control from poor road conditions such as pot holes, speed bumps, wet, icy or snowy road surfaces.

FORCE AND ACCELERATION (SPEED)

Force = Mass x Acceleration *(F=MA)*

- *'The bigger you are, the harder you hit.'*
- *'The faster you go, the harder you hit.'*

FRICTION

- It would be impossible to control a vehicle without friction.
- Friction enables the Emergency Vehicle to stop, accelerate, and change direction.
- Friction is the resistance to slipping.
- Friction occurs whenever two surfaces rub together.

COEFFICIENT OF FRICTION

A friction coefficient measures how slippery a road is.

Dry asphalt has a value of 0.8 to 0.9

Wet or icy roads drop to 0.2 or 0.3

The lower the value, the longer it takes to come to a complete stop.

We need friction to stop.

Braking Distance - How far the vehicle travels from the brakes starting to slow the vehicle and the vehicle coming to a complete stop.

Perception Distance - How far the vehicle travels when the need to brake occurs and the driver recognizes that need.

Reaction Distance - How far the vehicle travels as the driver reacts and applies the brake.

Brake Lag Distance - How far the vehicle travels from the time the brakes are applied and the vehicle begins to slow down.

= Braking Distance

Speed, weight, and road surface also are contributing factors.

STOPPING DISTANCES OF AN ENGINE

Speed / MPH	Reaction Distance	Air Lag	Braking Distance	Total Stopping Distance
10	23.47	7.34	6.54	37.34
20	46.94	14.67	26.14	87.76
35	82.15	25.67	80.07	187.89
45	105.62	33.01	132.35	270.98
55	129.10	40.34	197.71	367.15

ANTILOCK BRAKES

Antilock brakes on newer vehicles improve performance in braking.

AIR BRAKES

Airbrakes are common on large vehicles and require an understanding of how they work.

In most vehicles, air pressure must build up to > 60 psi in a tank to 'release' the brakes and allow travel.

You must push the 'brake release' button to move the vehicle.

AIR BRAKE SYSTEMS

The **air compressor** pumps air into the storage tanks (reservoirs). This compressor can be driven by gears or most common a V-belt.

The **governor** controls the pressure going to the storage tanks. When the air pressure reaches 120 psi depending on the system requirements the governor will shut the compressor off until a pressure loss is detected.

Storage tanks will hold enough air to allow the brakes to be used in the event the compressor stops working.

A **safety relief valve** is installed in the first air tank (quick build up tank) this protects the braking system from over pressuring. This safety valve in most vehicles will pop off at 150 psi, then reset itself.

The **tank drain valve**, when opened, will allow any moisture or water to be drained from the air tank at its lowest point. This valve should be opened at least once a week for 2 to 3 seconds then closed.

The **air chamber** holds the parking brake spring and applies pressure to a piston that will push on the s-cam. This will put pressure on the slack adjuster then to the brake pads.

Brake drums are located at the end of each axle and the wheels are bolted to the drums.

The **brake shoes** and linings are located inside the drums and push against the inside of the drum to provide friction needed for stopping.

The **air chamber** holds the parking brake spring and applies pressure to a piston that will push on the s-cam. This will put pressure on the slack adjuster then to the brake pads.

All air-braked vehicles have an **air supply pressure gauge.** This gauge allows the driver to see the pressure in the system at all times. This is also used to check for air leaks when the system is off.

The ***low pressure warning buzzer*** will give the driver an audible warning in the event the system air pressure falls to the danger zone. In most fire trucks this alarm will sound at 60 < psi. Should this buzzer sound when the vehicle is in motion, locate a safe location to pull the vehicle to a stop and check the system for damage.

AIR BRAKE INSPECTIONS

The breaking system must be inspected and maintained in accordance with the manufacturer's service recommendations.

If no service recommendation exist the shortest interval recommendation by the braking system manufacture, based on time or mileage, shall be adhered to.

The braking system should be inspected at least once a week. Many full time fire departments require their emergency vehicles to be checked at the start of each shift.

In the volunteer sector emergency response vehicles should be inspected at least once a week.

The most important point to remember is to document each inspection and keep the records for not less than 5 years.

The entire braking system should be inspected by an ASE certified mechanic once a year or every 3,000 miles.

There are some simple tests that should be completed during all in-house inspections.

Leak down test - with a fully-charged air system (typically 125 psi) turn the engine off and the wheels chocked and the parking brake off. Note the pressure and the time.

For single system, unit there should not be more than a 3 psi drop in one minute. If the pressure drop is more than 3 psi the system should be inspected for damage or leaks.

Parking brake test - With the system air pressure in the normal operating range and the driver in the vehicle with seatbelt on and the shifter in natural; the parking brake off, allow the vehicle to roll forward. Apply the parking brake and the vehicle should come to a rapid stop and prevent vehicle movement.

BRAKE FADE

Brake fade is a superheating of the brake system which will lead to brake failure or a significant decrease in the vehicle's ability to stop.

The brake pedal will feel soft. Brake pedal travel will increase and will give a feeling that the brake system has failed completely.

BRAKING TECHNIQUES

If you were faced with a 6% grade that went for a total distance of 6 miles and if you did not use any braking action during your decent.

With a vehicle with a GVW (gross vehicle weight) of 38,000 pounds your speed would climb to 238 mph this is called terminal velocity. Therefore we must learn how to brake on hills.

For many years drivers of fire vehicles were taught to apply light steady brake pressure to keep vehicle speed in check during down hill braking.

This method is still taught to this day however after much testing and research this theory has been proven ***WRONG.***

SNUB braking is now the recommended method for downhill braking.

This method works by allowing the vehicle to speed up to the desired or posted safe speed then applying the brakes and slowing the vehicle down 5 to 10 mph below the posted speed.

Then allowing the speed to pick up and the process is repeated. By applying the brakes in this method there is time to allow the brakes and the brake drums to cool to help control heat buildup as well as to reduce the chance of brake fade.

AUXILIARY BRAKING SYSTEMS

Consider these auxiliary braking systems to reduce the chance of brake fade:

- Engine Brake
- Transmission Retarder
- Electromagnetic Driveline Brake

Engine brakes or transmission retarders (Jake Brakes) are a safety feature used to reduce the strain on the brake system by using an alternate system to slow down.

However, they are very loud and many areas have ordinances prohibiting their use.

The Jake Brake is not designed for use on ice and very slippery conditions and may cause the vehicle to lose control.

On slippery roads or in winter conditions, if you do decide to use this method, the unit and any trailers should be lined up and straight before engaging the Jake Brake. This is to avoid jack-knifing.

Service brakes will still need to be used to bring the vehicle to a stop.

PARKING USING AIR BRAKES

Whenever you bring the vehicle to a total stop with the transmission in neutral, you must set the brake.

If you are on an incline, turn the steering wheel towards the curb on a decline.

On an incline the wheels should be turned away from the curb.

Chocks, rated for the vehicle size, must be used while parking the apparatus.

FOLLOWING DISTANCE

Following distance is influenced by reaction distance and braking distance for an apparatus.

Other factors are the WEIGHT and MECHANICAL CONDITION of the emergency vehicle.

FOUR SECOND RULE

Four Second Rule - Keep a separation of at least four seconds between the EV and the vehicle being followed.

Adjust following distances by:

- 2 Seconds might be adequate for smaller trucks and speeds under 40mph.
- 3 seconds should be used if traveling over 40mph.
- 4 seconds should be used for emergency vehicles.

Greater distance is required under poor road conditions, overloaded vehicles, etc.

DISCUSSION: FOLLOWING DISTANCE IN EMERGENCY MODE

- Many operator’s reactions and performance get worse under stress.
- Motorist may react in unusual ways to lights and sirens. If they stop abruptly, the EV Operator will need as much distance as possible to respond.
- A greater following distance permits the EV Operator to get “The Big Picture” of the traffic situation.

CENTRIPETAL FORCE AND TURNS

Negotiating turns without tipping over is related to centrepital force and center of gravity.

A centripetal force (from Latin centrum, "center" and petere, "to seek"[1]) is a force that makes a body follow a curved path. Its direction is always orthogonal to the motion of the body and towards the fixed point of the instantaneous center of curvature of the path.

In other words, we tend to come out of a rotation going in a straight line unless we continually add a centripetal force to continue the curve.

The higher the center of gravity on the vehicle, the more likely more likely it will tip over in a curve.

CRITICAL SPEED OF A CURVE

The speed at which the vehicle will lose control rounding a curve is called the critical speed.

The experience of the driver does not matter, it is a function of physics.

If the critical speed is exceeded the vehicle will not stay on the road!

Obey posted speed limits in curves and exit ramps from highways. The critical speed for larger apparatus may be less then the posted speed limit!

Wheels have to be moving to retain control of the vehicle, locking up the brakes results in a loss of ability to negotiate a curve.

It is important to train EV drivers on the vehicle they will be expected to operate under emergency conditions.

CHANGING LANES

Changing directions too abruptly can cause rollovers.

REVIEW

- *Accelerate and brake slowing when possible.*
- *Slow down overall response speeds.*
- *Snub brake (Video) down hills to avoid brakes overheating and losing friction.*
- *Increasing following distances as speeds increase, with at least a 4 second minimum.*
- *Enter curves at or below the posted speed limit.*
- *Avoid quick turns can cause vehicle with high centers of gravity to roll over.*