Learning Objective 1

Identify the considerations taken when selecting qualified driver/operators.
Methods of selecting driver/operators vary by department.

- **Academy recruit**
  - Academy includes driver/operator component
  - Qualified upon graduation

- **Career firefighter**
  - Minimum time of service
  - Written test and performance evaluation
  - Review of personnel records

- **Volunteer firefighter**
  - Training and evaluation
  - Truck-driving experience
Regardless of selection process, all driver/operators must have certain characteristics to be successful.

- Experience
- Knowledge
- Maturity
- Sense of responsibility
- Mental aptitude
In order to meet the intent of NFPA® 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, candidates must have successfully completed a Firefighter I course or equivalent course.
All departments must establish and maintain a training program and keep thorough documentation of training.

- Regularly scheduled review
- Courses to maintain skills
- Courses to introduce new concepts
Driver/operators must possess various skills to help them be successful.

- Reading
- Computer
- Writing
- Mathematical
- Physical fitness
- Visual acuity
- Hearing

(Cont.)
CAUTION

While driving, the driver/operator should not operate a mobile computer. Driver/operators should focus on driving and driving only!
Driver/operators must possess various skills to help them be successful.

- Reading
- Computer
- Writing
- Mathematical
- Physical fitness
- Visual acuity
- Hearing

(Cont.)
A periodic medical evaluation, in accordance with the NFPA® 1500, *Standard on Fire Department Occupational Safety and Health Program*, should be administered under the direction of the authority having jurisdiction (AHJ) in order to establish and maintain a driver/operator’s fitness for duty.
Driver/ operators must possess various skills to help them be successful.

- Reading
- Computer
- Writing
- Mathematical
- Physical fitness
- Visual acuity
- Hearing
The U.S. DOT and Canadian TC establish basic licensing requirements.
What abilities and skills are necessary for all driver/operators?
Learning Objective 2

List driving regulations that affect apparatus driver/operators.
Driver/operators are subject to a number of driving regulations while on duty.

Must be familiar with all pertinent traffic regulations:

- Federal
- State or provincial
- Department
- NFPA®
- City
Driver/operators may be exempt from certain regulations if they are responding to an emergency.
Driver/operators may face consequences for violating laws, policies, or ordinances.

Due regard for public safety

Reckless disregard for safety

• Negligence
• Gross violation
How are driver/operators regulated in their duties?
Detect reasons for accidents.
The driver/operator’s most important responsibility is to safely operate the apparatus at all times.

Collision consequences

- Delayed response to emergency scene
- Resources must be deployed to apparatus accident
- Reduced capacity until apparatus replaced
- Involvement in litigation
- Financial burden on department

(Cont.)
The National Institute for Occupational Safety and Health (NIOSH) reviews and publishes reports concerning firefighter fatalities including vehicular accidents. Readers may review current as well as historical reports analyzing common fire apparatus accidents at the Institute’s web site.
The driver/operator’s most important responsibility is to safely operate the apparatus at all times.

- Intersections
  - Most common place for collisions to occur

- Driver/operator safety
  - Maintain situational awareness
  - Know local traffic laws
  - Complete training in controlled environment
Backing accidents account for a significant percentage of all damage repair costs.

Most injuries are minor

Fatalities have occurred

Courtesy of Ron Jeffers
Many actions are considered reckless when driving an apparatus.

- Speeding excessively
- Running off pavement onto soft road shoulder
- Reading a map, electronic device, talking on a cell phone, or texting
- Failing to abide by posted weight limits
- Following too closely
- Failing to obey posted traffic regulations
- Failing to yield to other emergency vehicles
- Reacting with panic or unpredictable behavior to an approaching emergency vehicle
The impulse to want to use excessive speed when responding to an emergency must be controlled.

<table>
<thead>
<tr>
<th>Excessive speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of control and inability to stop</td>
</tr>
<tr>
<td>Difficulty braking and stopping</td>
</tr>
<tr>
<td>Possibility of brake fade</td>
</tr>
</tbody>
</table>
Departments must ensure that driver/operators complete a thorough training program.

Must be trained on assigned vehicles

Unfamiliarity with controls and handling may lead to collision
Accidents can occur because of overloading, nonengineered modifications, and misuse.
Mechanical failure may be immediate and without warning, possibly resulting in an accident.

Pretrip inspection and effective maintenance program

Reduced likelihood of mechanical failure
Poor vehicle design can be the cause of serious fire apparatus accidents.

- Problems less likely: Built by apparatus manufacturers
- Problems more likely: Built by department members or local mechanics
Driver/operators must report to duty without compromised physical or mental ability.

Impairment may be an effect from:

- Substance abuse
- Prescription or over-the-counter drugs
- Personal issues such as divorce, bankruptcy, or impending hardship
- Death in the family
- Illness
- Depression
- Fatigue
NOTE

A professional fire apparatus driver/operator is expected to adjust to and overcome driving challenges with intelligence, expediency, and safety. While driving fire apparatus, maintain a professional demeanor. Rude gestures, shouting, or using the horn to express anger are inappropriate actions.
What are some common causes of collisions?
Learning Objective 4

Review apparatus rider safety considerations.
Driver/operators must always ensure safety of all personnel riding apparatus.

Protective gear

Seatbelts

Courtesy of Ted Boothroyd
CAUTION

The driver/operator is responsible for confirming that all personnel are on board the apparatus with seat belts fastened. Confirmation must be verified verbally before moving the vehicle.
It is common to load large diameter supply hose while the apparatus is in motion.

Hose-loading

- Train all members
- One member assigned to observe and communicate with the driver/operator
- Close the area to traffic
- Only drive forward at no more than 5 mph (10 km/h)
- No members standing on apparatus in motion
WARNING!

Firefighters must never ride on the outside of a moving apparatus for any reason. Serious injury or death could occur if the apparatus is involved in a collision or rollover or if the firefighter falls from the moving apparatus.
Many older apparatus have jump seat positions that are not fully enclosed.

- Safety procedures that require seat belt in safe, enclosed position
- Safety bars and gates intended to prevent falling out of jump seat
Tiller training can be problematic due to the lack of a second seat in the tiller operator’s enclosure.

Single seat in operator enclosure

- No place for instructor to have contact with operator

NFPA® allows for detachable seat

- Seat firmly attached
- Instructor belted in

- Helmet and eye protection required
- Newer apparatus may have operator and instructor seats
What must be ensured for all riders before the apparatus is put in motion?
Learning Objective 5

Explain considerations to take when starting, idling, and shutting down apparatus.
Driver/operators should be aware of destination and route of travel, as well as road closings and traffic congestion.
Driver/ operators should follow the manufacturer’s recommendations on idling engines.

Allowing diesel engine to idle unnecessarily:

- Wastes fuel
- Build up of carbon
- Damage to internal engine components and emission systems
Driver/operators should be familiar with operation of the DPF.

Familiar with four indicators
Burns soot from exhaust more completely
Frequent, short runs or operation in cold climates won’t allow soot to burn
Active regeneration occurs in automatic and manual modes
Regeneration increases temperature
Driver/operators are responsible for keeping the DEF tank filled at all times.

Failure to keep DEF tank full

- May derate apparatus engine
- Limit speed
A hot engine should cool to normal operating temperature before being shut down.

Premature shut down may result in:

- Immediate increase of engine temperature
- Oil film “burning” on hot surfaces
- Damage to heads and exhaust manifolds
- Damage to turbocharger that can result in seizure
CAUTION

Never rev a diesel engine immediately before shutting it down. Damage to internal components may occur.
Remember the following considerations when shutting down an apparatus.

Never shut down the engine when apparatus is in motion

Always follow the manufacturer recommendations
REVIEW QUESTION

What recommendations should always be followed when starting or shutting down an apparatus?
Learning Objective 6

Explain considerations for the operation of an apparatus.
It is imperative that apparatus mirrors are well-adjusted in order to minimize blind spots.

Adjustment

• Start of each shift
• When driver changes

Blind spots

• Have partner walk around to identify blind spots
• Adjust mirrors, then compensate while driving
Most apparatus are equipped with automatic transmissions.

Automatic transmissions

No decision about when to shift gears

Less likely for engine damage from lugging
NOTE

Some jurisdictions may recommend manually shifting an apparatus equipped with an automatic transmission as a way to slow the vehicle in preparation for a stop. Local policy may specify this practice as a measure to extend the life of service brakes.
Aerial apparatus have several points of contact that must be considered when turning or parking the vehicle.
Driver/operators must understand weight transfer in order to safely operate the apparatus.

- Follows law of inertia
- Weight transfer when vehicle changes speed or direction
- Skidding or rollover due to lateral weight transfer
- Hazardous conditions result from fast turns, harsh steering action, or driving on steep slopes
- Water tanks can be a concern to drivers
- Use minimum steering needed to keep weight transfer at a minimum
Poor weight distribution can make vehicle handling unsafe.

- Too much weight on steering axle
  - Hard steering
  - Damage to axle and tires

- Underloaded front axles
  - Axle too light to steer safely

- Too little weight on driving axles
  - Poor traction

Weigh apparatus *after* loading with equipment and personnel.
Use the service brake and manually shift gears to lower speed going downhill.

Limit engine speed to lower than maximum rpm.

Speed faster than maximum rpm can result in engine damage.
NOTE

Some jurisdictions may recommend using the transmission to slow the vehicle and maintain a safe speed on the descent. Local policy may specify this practice as a measure to extend the life of service brakes.
Engine lugging occurs when the throttle is applied and the transmission is in too high of a gear to meet demand.

- With a diesel engine, more fuel is injected than can be burned
- Excessive amount of carbon particles in exhaust
- Oil dilution
- Additional fuel consumption

Keep engine rpm above peak torque speed
Driver/ operators must be familiar with potential hazards associated with travel routes.

Bridges and overpasses
- Low overpasses
- Incompatible bridges
- Placard required in every apparatus

Railroad tracks
- Aerial apparatus longer than other commercial vehicles
- Ensure that there is adequate room between tracks and stop light to fit apparatus
- Survey local roads and be prepared
Adverse weather conditions must be factored in while driving apparatus.

Rain  Snow

Ice   Mud
What are some considerations the driver/operator must take into account when driving an apparatus?
Learning Objectives 7-9

Explain apparatus emergency response considerations.

Describe types of emergency operations warning devices.

Identify types of traffic control devices.
Driver/operators must never assume that civilian drivers will react appropriately when encountering emergency vehicles.

<table>
<thead>
<tr>
<th>Appropriate reactions</th>
<th>Other possible reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pull to the right</td>
<td>• Pull over for first apparatus and pull out in front of next apparatus</td>
</tr>
<tr>
<td>• Stop</td>
<td>• Panic at approaching apparatus</td>
</tr>
<tr>
<td>• Clear intersections</td>
<td>• Abruptly stop in intersection</td>
</tr>
<tr>
<td>• Remain motionless</td>
<td>• May not hear apparatus approaching</td>
</tr>
</tbody>
</table>
Driver/operators should anticipate responses and plan to avoid collisions.

- Aim high in steering
- Get the big picture
- Keep your eyes moving
- Leave yourself an “out”
- Maintain distance
- Make sure others can see and hear you
Fire apparatus are equipped with audible and visual warning devices.

- Used to make public aware of approaching emergency vehicles
- Use should be limited to true emergencies
- Some departments require warning devices turned off on limited access highways
- Used to help negotiate passage in slow traffic
Audible warning devices may include sirens or air horns.

May outrun effective range of audible warning device if traveling at speeds of over 50 mph (80 km/h)

Multiple emergency vehicles travel at least 300 to 500 feet (90 to 150 m) apart
CAUTION

In-cab intercom headsets may make it more difficult to hear ambient noise or sirens of other emergency vehicles.
A combination of lights may be used as visual warning devices on apparatus.

- White lights
- Colored lights
- Warning lights
- Headlights
NOTE

Studies have shown that vehicles traveling with low beam headlights on during daylight hours have fewer accidents. It is the practice in some jurisdictions that fire apparatus travel with low beam headlights activated anytime that they are on the road.
Driver/operators must continue to use defensive driving techniques, even if a traffic control device is present.

<table>
<thead>
<tr>
<th>Green light</th>
<th>Red light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain speed that allows for quick stop or safe evasive maneuver</td>
<td>Approach with extreme caution</td>
</tr>
<tr>
<td></td>
<td>Bring apparatus to a complete stop before proceeding</td>
</tr>
</tbody>
</table>
NOTE

Watch for other responding apparatus from different directions as multiple vehicles may confuse the signal preemption.
Traffic signals in front of the station allow apparatus to more safely enter the roadway.

Controlled by
- Button in the station
- Remotely by a dispatcher
- Station alerting system
Traffic signals along the route of travel may be controlled by the fire department.

- Strobe Light Activated Preemption Devices
- Traffic Signal Preemption Devices
- GPS Based Traffic Signal Preemption
Intersections are the most likely place for a collision to occur involving an emergency vehicle.

Know statutes and department policy regarding intersections.

Many jurisdictions and NFPA® requires:
- Full stop
- Account for vehicles in all lanes before proceeding

Be cautious on multilane roads:
- Unconventional stopping places
- If all lanes are blocked, it may be allowable to drive in opposing lane of traffic
It is best to avoid passing vehicles that do not pull over to yield to apparatus.

Safe passing if necessary

• Travel on innermost lane and wait for vehicles to move to the right before passing
• Avoid passing on the right side
• Be certain opposing lanes are clear before crossing center line
• Avoid passing other emergency vehicles
  • Smaller vehicles may pass larger apparatus
  • Coordinate maneuvers by radio
What are some types of traffic control devices?
Learning Objective 10

Explain considerations when stopping and braking apparatus.
Driver/ operators must consider the weight of the apparatus and several conditions before applying the brakes.

Excessive or abrupt braking → Skid
NOTE

Driver/operators of apparatus with retarders, engine brakes, or auxiliary braking systems should become familiar with local traffic laws and the manufacturers’ recommendations for use during inclement weather or other road conditions.
Driver/operators establish visual lead time by scanning the path of travel far enough ahead based on their speed.

**Visual lead time**

- **Determines sufficient reaction time and stopping distance**
- **Match distance surveyed ahead with speed of travel**
Driver/operators should know the braking characteristics for the vehicle they are operating.
Other factors may affect the driver/operator’s ability to stop the apparatus.

- Road conditions
- Speed of apparatus
- Vehicle weight
- Type and condition of vehicle brakes and tires
Recognizing and avoiding conditions that lead to skids is an important skill.

Practice at facilities with skid pads
Supervised by qualified instructors
Approved apparatus
Using ordinary parking lots to conduct fire apparatus skid training may result in rollover accidents.
CAUTION

Use extreme caution at minimal speeds for skid training using tractor-drawn aerial apparatus.
Acceleration skids and locked wheel skids are two common types of skidding.

<table>
<thead>
<tr>
<th>Acceleration</th>
<th>Locked wheel</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Drive wheels will lose traction on road surface</td>
<td>• Braking too hard at high rate of speed</td>
</tr>
<tr>
<td>• Don’t apply brakes</td>
<td>• Wheel direction doesn’t matter</td>
</tr>
<tr>
<td>• Ease off accelerator</td>
<td>• Ease off brake then straighten front wheels</td>
</tr>
<tr>
<td>• Straighten out front</td>
<td>• Slow gradually until at a safe speed</td>
</tr>
</tbody>
</table>
In a vehicle with a standard transmission, do not engage the clutch until the vehicle is under control and just before stopping.

Skid is under control

Gradually apply power to wheels or apply brakes as needed
Maintaining control when descending grades during icy conditions requires a balance of techniques.

- Service brakes
- Transmission gear selection
- Retarder device
The loss of vehicle control is sometimes due to driver error.

- Driving too fast for road conditions
- Failing to anticipate obstacles
- Improper use of auxiliary braking devices
- Improper maintenance of tire air pressure and adequate tread depth

Driver error
Most new apparatus are equipped with an all-wheel ABS.

- Minimize chance of skid when brakes are applied forcefully
- Maintain steady pressure on brake rather than pumping pedal
- Some apparatus automatically shut off auxiliary brake if ABS activates
- Apparatus without ABS require auxiliary brake to be manually deactivated
Auxiliary braking systems help reduce brake fade and service maintenance costs.

- Exhaust brakes
- Engine compression brakes
- Electromagnetic retarders
- Transmission retarders
Driver/operators should be aware of traction features on apparatus and trained how to use them.

- Auxiliary traction control systems
- ATC
- DCDL
- Interaxle differential lock

(Cont.)
Manufacturers recommend that the differential lock be disengaged while traveling and turning downhill. A dangerous condition can occur whereby the driver/operator loses positive steering control due to the differential lock not allowing differential rear wheel rotation.
Driver/operators should be aware of traction features on apparatus and trained how to use them.

- **Auxiliary traction control systems**
- **ATC**
- **DCDL**
- **Interaxle differential lock**
Stability control systems are designed to help prevent roll-overs or tipping.

- Roll Stability Control
- Electronic Stability Control

Reduces vehicle instabilities

- Cannot prevent all instabilities from occurring
- Always use safe driving techniques
What are types of auxiliary braking systems?
Learning Objective 11

Explain considerations when backing apparatus.
Driver/operators should always follow SOPs and local ordinances when backing vehicles.

- Always follow safety guidelines
- All apparatus should be equipped with warning alarm
- Some may be equipped with backup cameras
- Use all means at disposal to safely back apparatus
CAUTION

The driver/operator must not rely solely on backup cameras to provide a full and accurate view of the scene. Spotters are still required.
Communication between the driver and backer (spotter) is important to avoid accidents and personal injury.

Radio or hand signals

Spotters

- Reflective vests
- Appropriate number deployed
- Keep in sight at all times
- Stop backing and check spotters if situation seems unsafe
Upon losing sight of a spotter, the driver/operator must stop immediately because the spotter could be killed or injured by the apparatus.
Spotters should always be positioned in vision of the driver/operator.

- Visible in driver’s side mirror
- Visible in right side mirror if hazards are present
- Remain in same mirror once position has been established
- Shadows or glare may inhibit visibility
- Use additional spotters if necessary
Mirrors may become obscured in wet or snowy weather. Driver/operators should keep a squeegee or towel close by to keep mirrors clear during inclement weather.
Spotters should use slow, exaggerated hand signals to communicate with the driver.

- Backing straight
- Backing toward left side of apparatus
- Backing toward right side of apparatus

(Cont.)
Spotters should use slow, exaggerated hand signals to communicate with the driver.

- **Slowing down**
- **Stopping**
- **Pull forward and reestablish backing**
What are some recommended backing policies?
Learning Objective 12

Explain considerations when performing tillering operations.
The tiller axle permits tillering of the tractor-trailer apparatus in and out of traffic and around turns.

Much more than just steering and maneuvering apparatus

Previously discussed practices apply to tractor-trailer apparatus
Added weight increases the stopping distance of a tillered vehicle. There is less weight over the drive axle, which makes it much more prone to losing traction.
Tiller operators must be qualified to operate aerial ladders and be aware of truck company personnel duties.

- Driving assignments
- Awareness
- Efficient operation
- Operator training
What are some factors tiller operators must be particularly aware of?
Describe driving exercises and evaluation methods.
Driver/operator candidates are evaluated after selection and training.

- Training
- Evaluation
- Operation of apparatus during an emergency
NOTE

All fire apparatus training and testing should follow NFPA® 1451, *Standard for a Fire and Emergency Service Vehicle Operations Training Program.*
After training, standard evaluation methods are used to assess driver/operator candidates’ performance.

- Written tests
- Practical driving exercises
- Road tests

(Cont.)
NOTE

The descriptions for the exercises listed contain minimum dimensions for setting up these exercises. NFPA® 1002 notes that these dimensions may not be reasonable for extremely large apparatus. The authority having jurisdiction may modify, with suitable justification, particular dimensions to make them feasible for local conditions.
After training, standard evaluation methods are used to assess driver/operator candidates’ performance.

- Written tests
- Practical driving exercises
- Road tests
What are some methods of evaluating driver/operator candidates?
Summarize considerations for working safely on and around fire apparatus.
Safety of the work environment can be improved by encouraging good practices with compartment doors.

Compartment doors closed when not in use

- Possible injuries by accidentally walking into doors left open
- Open horizontal doors can be mistaken for walking surface
WARNING

NEVER step on open compartment doors. They do not support heavy weight. Falls can cause serious injury or death.
It may sometimes be necessary to climb or walk on parts of an apparatus that do not have railings.

- Have second person present
- Only on slip resistant surface
- Maintain three points of contact to get off
- Wear PPE according to local policy
New apparatus must include positive restraints for all hoses carried on the apparatus.
WARNING

Secure hose and other equipment before placing vehicle in motion. Loose hose may drag behind vehicle and injure or kill.
Aerial apparatus may carry the hose under the aerial ladder and have a chute that guides it out the back.

- Ensure hose connections do not get caught in chute
- Lay hose according to chute design
- Obstructed couplings can cause damage or injury
- Maintain speeds of 5 mph (10 km/h) or less
Many departments store equipment in the cab or other crew areas.

- SCBA packs
- Helmets
- Flashlights
- Axes
- Maps
- Medical supplies

Secure in brackets or storage cabinet

Minimize equipment amount stored in crew areas
WARNING

Secure equipment in the crew areas before placing the vehicle in motion. Unsecured equipment may cause serious injury or death in a crash.
Hydraulic fluids

- Leaks may cause burns or injuries
- Some are toxic to human tissue
- Familiar with SDS/MSDS

Always wear PPE

Be familiar with hydraulic extrication tools
WARNING

High pressure fluid leak will pierce skin. Release pressure before working on system.
Driver/ operators must take care when removing inlet and discharge caps.

Check for trapped pressure before removing caps

Open bleeder valve or drain valve
- Release trapped pressure

Remove cap
- Slow and careful
- Do not stand in front
NOTE

One sign of trapped pressure is a cap that does not turn easily. If the cap is difficult to remove, double check that the drain valve or bleeder valve is not plugged and that all pressure is relieved before proceeding.
WARNING

ALWAYS open drain/bleeder valve BEFORE removing inlet or discharge cap. Intake and discharge lines can trap pressure if the valve is opened and left closed. Intake and discharge cap under pressure will blow off with explosive force. Exploding cap will injure or kill.
What are some guidelines when operating on top of apparatus?