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EMERGENCY SERVICES TRAILER OPERATIONS & SAFETY PROGRAM

INSTRUCTOR MANUAL

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Please Read Carefully

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Introduction

Emergency service continues to evolve in many ways and for many reasons, including:

- New concepts in vehicle design
- New and safer methods of responding to emergencies
- Re-thinking scene set-up and safety
- Legislation
- Increased potential for terrorism
- Availability of funding for equipment

All of these and many more factors are changing the face of emergency response by fire departments, EMS units, and law enforcement. Public emergency service organizations (ESOs) are being asked to do more.

Since 9/11 ESOs have re-evaluated many practices that define emergency response, including safe arrival at the scene, control of operations, and inter-agency communications. In some cases, these have contributed to bad outcomes for crews and the public. When new challenges are thrust upon emergency services, changes should occur to ensure that everyone returns home safely.

As a result of many operational changes, equipment that was never considered is now being moved with increasing frequency. Often this equipment is needed, but cannot be carried on traditional vehicles. It is becoming a challenge for operational personnel to move equipment during specific operations or multiple agencies responses.

Trailers can satisfy many of these needs and yet many departments lack the expertise or training to hook up and move a trailer.

Emergency responders involved in trailer operations can profit from a training course tailored to their needs.

Succeeding in the Long Term

Administrators, chiefs and officers should continue to develop emergency service organizations that will grow and thrive for many years. A long term view of organizational development takes on a new meaning when decision makers view emergency operations as a "part of doing business". All businesses exist to deliver a product or service, and survival of the organization is imperative. As new activities evolve, a savvy leader will determine the best methods to perpetuate and encourage safe and effective operations.

Risk management is a process of proactive decision-making that minimizes the adverse affects of accidental loss. Risk management also works toward decreasing potential damage to public and private property.

Trailers have been used for many years in emergency services. When a trailer is designed, delivered and put into service there are many considerations that may be overlooked. This program will attempt to cover these issues.

Topics covered:

Use of the trailer

- Storage of specialized equipment
- Transportation of material for scene management, rescue, communications, overhaul, mass casualty and other auxiliary functions
- Inter-municipal response

The need for specialized training

- Designing and purchasing the tow vehicle and trailer
- Hooking up and moving the trailer
- Driving
- Scene safety

Chapters

1. Trailers
2. The Tow Vehicle
3. Brake Requirements
4. Tow Hitch, Ball and Coupler Assembly
5. Inspecting the Vehicles
6. Loading the Trailer

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8. The Course

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- Case Study
- Interpreting Hand Signals
- Formulas
- Glossary
- References

Towing Troubles/Trailer Security

Trailer usage has increased in emergency services. As use increases, though, so does the chance of collision involving emergency service vehicles and private vehicles, single emergency vehicle crashes and on-scene damage incidents. Because trailer usage has only recently expanded, statistics on vehicle/trailer accidents have not been quantified to determine any trends. However, by analyzing vehicle accidents involving trailers by the general public, assumptions about incidents involving emergency vehicle responses with trailers can be approximated. Educating ESO personnel can help to avoid incidents.

In fact, each year, based on a five year data history, there are more than 68,000 incidents involving passenger vehicles towing trailers occurred on the nation's highways (National Highway Traffic Safety Association, data averaged on one year from a five year history). This data also shows that accidents involving trailers resulted in the deaths of more than 440 people, more than 24,000 injuries, and 43,000+ reported cases of property damage.

A study conducted by Master Lock (see www.towingtroubles.com) concluded that trailer owners lacked knowledge on basic trailer safety and proper towing procedures. Few had received any training on their trailers. It was also determined that the majority of owners thought they knew what they were doing.

The Master Lock study revealed that:

- 57% did not know or were uncertain of the trailers GVW, which is crucial to selecting the proper towing systems,
- 54% did not know or were uncertain of their class of trailer hitch,
- 71% admitted to being only "somewhat" to "not knowledgeable" about proper towing practices and safety,

- 75% admitted that a main source of information was past experience,
- 24% used the owner's manual and about 45% sought others' help,
- 13% received towing information from the dealer, and
- 9% of boat owners received their information from magazines.

Although one-third of trailer owners felt they were very knowledgeable, nearly 63% felt they did not need help or further information. This disconnect reveals a significant lack of understanding of the risks of towing a trailer. Simply stated, experience towing trailers with personally owned vehicles may not be adequate training or experience for towing emergency response trailers.

Consider the following facts. Less than 40% of those who purchased trailers were educated in the key practices essential to safe operations. Following is a list of safety features and the percentage of trailer owners who were trained on these features.

Proper use of safety chains	57%
Fastening the trailer to the hitch	55%
Trailer/brake lights	49%
Weight distribution	49%
Securing cargo	47%
Tire safety	46%

Unfortunately, only approximately 20% of all trailer owners received any instruction on proper towing and safety procedures. What was also determined by the study was 21% of owners have experienced a safety incident that included swaying, tire blowout, disconnect of trailer from the tow vehicle or loss of cargo. Fifty-six percent of these situations resulted in vehicle/trailer damage and 11% resulted in injuries.

In addition to safely towing a trailer, security from theft is also an issue. Many owners do not understand how to secure their trailers and cargo. Often, due to the increasing size of trailers being used by ESOs, the trailers are stored outside with little more than a key lock or simple door lock as the main security feature. At emergency scenes there is usually minimal security afforded to an open trailer.

Leaders in emergency services must become more aware of the risks involved in developing and utilizing a trailer response program. Using this new tool to deliver needed equipment does entail risk. Operators need to learn and practice proper safety procedures for operating a trailer in emergency situations. This course will help leaders and drivers recognize potential problems with trailer operations and structure training to maximize safety.

Chapter 1 — Trailers

There are many uses for trailers in emergency services, and their use is growing. One department, for example, increased its fleet from two trailers to over 40 trailers in just the last decade. It is the increasing specialization of emergency services that continues to increase its use of trailers. Trailers can be used for:

- Smoke houses
- Boats
- All-terrain vehicles (ATVs)
- Hazardous materials response equipment
- High angle rescue
- Collapse equipment and trench rescue
- Traffic signage
- Foam delivery
- Canteen services
- Breathing Air tanks and compression equipment
- Heavy construction
- Command centers
- Mass casualty support
- Fire wagons
- Fire investigation

There are many other creative applications for trailers. Interestingly, while ESOs have been using vehicles that pull other equipment for decades (tillers, mass casualty, incident (MCI) trailers, and boats) the surge in smaller specialty trailers is a relatively new concept.

When reviewing the material in this course the common or public classification of trailers is used. With the introduction of NFPA's 1901 Standard for Automotive Fire Apparatus (2009 Edition), emergency service organizations will also have to consider the three classifications outlined in NFPA 1901.

Type I Trailer – Trailers that are designed to remain connected to their tow vehicle throughout the response event and that are dependent on the tow vehicle to provide the required electrical power and conspicuity.

Type II Trailer – Trailers that are designed to allow separation from their tow vehicle after arrival at the response event and that are not dependent on the tow vehicle to provide the required electrical power and conspicuity.

Type III Trailer – Open trailers designed to transport other vehicles, equipment, or containers that will be removed from the trailer after arrival at the response event and that will not be blocking the right-of-way during the incident.

Additionally, NFPA 1901 covers carrying capacity, information labeling, fluid pressures, braking systems, suspension and wheels, hitches, safety chains, and wheel chocks. The NFPA standard also covers low-voltage electrical systems, power supplies, umbilical cables and connections, optical warning devices, work lighting and reflective markings.

Rules for Loading

Trailers should be well built and designed for practicality and functionality. While the use of a trailer may change over time, hauling of equipment should follow the same general rules. As in many situations, the originator of a new piece of equipment will often research the best practices of its use. These practices should be reinforced and practiced. The rules for loading equipment should be observed. These rules include:

Correct weight distribution – front to back (horizontally)

60% of the weight should be in front of the trailer axle and 40% of the weight should behind the trailer axle, with the heaviest equipment over the axle.

The weight on the tongue should be between 10-15% of the gross trailer weight.

Correct weight distribution – vertically

The trailer should be loaded with the heaviest equipment closest to the floor. Heavy equipment above the center line will change the center of gravity and make the vehicle top-heavy, thus exposing the vehicle to rollover potential.

Correct weight distribution – left to right

Equipment should be placed so the equipment load does not cause the trailer to favor one side or the other. The trailer should sit level whether it is on the tow vehicle or disconnected from the tow vehicle. Improper loading from left to right will cause undo sway, increase the chance of rollover and result in uneven wear on stabilizing or moving parts.

Hooking up the Trailer

Special attention to care when hooking up the trailer is an essential safety step. The driver should be the primary person hooking up the trailer. A second set of hands and eyes can double-check that a proper hook-up was made and spot for backing. Since the driver is ultimately responsible for the control of the vehicle, leaving the procedure up to someone else is ill-advised.

Each trailer will have nuances to consider in order to hook it up correctly. Generally, the process includes:

1) place wheel chocks,
2) align the ball under the raised coupler,
3) lower the coupler onto the hitch and ball assembly,
4) engage the locking mechanism around the ball,
5) attach release cable around the ball onto a fixed point on the tow vehicle.
6) hook the safety chains in a criss-crossed fashion under the ball assembly,
7) connect electrical systems,
8) lock the trailer to the hitch/ball assembly,
9) ensure the trailer jack is retracted and secured,
10) remove wheel chocks, and
11) complete walkaround.

After the proper procedure is completed, the driver should drive the trailer approximately 10-20 feet to ensure the trailer is seated properly, the brakes are working, the lights are functioning, and the vehicle is ready to be moved.

Chapter 2 — The Tow Vehicle

When an ESO decides to place a trailer into operation, one of the first considerations should be the anticipated tow vehicle. The towing vehicle is most often currently in the fleet of emergency vehicles. Some organizations may not have a suitable vehicle for towing, so purchasing a vehicle will be the next phase of implementation.

The right vehicle is critical and designating or purchasing the vehicle should be systematic and logically supportable.

Questions to consider may include:

- Is the vehicle big enough to move the trailer safely?
- What adaptations do we have to make to reinforce the tow vehicle?

First, the tow vehicle must be capable of hauling the gross vehicle weight of the trailer (weight of trailer plus contents). In addition, the hitch itself must be capable of handling at least 15% of this gross vehicle weight. This being the case, the biggest consideration is the towing capacity of the tow vehicle.

In discussing towing, the following terms will be used. Introducing them will help clarify the concept of the tow vehicle and its capacity.

GCWR or gross combination weight rating – the total allowable weight of the towing vehicle, plus the trailer, cargo in each, fluids and occupants.

GVWR or gross vehicle weight rating – the total allowable weight for the towing vehicle, including fluids, options, occupants, hitch, cargo and any trailer hitch weight.

Trailer Rating Plate

GTWR or gross trailer weight rating – the total allowable weight of the trailer, fluids, options and cargo.

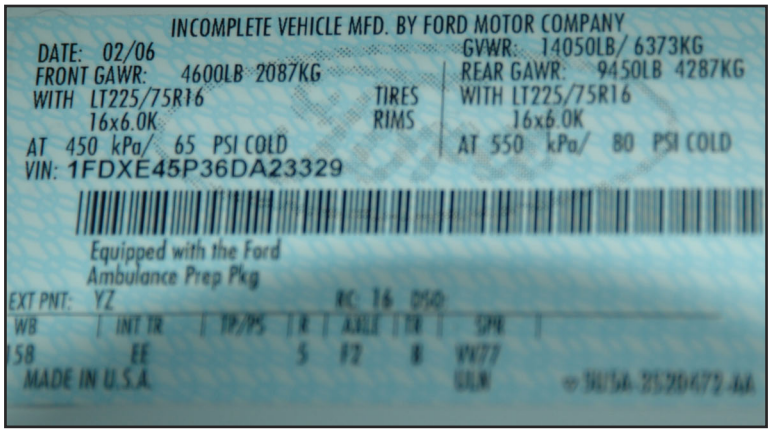
GAWR or gross axle weight rating – the total allowable weight on any given individual axle. This includes the weight of the tires and brakes and the axle itself.

Maximum Tow Rating – the manufacturer's weight limit for tow loads.

The GVWR and GAWR are listed on the data plate affixed to the driver's door, fuel door, glove compartment, end of dashboard or other easily accessible location.

TGVWR – total gross vehicle weight rating – see formula on page 67

ATW – Allowable tongue weight – see formula on page 67



Example: Manufacturer's Rating Plate

NOTE: The GVWR of the vehicle is neither a guideline nor an estimate. It is the LIMIT. When determining GVWR all allowable weights the vehicle may carry should be anticipated.

Looking in the owner's manual for a vehicle's GVWR may result in inaccurate information, so it is imperative for ESO decision makers to plan ahead when purchasing a new vehicle or retro-fitting an existing vehicle. An example is provided using a vehicle's accessories.

- A diesel engine weighs 700 lbs. more than a standard gas engine
- An automatic transmission weighs 175 lbs. more than a manual transmission
- A four wheel drive package adds 400 lbs.
- Having a long bed adds 300 lbs.
- A towing package and hitch adds additional lbs.

How does this affect the ratios listed in the owner's manual? If the manual lists the GCWR as 23,000 lbs. and the quoted tow rating is 17,000 lbs., what does this really mean? To work it through, assume a GVWR of 9,900 lbs., a front GAWR of 5,000 lbs., and a rear GAWR of 6,824 lbs.

The GAWR is derived from the tire's maximum load of 3,412 lbs.

Therefore 23,000 GCWR
<u>– 9,900 GVWR</u>
13,100 lbs. about 2 tons less than the quoted towing ability

This is an example of deriving the towing capacity using the GVWR.

This vehicle has a total weight of 7,000 lbs. Add two people (150 lbs. each), tools, fluids and cargo for a total weight of 7,500 lbs.

	Rear axle 3,500 lbs.
	Front axle 4,000 lbs.
Which gives	23,000 GCWR
	– 7,500 GVWR
	15,500 lbs. of towing capacity, 1,500 lbs. less than quoted

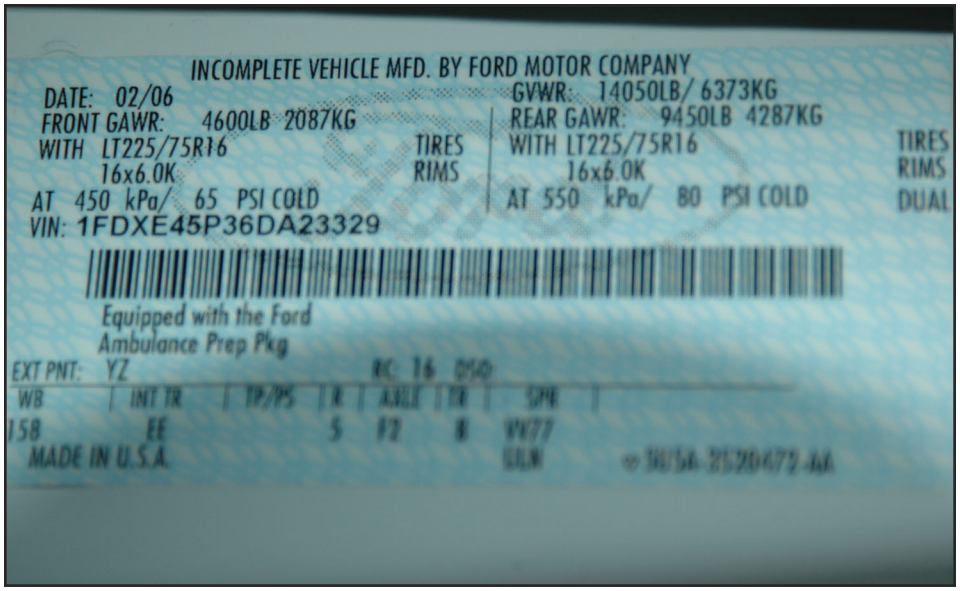
Exercise 1 and 2

Use the information on the PowerPoint slides to calculate Exercise 1 and Exercise 2.

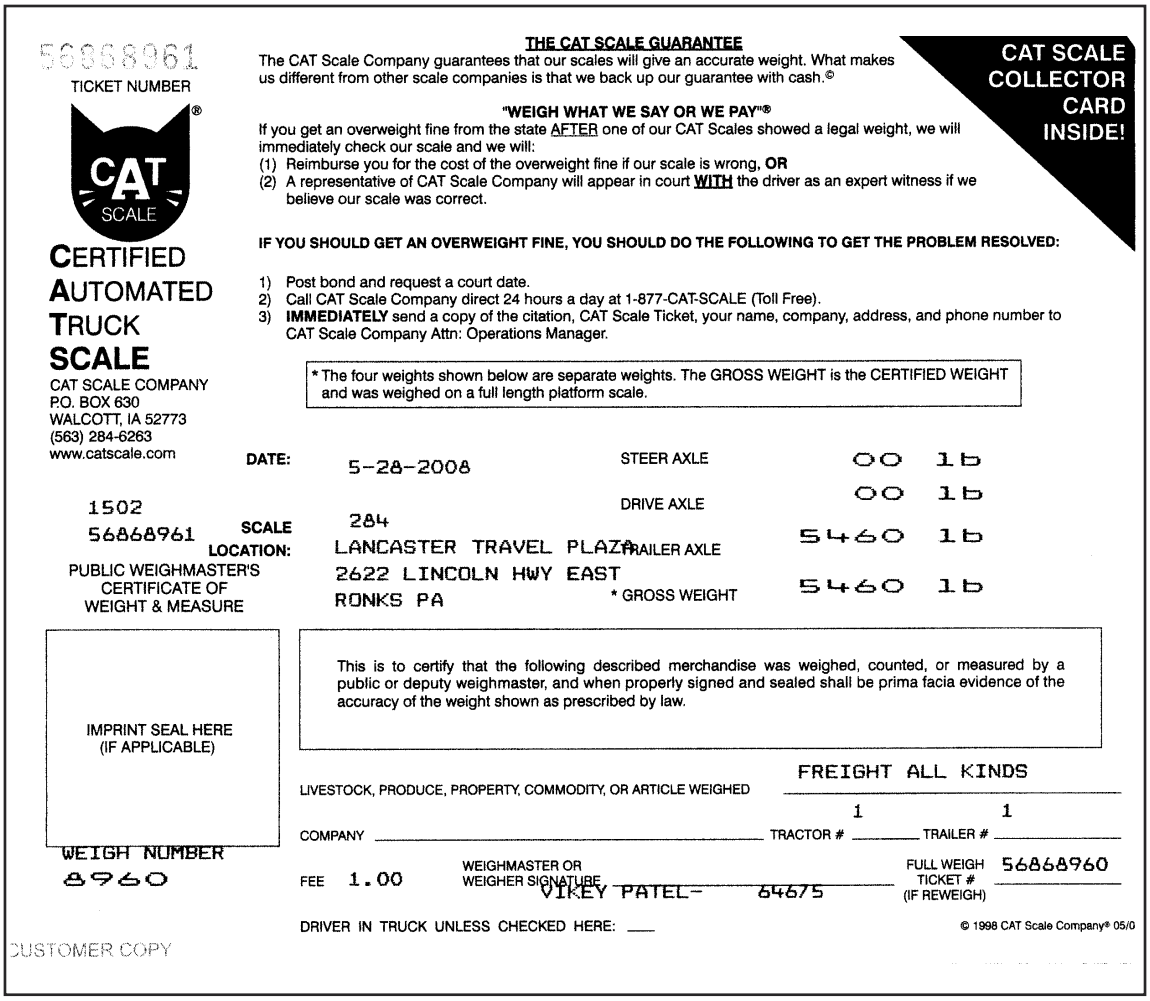
Exercise 3

Determine the weight ratings with the following information (see next page).

Determine how much weight the hitch will have to carry.



Example: Manfacturer's rating plate



56868961
TICKET NUMBER

CERTIFIED AUTOMATED TRUCK SCALE

CAT SCALE COMPANY
P.O. BOX 630
WALCOTT, IA 52773
(563) 284-6263
www.catscale.com

1502
56868961
PUBLIC WEIGHMASTER'S CERTIFICATE OF WEIGHT & MEASURE

IMPRINT SEAL HERE (IF APPLICABLE)

WEIGH NUMBER
8960

CUSTOMER COPY

THE CAT SCALE GUARANTEE

The CAT Scale Company guarantees that our scales will give an accurate weight. What makes us different from other scale companies is that we back up our guarantee with cash.©

CAT SCALE COLLECTOR CARD INSIDE!

"WEIGH WHAT WE SAY OR WE PAY"®

If you get an overweight fine from the state AFTER one of our CAT Scales showed a legal weight, we will immediately check our scale and we will:
(1) Reimburse you for the cost of the overweight fine if our scale is wrong, **OR**
(2) A representative of CAT Scale Company will appear in court **WITH** the driver as an expert witness if we believe our scale was correct.

IF YOU SHOULD GET AN OVERWEIGHT FINE, YOU SHOULD DO THE FOLLOWING TO GET THE PROBLEM RESOLVED:

1) Post bond and request a court date.
2) Call CAT Scale Company direct 24 hours a day at 1-877-CAT-SCALE (Toll Free).
3) **IMMEDIATELY** send a copy of the citation, CAT Scale Ticket, your name, company, address, and phone number to CAT Scale Company Attn: Operations Manager.

* The four weights shown below are separate weights. The GROSS WEIGHT is the CERTIFIED WEIGHT and was weighed on a full length platform scale.

DATE: 5-28-2008
SCALE: 284
LOCATION: LANCASTER TRAVEL PLAZA
2622 LINCOLN HWY EAST
RONKS PA

STEER AXLE	00	lb
DRIVE AXLE	00	lb
TRAILER AXLE	5460	lb
* GROSS WEIGHT	5460	lb

This is to certify that the following described merchandise was weighed, counted, or measured by a public or deputy weighmaster, and when properly signed and sealed shall be prima facia evidence of the accuracy of the weight shown as prescribed by law.

LIVESTOCK, PRODUCE, PROPERTY, COMMODITY, OR ARTICLE WEIGHED: FREIGHT ALL KINDS

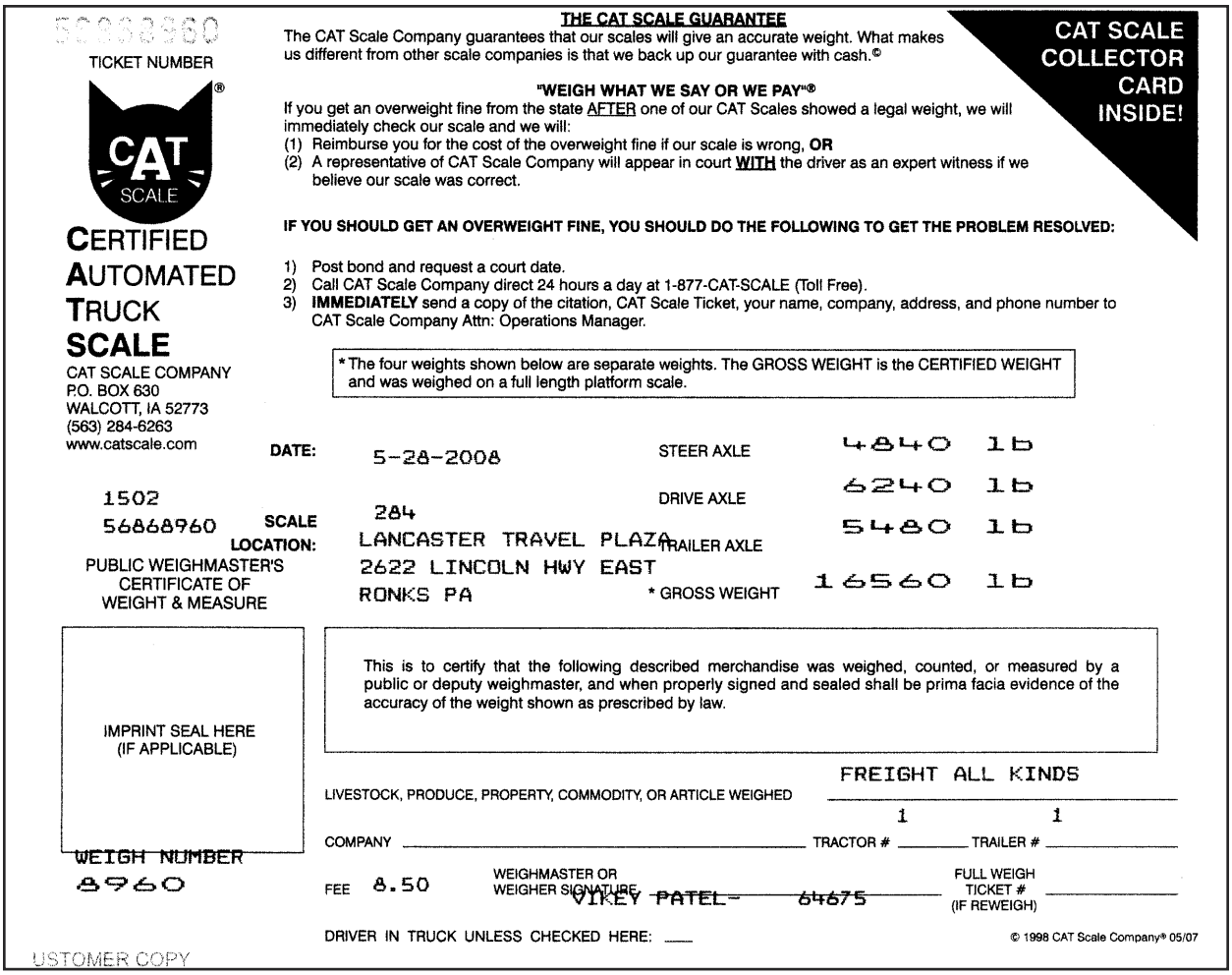
COMPANY _____ TRACTOR # 1 TRAILER # 1

FEE 1.00 WEIGHMASTER OR WEIGHER SIGNATURE VIKEY PATEL- 84675 FULL WEIGH TICKET # (IF REWEIGH) 56868960

DRIVER IN TRUCK UNLESS CHECKED HERE: ___

© 1998 CAT Scale Company® 05/0

Example: Trailer Weight



THE CAT SCALE GUARANTEE

The CAT Scale Company guarantees that our scales will give an accurate weight. What makes us different from other scale companies is that we back up our guarantee with cash.©

CAT SCALE COLLECTOR CARD INSIDE!

"WEIGH WHAT WE SAY OR WE PAY"®

If you get an overweight fine from the state AFTER one of our CAT Scales showed a legal weight, we will immediately check our scale and we will:
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TICKET NUMBER

CERTIFIED AUTOMATED TRUCK SCALE

CAT SCALE COMPANY
P.O. BOX 630
WALCOTT, IA 52773
(563) 284-6263
www.catscale.com

* The four weights shown below are separate weights. The GROSS WEIGHT is the CERTIFIED WEIGHT and was weighed on a full length platform scale.

DATE: 5-28-2008

1502
56868960 SCALE
284
LOCATION: LANCASTER TRAVEL PLAZA
2622 LINCOLN HWY EAST
RONKS PA

PUBLIC WEIGHMASTER'S CERTIFICATE OF WEIGHT & MEASURE

STEER AXLE	4840 lb
DRIVE AXLE	6240 lb
TRAILER AXLE	5480 lb
* GROSS WEIGHT	16560 lb

IMPRINT SEAL HERE (IF APPLICABLE)

This is to certify that the following described merchandise was weighed, counted, or measured by a public or deputy weighmaster, and when properly signed and sealed shall be prima facia evidence of the accuracy of the weight shown as prescribed by law.

LIVESTOCK, PRODUCE, PROPERTY, COMMODITY, OR ARTICLE WEIGHED: FREIGHT ALL KINDS

COMPANY _____ TRACTOR # 1 TRAILER # 1

WEIGH NUMBER 8960

FEE 8.50 WEIGHMASTER OR WEIGHER SIGNATURE VIKEY PATEL 64675 FULL WEIGH TICKET # (IF REWEIGH) _____

DRIVER IN TRUCK UNLESS CHECKED HERE: ___

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Example: Total Weight – Tow vehicle and trailer combined

1) GVWR – GVW = allowable tongue weight

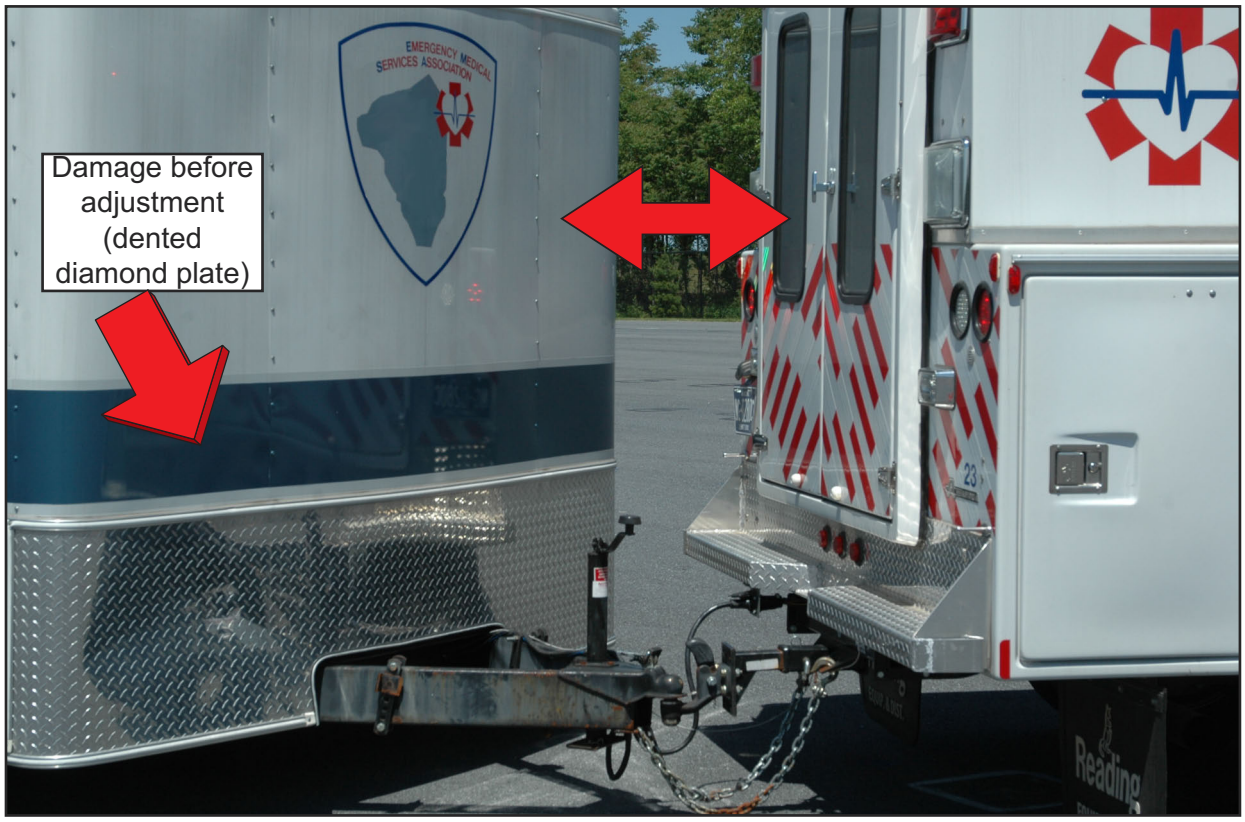
The driver is responsible for the trailer weight and understanding the towing capacity of the vehicle. Determining the towing potential and loading at least 12% of the best estimate of the total weight on the hitch will provide a margin of safety.

In this example, planning requires knowledge of the type of vehicle towing the trailer, the size of the trailer, the equipment and materials to be loaded into the trailer and the personnel who could potentially ride in the tow vehicle. With this information the ESO can determine the best setup for its needs.

The follow-through on the planning may require the organization to develop new Standard Operating Procedures/Standard Operating Guidelines (SOPs/SOGs) regarding the towing of a trailer. It is important all drivers understand the specifics of operating a trailer and stay within safety margins.

Other considerations for the tow vehicle include the extra demand on the cooling system, since the increased engine demand will raise the temperature, especially going up hills. In addition, on vehicles with an automatic transmission, the tow vehicle will be subjected to greater wear. Overheated transmissions are common in undersized tow vehicles, so auxiliary transmission coolers may need to be considered.

When looking at a particular vehicle to buy or retrofit for a trailer the distance between the bumper or back of the tow vehicle and the front of the trailer must be considered. When turning, this space becomes important, as too little distance will result in damage to both vehicles and potentially cause the trailer to overturn. Too much distance means that control of the trailer direction and movement is reduced.



Inadequate clearance between towing vehicle and trailer


EMS
EMERGENCY MEDICAL SERVICES ASSOCIATION
COUNTY
Damage before adjustment

Chapter 3 — Brake Requirements

Adding a trailer to a tow vehicle means the braking requirements suddenly change. Stopping distances lengthen, brakes undergo more wear, and the driver may need to change his or her driving habits to accommodate the added weight.

The tow vehicle braking system should be designed to handle the towing of a trailer. If an ESO purchases a vehicle specifically for this purpose the dealer should understand the potential uses for the tow vehicle. If a vehicle is retrofitted with coupling attachments, the ESO would be wise to discuss the capabilities of the tow vehicle with a person who understands brake requirements and the towing needs of the organization.

For the trailer there are basically three types of brake activation systems:

1) Electronically controlled electric brakes, which provide automatic and manual control of electric trailer brakes. These are used to regulate the drag of the trailer by adjusting the trailer brakes. This system requires the tow vehicle to be equipped with a controlling device and additional wiring to supply electrical power to the trailer.

Example: Electronic Brake Controls

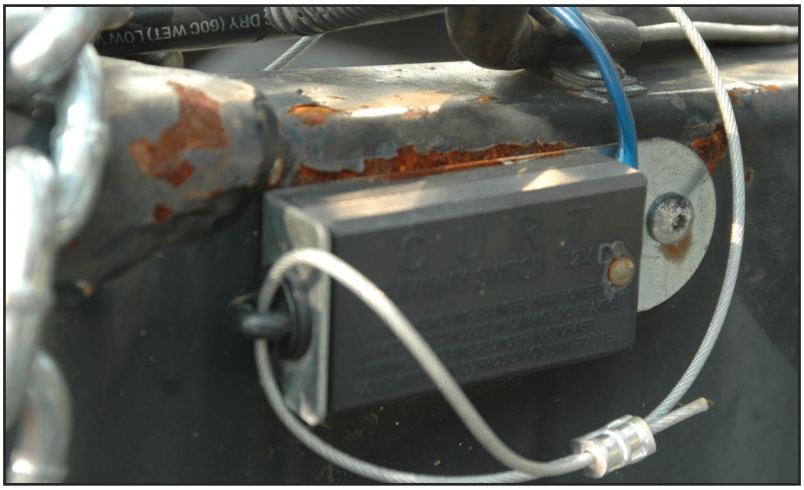
2) Hydraulically controlled electric brakes, which allow for evenly applied braking, which is proportional to brake pedal pressure. The trailer brakes should never be connected directly to the tow vehicle brake system.

3) Surge brakes, which are an independent system activated by a master cylinder at the junction of the hitch and trailer tongue. Surge brakes are available on trailers having a GW of 8,000 lbs. or less.

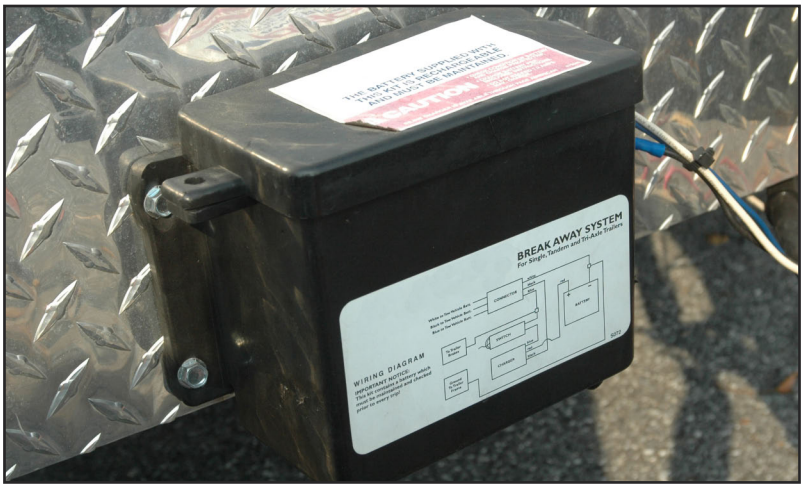
According to NFPA 1901, any trailer with a GVWR of 3,000 lbs. or more shall be equipped with a braking system that functions on all wheels. The tow vehicle braking system should be capable of handling the braking duties of the tow vehicle and the trailer, and when parked safely hold the trailer stationary. Electric or air brakes are required on all trailers over 8,000 lbs.

Trailer brakes should be inspected on a regular basis. Generally, new trailers should have the brakes adjusted after the first 200 miles of use and approximately every 3,000 miles thereafter.

Other safety features include an electric breakaway system, which is activated only if the trailer comes loose from the hitch and the breakaway pin is pulled. The breakaway battery switch causes the breakaway battery to operate the electric brakes on the free trailer. On this safety feature it is essential that the pull cable, pull pin, switch, battery and brakes are functioning properly. This battery should be inspected on a regular basis. To check this system, pull the pin from the switch and confirm that the brakes are applied to each wheel.



Component parts of electric breakaway system: Pin pull system



Component parts of electric breakaway system: Battery and switch

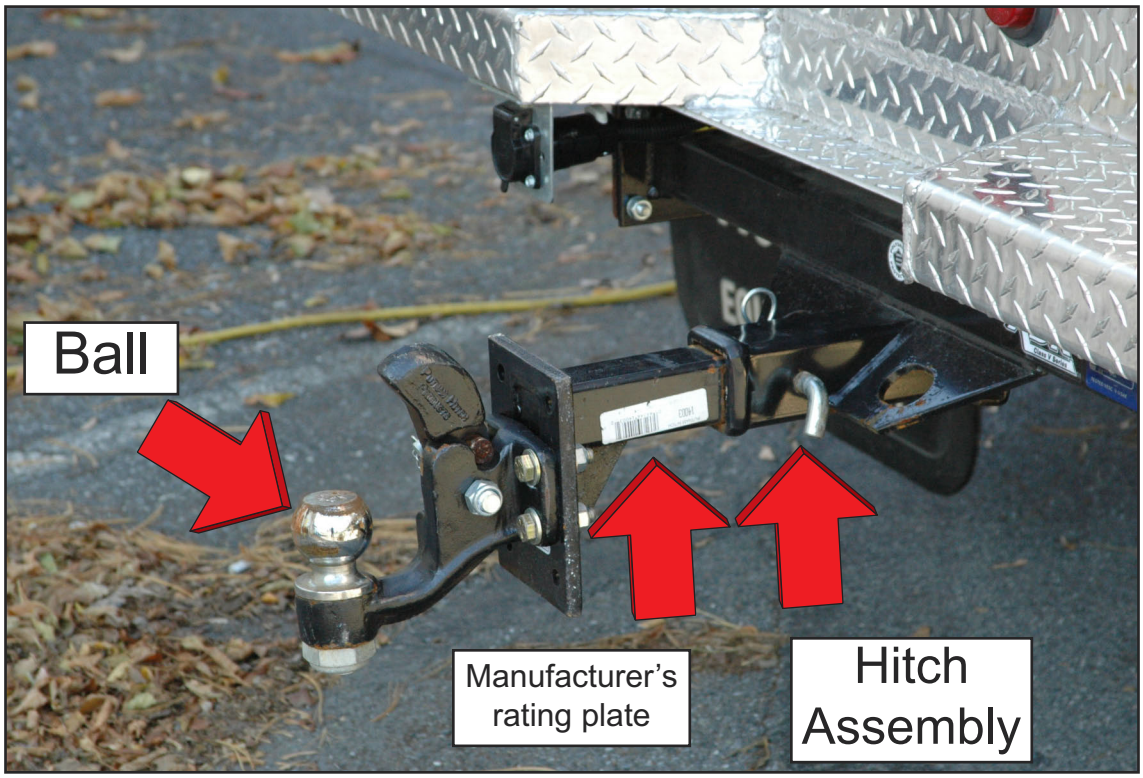
Component parts of electric breakaway system: Pull cable

Having a good braking system on the tow vehicle and the trailer is essential for safe operation. The benefits for investing in a good system include saving on wear and tear on both vehicles and adding a higher level of safety to the operation of trailers in emergency situations.

Chapter 4 — Tow Hitch, Ball and Coupler Assembly

The tow hitch is a device that supports the weight of the trailer tongue and pulls the trailer. When the hitch is attached to the tow vehicle it must have a capacity equal to or greater than the load rating of the trailer. The tow hitch capacity must also be matched to the tow vehicle capacity. A hitch is rated by not only its towing capacity but also its tongue weight.

There are three common types of hitches. They are the weight-carrying hitch, the weight distributing or load equalizer hitch, and the fifth wheel or gooseneck. Weight-carrying hitches are designed to carry all of the trailer's tongue weight. Weight-distributing hitches are used with a receiver hitch and special parts that distribute the tongue weight among all tow vehicle and trailer axles. The gooseneck is rarely used in ESO, so it will not be covered in this course.



In relation to the trailer's gross vehicle weight, load weight and hitch weight, consider how the hitch weight compares to the GVW. If the hitch weight is 10% of the GVW the load can be adjusted. Remember it is important to ensure that the hitch weight is matched to the capacity AND load. Therefore, if the hitch weight is 10% of the GVW, load supplies as far forward as possible.

Weight-Distributing Hitch

Weight-distributing hitches are designed to distribute the weight relatively evenly to all axles of the tow vehicle and trailer. The tow vehicle and trailer should be level in order for the hitch to operate properly. The following procedure will check the distribution:

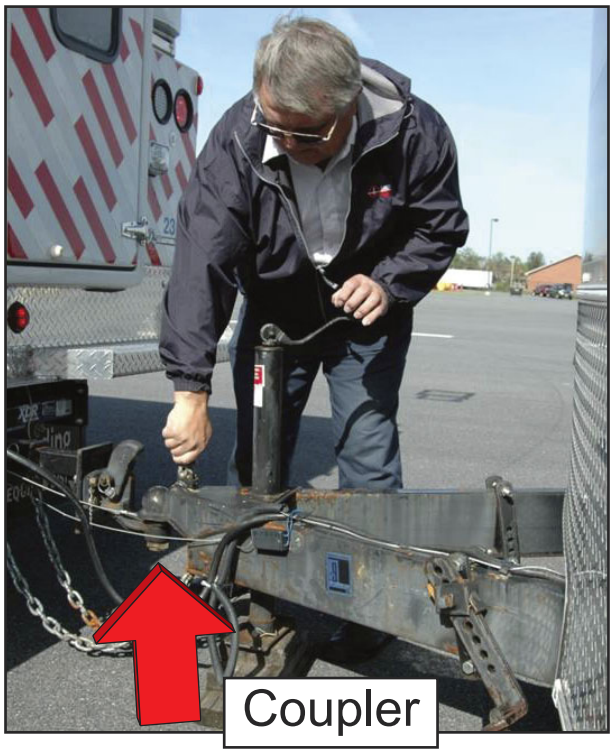
1. With the tow vehicle loaded, measure the distance between the vehicle and the ground at predetermined reference points, both in the front and rear.

2. Hitch the trailer and adjust the tension on the spring bars so the tow vehicle remains at approximately the same level (attitude). If the rear of the tow vehicle drops an inch, the rear of the trailer should also drop an inch.

3. Inspect the trailer to be sure it is level. If not, the hitch ball height should be raised or lowered. If adjustments cannot make the trailer level, spring bars rated for more weight may be required to keep the tow vehicle from sagging in the rear.

If the vehicle is equipped with a load distributing hitch, be sure that the spring bars are rated highly enough to handle the hitch weight of the trailer, plus a safety margin of at least 10%.

The coupler is a device on the tongue of the trailer that connects the hitch on the tow vehicle. The coupler attaches to the hitch. The coupler handle lever must rotate freely and automatically snap into the latched position. Damaged coupler parts that interfere with proper functioning must be replaced before towing. Operators should oil pivot points, sliding surfaces and spring ends regularly according to manufacturer recommendations.



The ball is the device the coupler sits on to connect the trailer and the tow vehicle and will have a range of diameters. Its location should allow the trailer to sit level when connected to the tow vehicle. The ball should be slightly greased with a thin layer of automotive bearing grease so the hitch rotates smoothly, reduces wear and ensures proper operation (see list of common sizes and weights in glossary).

Chains are used in case the coupler comes loose. They provide a safety backup to keep the trailer attached to the tow vehicle in the event the coupler fails. When properly attached it is possible for the chains to keep the tongue of the trailer from digging into the road. The chains should be rigged so they:

- Cross underneath the coupler.
- Loop around the frame member of the tow vehicle or to holes provided on the hitch system.
- Have enough slack to permit tight turns, but not be so close to the road surface as to drag or not support the trailer if it uncouples. Safety chains are required by most states.

An operator should have good trailer handling if the weight and hitch adjustments are correct. However, the movement between the tow vehicle and trailer should be minimized to prevent any side-to-side motion. If sway does occur the operator should check whether the load shifted, there are problems with the suspension, and whether the tires/wheels are secure and properly inflated. An anti-sway device may be helpful, as it allows the tow vehicle and trailer to operate as "one vehicle." There are two basic types of sway control:

1. A friction bar slides in and out and is activated by the motion of the vehicles. When the driver applies the brakes the trailer weight compresses the bar, which compresses the trailer against the tow vehicle.
2. A dual-cam sway control usually works best with larger trailers with heavy tongue weight. The cam action is applied to the spring of the trailer to reduce sway and shifts the weight forward.

The driver should be able to feel any variation of the trailer and understand what adjustments need to be made for safe travel.

Chapter 5 — Inspecting the Vehicles

The driver should follow a routine pattern of inspection prior to departing on an emergency response. For example, see page three.

A detailed inspection should occur regularly; however, a summary inspection should be conducted before a response. Most trailers are not used on a daily basis, so an inspection is required to ensure that the trailer is ready for use.

Body

The exterior of the trailer can reveal whether there is damage to the structure of the trailer. If doors are misaligned or weak areas are noted, the trailer may need to be removed from use until proper repairs are made. The driver can determine if the trailer requires service by following these steps:

_____ Inspect for torn fenders, projections from body or frame, or missing or damaged parts.

_____ Verify that doors are properly aligned and that latches are easy to open and close.

_____ Check flooring for weak or soft spots.

_____ Make sure that guides, rollers and pivots for boats are properly secured and non-binding.

Suspension

Trailers over 1,000 lbs. GVWR must have suspension rather than attaching the axle directly to the frame.

_____ Check to ensure that the lowest part of the leaf spring is not less than 4" off the ground.

_____ Verify that all nuts and bolts are tight and there are no obvious cracks in the suspension system.

Brakes

_____ Check brake fluid reservoir. Refill as necessary.

_____ Ensure that solenoid wire is securely attached to the tow vehicle's brake wire if trailer is equipped with disc brakes. Improperly engaging (or failing to engage) the reverse solenoid will result in locked brakes while backing.

Coupler

There are generally two types of couplers: lever and hand wheel. The lever coupler engages the pawl and secures the trailer to the hitch ball. The coupler and hitch ball MUST be rated for the same size. The size should be imprinted on both ball and hitch.

_____ Visually inspect coupler for wear or damage.

_____ Verify that the coupler fits over the ball and the lever engages smoothly.

_____ Ensure that the wheel is clamped hand-tight only.

_____ Check to see if the ball is properly situated inside coupler.

_____ Check whether the trailer lifts off of the ball.

Electrical

_____ Ensure that the wire harness connector from the tow vehicle and trailer are free of debris and water.

_____ Verify that the white ground wire on the trailer is securely attached to the trailer frame.

_____ Verify that the grounds from the trailer light are securely attached to the trailer frame if there is an independent grounding circuit.

_____ Properly secure the wire harness from the trailer to the wire harness connection of the tow vehicle.

_____ Check to ensure that the brake and turn signal lights illuminate.

_____ Replace any burned-out or broken bulbs along with many cracked or broken lenses. Replace all non-working or damaged parts.

_____ Inspect the trailer's battery system if it has one, since, some battery systems control the braking system.

Fenders

Fenders are required where the body portion does not afford adequate protection to minimize the spray or splash of water or dirt.

_____ Ensure that fenders cover the entire tread of width of the tires.

_____ Inspect for damage.

License Plate

_____ Ensure that the plate is horizontally fastened and illuminated for best visibility.

Lighting

Trailers 80" or more in overall width should be equipped on the rear with three red identification lamps mounted in the center. The centers of each lamp must be spaced not less than 6" nor more than 12" from each other.

_____ Ensure that all marker and safety lights are functioning properly.

_____ Verify that stop lamps are mounted at a height between 15" and 72" and that they are functioning correctly.

_____ Check that turn signals are either red or amber, and are mounted at a height between 15" and 83" and they are operating correctly.

_____ Make sure that reflectors are displayed (two red reflectors in the rear) and mounted as far apart as practical (trailers less than 80").

_____ Inspect side reflectors. They should be mounted with two red reflectors at the rear of the trailer and, if the trailer is over 61" long, two amber side reflectors should be located at or near the front.

_____ Check the sides and rear of trailers over 10,000 lbs. GVWR to be sure they have red and white reflective tape.

_____ Verify that there is an additional amber reflector centrally located on each side of any trailers of 30' or longer.

Safety Equipment

Chains

_____ Two chains capable of being attached to the frame of the tow vehicle should be on hand.

_____ Inspect for damage, scrapes and gouges.

_____ Ensure that chains do not drag on ground.

_____ Ensure wheels are chocked.

_____ Ensure that wheel chocks are stored on the trailer and they are clear of chemicals and not damaged or worn.

Tires

_____ Check tire pressure when tires are cold. It should match the manufacturer's recommended pressure printed on the side wall.

_____ Ensure that tire treads are visible. Note any bubbles, deep cracks, uneven wear or tread separation, cord exposure or deteriorating sidewall (dry rot).

_____ Ensure sufficient tread depth and that the tread is free of damage. Tires must have at-least two thirty-seconds of an inch (2/32") center tread.

_____ Check spare tire.

_____ Verify that tires are the same type of tire (bias-belted vs. radial).

Tongue Jack

_____ Check jack for grease. Use manufacturer-recommended wheel-bearing grease.

_____ Ensure jack is completely raised before towing.

_____ If trailer is equipped with a swivel jack, check to ensure the jack is folded completely and is parallel with the trailer tongue.

_____ When lowering the jack, ensure that the swivel pin is engaged BEFORE adding weight to the jack or unhitching the trailer from the tow vehicle.

Wheels and Hubs

_____ Check for loose or missing lug nuts.

_____ Tighten all lug nuts to the required foot-pounds.

_____ Replace any damaged or missing lug nuts. When tightening lug nuts use correctly sized wrench to avoid stripping.

_____ Check for bearing grease splatter on rims.

_____ Be aware of smoke from wheels.

_____ Visually inspect hub, bearing buddy (if applicable), bearing protector cap or grease cap. Replace as needed.

Winch Assembly

_____ Check any straps, ropes or cable and hook before each use.

_____ Replace any worn, damaged, frayed or kinked parts.

_____ Make sure winch strap is securely attached to boat's eye.

_____ Check that all tie-down straps are secure.

Chapter 6 — Loading the Trailer

According to studies, more than half of truck driver deaths in crashes occur as the result of rollovers. When cargo is loaded high in the trailer the center of gravity is raised higher up from the road, making it vulnerable to rollover. Fully loaded trailers are ten times more likely to roll over in a crash than empty trailers.

To safely load a trailer the following elements must be considered:

1) overall load weight
2) load weight distribution, both horizontal and vertical
3) proper tongue weight
4) load securing measures

The trailer axles carry most of the weight of the trailer and its contents. The remainder of the weight is carried by the tow vehicle hitch. For safety purposes the total weight must be properly distributed and balanced; otherwise the trailer can swing wildly while towed.

The load must be distributed so that no part of the trailer is loaded beyond its rating. Thus the rating of the tires, wheels, frame and axles must be considered.

Example: Manufacturer's Pressure Recommendation

Towing stability also depends on keeping the center of gravity as low as possible. The heaviest items should be loaded on the floor and over the axles. Additional items should be loaded so as to maintain an even side-to-side weight distribution. Remember, the total weight of the trailer must never exceed the total weight rating of the trailer.

Top heavy loads can cause problems not only when cornering but also in hard braking situations. Top-heavy loads can make the trailer "dive." This sudden movement increases the tongue weight and can decrease the tow vehicle front axle load (raising the front of the tow vehicle) just when steering is critical; and the front brakes are needed to brake the most. Instead, top heavy loads should be centered or arranged so that the rest of the load can act as a counter weight to minimize this affect.

Weighing the Vehicle

The ESO should be familiar with the total weight of the loaded vehicle, the weight of the unloaded trailer and ultimately the weight of the fully loaded trailer to determine safe driving standards.

The manufacturer can provide a rough estimate of the weight of the vehicle. The organization will determine the additional weight of equipment, personnel and add-ons. The ESO should determine the total weight of the loaded trailer and the tongue weight when loaded. This can be accomplished by weighing the unloaded trailer at a scale.

To determine the unloaded weight pull the trailer onto the scale and position the trailer such that just its wheels are on the center of the scale. The trailer does not need to be disconnected, but the hauling vehicle should not impinge on the scale.

Tongue weight is the amount of the trailer's weight that presses down on the trailer hitch. Too little tongue weight can cause the trailer to sway. Too much tongue weight can affect the weight on the front tires of the tow vehicle, making it less responsive to steering. Excessive tongue weight can also cause damage to the suspension and drive-train of the tow vehicle.

Tongue weight should be determined. Disconnect the trailer from the towing vehicle and weigh the front of the trailer at the hitch. This will result in the empty hitch weight. This will be important once the trailer is loaded.

Trailer Weight Class

Class I

- 2,000 lb. maximum
- Load-carrying hitch

Class II

- 3,500 lb. maximum
- Single axle, small to medium length (up to 18 feet in length)

Class III

- 5,000 lb. maximum
- Dual axle or larger single axle
- Weight distribution hitch not required unless specified for a particular vehicle

Class IV

- 12,000 lb. maximum
- Weight distribution hitch required

Both the tow vehicle and the hitching system have weight capacities that affect the safe handling of the vehicle. The tow vehicle's GVWR should not be exceeded. This includes the curb weight of the vehicle, trailer load and hitch weight.

Hitch weight is the percentage of the trailer weight that is placed on the trailer coupler of the tow vehicle. Payload and hitch weight must be divided evenly between the axles to conform to weight limits and avoid over-steering problems.

Method to Determine Hitch Weight

Practical application example – Determine the unloaded, loaded and combined weight of the vehicles.

To determine the correct load weight the operator should know the weight of the empty trailer. This number should be subtracted from the GVWR (found on the VIN certification label). The number derived is the maximum available cargo capacity of the trailer.

Approximately 10 to 15% of the trailer's gross weight is designed to be loaded in front of the axle and onto the hitch mechanism. This ensures needed stability for road handling. Below are steps to determine hitch weight.

1. Park the loaded trailer on a scale so that the hitch coupler extends beyond the end of the scale, but the tongue jack post (the post on the front of the trailer that rests on the ground when unhitched) is on the scale.

2. Chock the trailer vehicle wheels, unhitch the trailer and obtain the weight. This is the curb weight of the trailer alone. Note this weight.

3. Place a jack stand under the coupler so the tongue jack post is supported off of the scale and the trailer is level. Note this weight.

4. Subtract the reading in step 2 from the reading in step 3 to derive the hitch weight.

The key idea to remember is that an improper load distribution will greatly affect the handling of the tow vehicle and trailer. If the tongue weight is miscalculated it can result in loss of control of the trailer. Positioning of the load should take into account even distribution:

- front to back to provide proper tongue weight.
- left to right to avoid tire or suspension overload.
- top to bottom to maintain a low center of gravity.

Chapter 7 — Driving with a Trailer

The driver must keep in mind that the vehicle is now a lot longer and heavier with a trailer than it was without a trailer. He or she will experience reduced acceleration, longer stopping distances, larger blind spots in the mirrors and a much wider turning circle. Relative speed needs to be considered when towing a trailer. Relative speed is the speed measured at any mph relative to the operating environment, road conditions, or vehicle condition. While the posted speed limit may be appropriate for a single vehicle, adding a trailer may require the driver to slow down below the posted speed limit based on the operating environment, road conditions, or vehicle/trailer condition.

As always refer to the manufacturer's manual for trailer towing recommendations. Seeing ahead is much more important when driving an emergency unit with a trailer. Because stopping or lane changes will require greater anticipation, the emergency driver will need to look further ahead than usual, at least 12 to 15 seconds ahead. At slower speeds that would mean about one block. At highway speeds it would mean looking at traffic conditions a quarter of a mile down the road.

The wider turning circle becomes important when rounding sharp turns. The trailer does not follow the same turning arc as the tow vehicle. In fact, the "entire" vehicle has three pivot points that the driver must be familiar with and manage. First, the rear tires on the tow vehicle on the turning side become the turning point for the tow vehicle as it turns.

The hitch, ball and coupler assembly become the second pivot point in the turning process.

Finally, the rear tires on the trailer on the turning side become the third pivot point for the trailer.

The driver must negotiate each pivot point to minimize any potential for losing control or hitting an object. Each pivot point must be at or past the hazard/turn before completing the turn.

When braking, the total stopping distance is much longer. The driver must anticipate the actions needed to keep the vehicle under control.

As with any driving situation, seatbelts should be used in accordance with state law.

Backing

When backing or hooking up the trailer, plan ahead and use a spotter. It is best to avoid backing if possible. However, if it is necessary to back up make sure your backing path is clear. The driver should imagine pushing from the ball backwards and decrease the tendency to turn the trailer beginning with his or her position in the front seat. Both mirrors need to be utilized. At all times, if practical, a spotter should be utilized. The spotter will generally stand on the hazard side of the vehicle. This is different than spotters who stand primarily on the driver's side when helping the driver back up without a trailer.

The driver must look at the line of travel before backing and leave plenty of room. The additional space will be helpful if the driver must turn the tow vehicle back toward the driver's side as it will be easier to watch the movement of the trailer. While backing, the easiest method for steering in reverse is to place one hand on the bottom of the steering wheel (six o'clock) and move that hand in the direction the trailer needs to go.

The trailer will turn right if the steering hand is moved counter clockwise. Alternatively, the trailer will turn left if the steering hand is moved clockwise. The driver, after making the turn, must track the trailer's movement to ensure smooth and straight direction. To reiterate, the driver cannot steer the trailer by turning the front wheels of the tow vehicle; it must be done by moving the ball.

In emergency situations drivers tend to forget the trailer will move in the opposite direction of the towing vehicle when backing up. It is best to proceed slowly. If the trailer begins to move in the wrong direction, the driver should stop, pull forward and try again. This is much easier than trying to correct the mistake during the backing phase and zigzagging to correct the direction. More time is lost when a driver attempts to correct while backing up.

Drivers should habitually blow the horn of the tow vehicle prior to backing. Use of spotters is important when moving a trailer, as there are more blind spots and lost visual lines in this driving scenario. Both the spotter and driver should become familiar with hand signals and use them appropriately.

Turning

Turns while towing require the driver to check the mirrors on both the driver and passenger sides. As always, use your turn signal so other drivers are aware of your intention. The driver should look at the rear of the vehicle to ensure it will not hit anything while turning. When making RIGHT turns the driver should make sure there is enough clearance on the right side of the vehicle to allow for follow through. Driver should turn slowly to allow for corrections and give other drivers time to avoid problems. While making a right turn avoid swinging into another lane. Keep the rear of the vehicle close to the curb or the line of travel on the passenger side. Don't turn wide to the left when beginning the turn, as a following driver may think a left turn is occurring and try to pass you on the right. Swing wide onto the street or driveway; this will stop other drivers from passing on the right. When crossing, cross into the oncoming lane to make a turn and watch out for oncoming traffic. Give room to go by or to stop. However, don't back up, because another driver may be in the rear blind spot. Extreme care must be taken during the turn as the trailer may go over the curb and strike a hazard, pedestrians or a sewer grate in the gutter, causing damage or injury.

When turning LEFT the driver must reach the center of the intersection before starting the turn. If the turn is made too soon, the left side of the tow vehicle may hit another vehicle. The tow vehicle should proceed up to the center of the intersection on the road from which it is turning. This clears the trailer of the corner. To reiterate, the turn should occur in the center of the intersection.

Driving in Windy Conditions

Wind can cause significant movement between the tow vehicle and the trailer. A thirty-mile-an-hour crosswind can blow the entire rig off the road. Consider a gust of wind where the vehicle is pushed toward the right. The driver attempts to compensate and to stay on the road steers the tow vehicle to the left. With the trailer leaning right and the tow vehicle turning left, the centrifugal force will decrease the driver's ability to maintain control of the entire process.

Driving in Wind Generated from Passing Trucks

Large vehicles develop pressure changes (or waves) between the front and rear of the vehicle. This may vary depending on the size, speed and other environmental conditions. For example, if a large truck passes the trailer first, a "bow wave" will move the trailer to the right. As the truck passes, the rear "low pressure wave" pulls the vehicle to the left. The tow vehicle experiences the same pressure changes.

Acceleration and Passing

Passing should only be done with caution and only when necessary. Drivers must be very cautious and be aware of the entire length of the tow vehicle and trailer when passing. The pass should occur on level terrain and with plenty of clearance. Drivers must be sure to allow the appropriate amount of space between the back of the trailer and the slower vehicle before pulling back into the lane. The use of mirrors is critical in determining the space required to pull back into the non-passing lane. Drivers have become accustomed to passing and getting back into the non-passing lane immediately after the slower vehicle is passed; the added length of the trailer can easily be forgotten. By taking the extra few seconds to look in both mirrors and become secure in the location of the back of the trailer relative to other vehicles, the driver can avoid problems. Allowing for additional space after the trailer has passed the front of the vehicle just passed will minimize the chance of collision.

The time saved by "rushing" to an emergency with a trailer may not be necessary or worth the risk. Driving at a higher speed to get to a scene rapidly can increase the chance of an incident.

Downgrades and Upgrades

Downshifting assists in deceleration on downgrades and provides added power at the drive wheels for climbing hills. Newer vehicles have a tow/haul mode. Select this mode to automatically eliminate unwanted gear search when going uphill and help control vehicle speed when going downhill. If the vehicle has automatic overdrive the driver may want to lock out overdrive to provide steadier performance and handling especially when excessive shifting occurs.

Always refer to the owners guide for manufacturer's recommendations for the tow/haul mode and locking out overdrive.

Parking with a Trailer

When at all possible, avoid parking on a grade. If this is necessary, place a wheel chock under the trailer's wheels.

Intersections

When an emergency vehicle responds to a call, private vehicle operators will hopefully react correctly to the situation. The driving public will anticipate one vehicle passing through an intersection or proceeding past them along a roadway. Many will wait the obligatory amount of time for the "one vehicle" and then proceed as normal. The emergency vehicle responding with a trailer is an added "abnormal" situation that the public does not anticipate. ESO drivers need to account for the lack of knowledge or awareness of trailer operations and provide an additional level of safety response.

Braking

Speed and stopping distance are directly related – the greater the speed, the longer the stopping distance. There are three factors to consider when bringing any vehicle to a stop:

Perception distance – the distance the vehicle travels from the time the driver's eyes see the hazard until the brain registers the hazard and then signals for a specific reaction. In the average driver this will occur in about 3/4 of a second. In that time, at 55 mph the vehicle will have traveled about 60 feet.

Reaction distance – the distance traveled from the time the brain tells the foot to move from the accelerator until the foot is pushing on the brake. This also occurs in an average of 3/4 of a second. In this same time, going 55 mph, the vehicle will have traveled an additional 60 feet.

Braking distance – the distance it takes to stop once the brakes are applied. At 55 mph on dry pavement with good brakes it can take about 4 1/2 seconds, or 170 feet. Adding the weight of the trailer and the load in the trailer will increase the stopping distance.

Doubling the traveling speed means that it takes four times as much distance to stop the vehicle.

Skid Control

Whenever the tires lose their grip on the road the trailer or tow vehicle can experience a skid. This can occur in one of five ways:

1) over-braking – braking too hard and locking up the wheels
2) over-steering – turning the wheels more sharply than the vehicle can turn
3) over-acceleration – providing too much power to the tow vehicle
4) driving too fast
5) situational awareness

When a vehicle starts to skid the tow vehicle can slide either right or left and the trailer will move in the opposite direction. This can push the tow vehicle into a jack-knife position. Attempting to correct this situation requires steering the tow vehicle in the intended direction.

Driving into Curves

Drivers of emergency vehicles must adjust their habits to account for road conditions, including curves. Going into a curve too quickly can cause the trailer to pull the tow vehicle toward the outer part of the curve. Trailers with higher center of gravity can roll over even when the driver is adhering to posted speed limits, as the limits are determined for a typical vehicle–not a vehicle towing a trailer.

Chapter 8 — The Course

The skills portion of the Trailer Driving Program, is based on completion of specific modules. The individual stations are designed to test the skills of the driver without the added time or speed component. The emphasis of driving SKILL is based on the concept that when a trailer is requested, the emergency situation is already being attended to and the need for the trailer and/or equipment is for specialty or supplemental purposes. It is understood that an emergency may still exist, such as a confined space rescue, need for a boat, a collapse team, etc. and lives may be at stake. However, because of the nature of the call and need for the trailer's equipment, getting to the scene safely is always the priority. The driver must possess the skills to negotiate traffic and any hazards encountered. Speed is NOT essential. Obviously, if the trailer is involved in an accident due to speed or lack of driving skill, the specialty equipment is useless to the victims of the original emergency. The driver candidate should have completed an emergency vehicle driver training program prior to taking the trailer program.

The stations are designed to:

1. Assist in the training of a candidate driver,
2. Qualify the candidate driver for the street and highway portion,
3. Verify the competency of an existing driver, and
4. Examine the proficiency of an existing driver.

The stations measure a driver's skills, knowledge and judgment. It can also identify the limitations of the trailer and vehicle while negotiating specific stations. Each driver should complete each station under ideal conditions and in a controlled environment. It should be emphasized that more is required than just the completion of each exercise. It must be supplemented by supervised/observed street and highway driving. It is strongly recommended that stations are set up one at a time. The driver should practice on each station individually. This will minimize the driving area, number of cones and personnel needed. Successful completion requires a driver to negotiate each station without striking any cones.

Emphasis on Safety

As in all training, extreme caution should be exercised to ensure there are no injuries to either the driver, support personnel or damage to equipment.

Specific safety recommendations include:

1. Safety Officer assigned.

2. Driver and support personnel briefing.

3. Safety vests for spotter, safety officer and support personnel.

4. Eating, drinking and smoking are not permitted by any vehicle occupant.

5. All personnel in the vehicle shall be seated and belted.

6. Pre-trip safety inspection completed.

7. Low speed thru each station.

8. Towing vehicle should operate with headlights on.

9. A second person should accompany the driver in the cab.

10. A spotter shall be used when backing.

11. No vehicle shall maneuver thru any station until given the signal by the safety officer.

Blind spots occur when backing a trailer and it is important for the spotter and the driver to communicate effectively. Portable radios and hand signals will play an important role in backing safely.

Skills Stations

Station 1 – Straight Line

The purpose of the straight line exercise is to familiarize the driver with operating the vehicle and trailer within close quarters both in the forward and reverse directions at a steady speed.

The exercise begins upon entering the straight line entrance. The driver travels through the exercise by hugging the left side; stopping at the end of the station and backing out of the station without brushing or knocking over any cones.

FORWARD

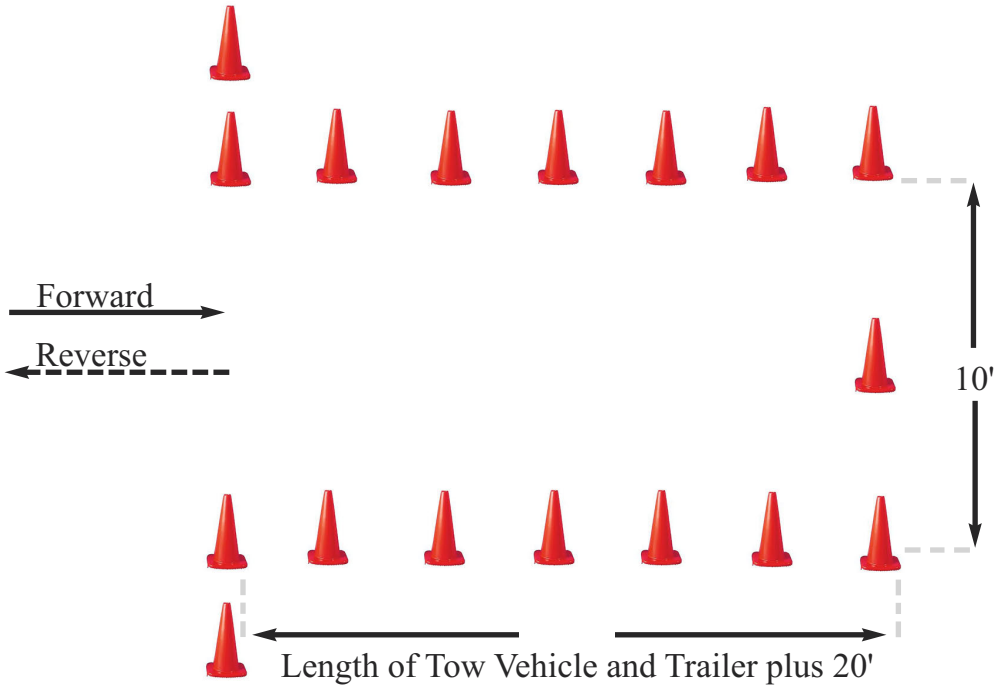
The driver will then back the unit through the straight station.

BACKWARD

Set up

The straight line station will need approximately 15 to 20 cones, minimum 24" high. The width of the station is 10' and is measured edge of cone to edge of cone. The length of the exercise is the total length of the towing vehicle and the trailer plus 20'. The entrance to the exercise should be marked with double cones or contrasting colored cones.

Station 1 – Straight Line



Station 2 – Right (Passenger Side) and Left (Driver Side) Alley Dock

The purpose of the alley dock exercise is to familiarize the driver with positioning the vehicle and trailer in a confined space and to judge depth perception and distance using the mirrors on both sides of the vehicle. Note: the right side backing attempt will be more difficult due to significantly more blind spots on both the passenger and driver's side. It is strongly recommended the driver side approach be practiced first.

The driver should approach the exercise and position the trailer past the entrance to the alley dock. He/she should see both first cones in the respective mirrors. The driver must be aware of the pivot points and push the ball as a means of negotiating this situation.

Passenger Side

When pulling out to go to the next station the driver must remember to clear the end cones with both the tow vehicle and trailer.

Alley Dock Approach

The driver should approach the alley and position the trailer past the entrance to the alley dock. He/she should see both first cones in the respective mirrors. The driver must be aware of the pivot points and push the ball as a means of negotiating this situation. The driver's side approach will have fewer blind spots; however, the entire right side will not be visible until the unit is relatively straight.

Driver's Side

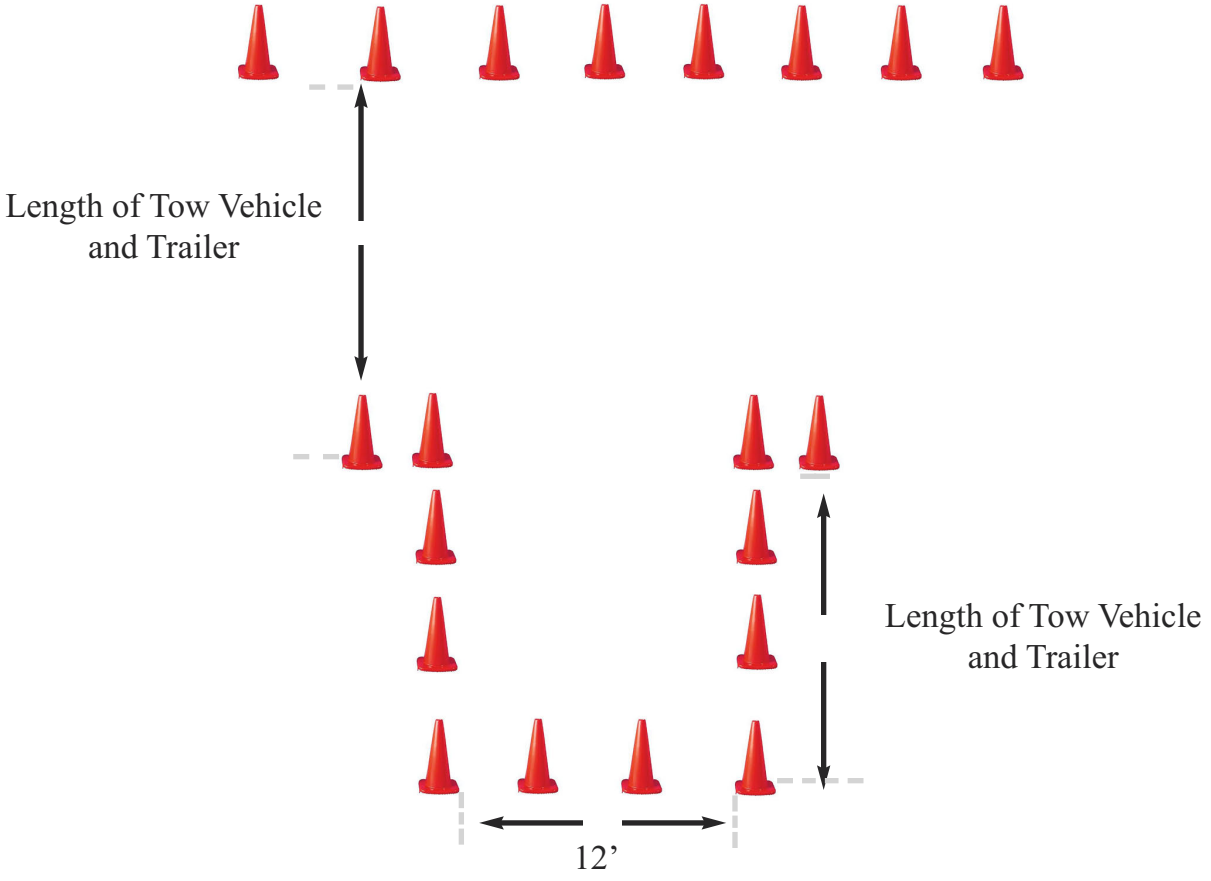
When pulling out to go to the next station the driver must remember to clear the end cones with both the tow vehicle and trailer.

Set up

The alley dock station will need approximately 25 to 30 cones, minimum 24" high. The width of the station is 12', measured edge of cone to edge of cone. The depth of the exercise is the length of the tow vehicle plus the trailer. The entrance to the exercise should be marked with double cones or contrasting colored cones.

A series of cones should be placed perpendicular to the alley dock so the driver must turn the trailer into the dock and not just simply back it in. The distance between the row and the entrance in the alley dock should be sufficient (Minimum Length of tow vehicle and trailer) to allow for the tow vehicle to maneuver the trailer into the alley and be able to pull out and make a right or left turn.

Station 2 – Right (Passenger Side) and Left (Driver Side) Alley



Station 3 – Serpentine

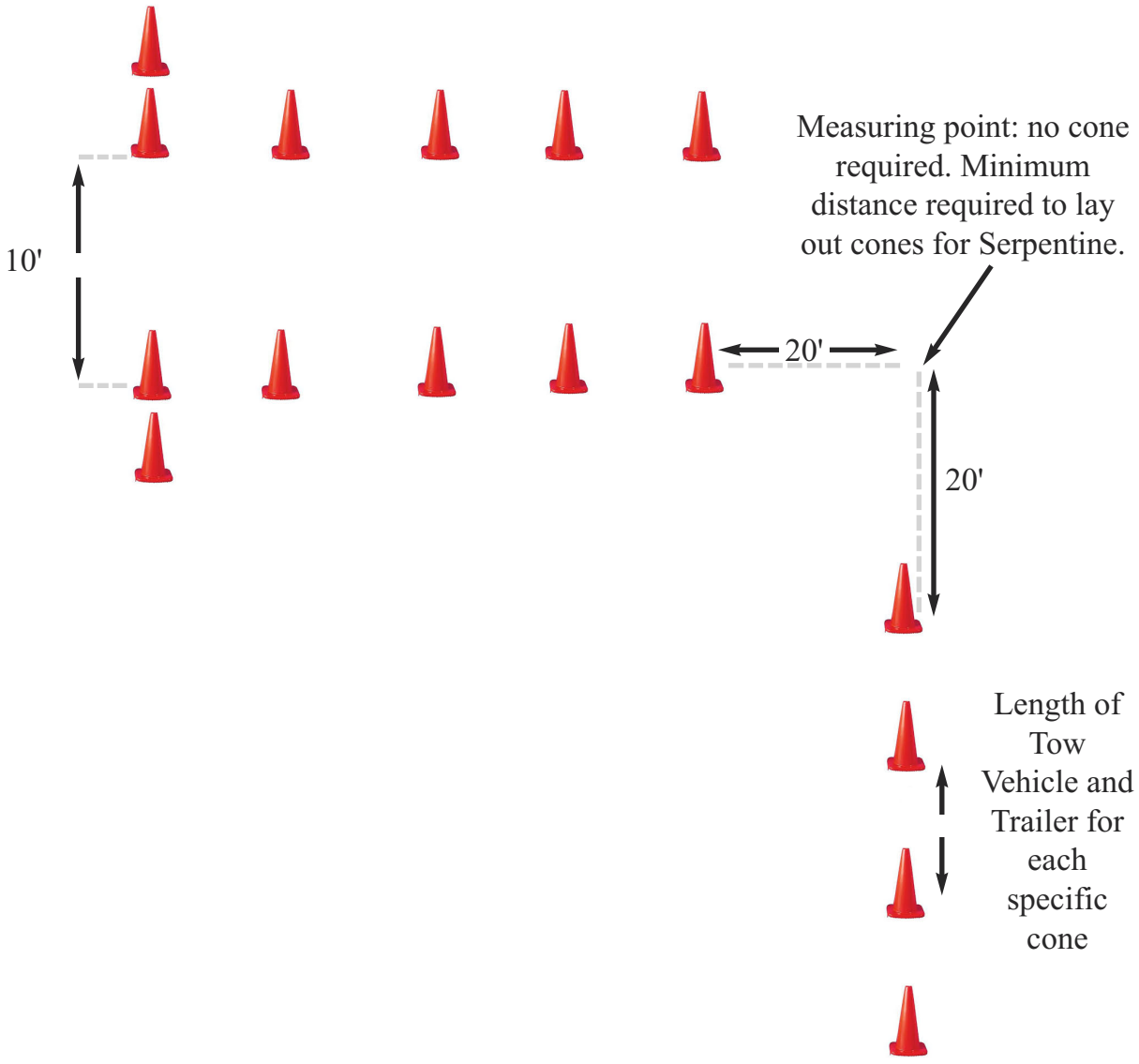
The purpose of the serpentine exercise is to familiarize the driver with the locations of the corners, turning radius and the pivot points of the towing vehicle and the trailer. The exercise will require the driver to travel in a forward direction using both mirrors during one continuous exercise.

The exercise begins upon entering the alley entrance. The driver travels through the alley and makes a right hand turn to enter the serpentine. The driver should pass to the right and left of the serpentine cones and exit the station without brushing or knocking over any cones.

Set up

The serpentine exercise will need approximately 15 to 20 cones, minimum 24" high. The width of the alley entrance is 10' measured edge of cone to edge of cone, and the length is the length of the towing vehicle and trailer. The entrance to the exercise should be marked with double cones or contrasting colored cones. The distance between the serpentine cones should be the length of the tow vehicle and the trailer measured edge of cone to edge of cone.

Station 3 – Serpentine



Station 4 – Off Set Alley

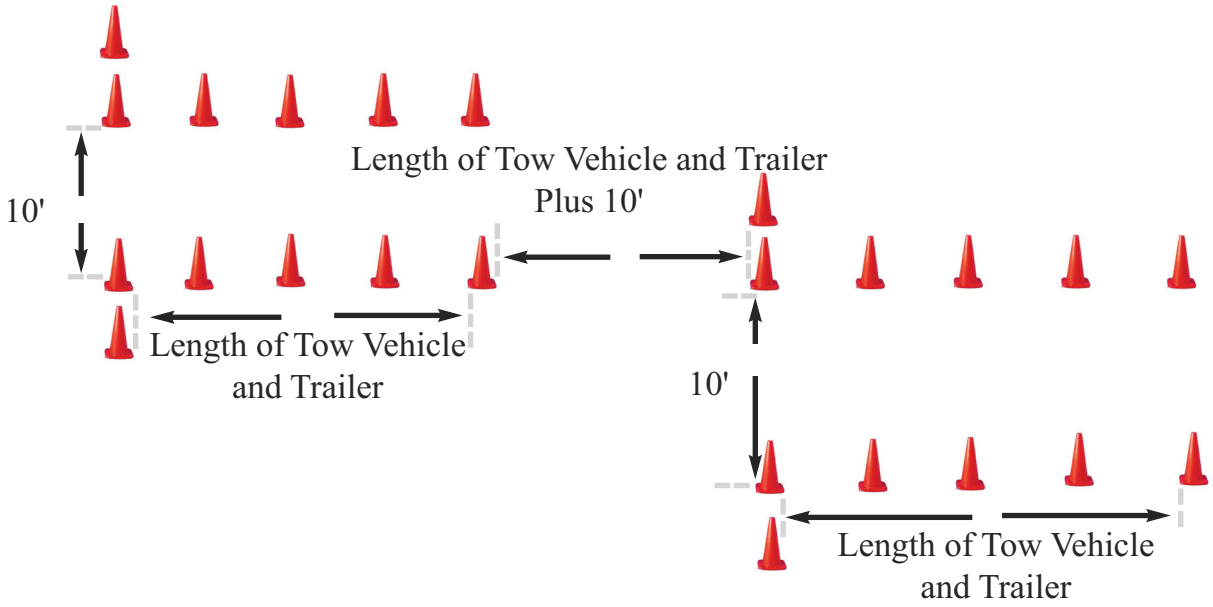
The purpose of the off set alley exercise is to familiarize the driver with the front and rear track of the towing vehicle and trailer as well as the pivot points of each.

The driver enters the first alley and exits. The driver should change the track of the towing package and enter the second alley and exit without brushing or knocking over any of the cones in the exercise.

Set up

The off set alley exercise will need approximately 20 to 25 cones, minimum 24" high. The width of each alley entrance is 10' measured edge of cone to edge of cone, and the length of each alley is the length of the towing vehicle and trailer. The entrance to the exercise should be marked with double cones or contrasting colored cones. The distance between each alley is length of the tow vehicle and the trailer plus 10' measured edge of cone to edge of cone.

Station 4 – Off Set Alley



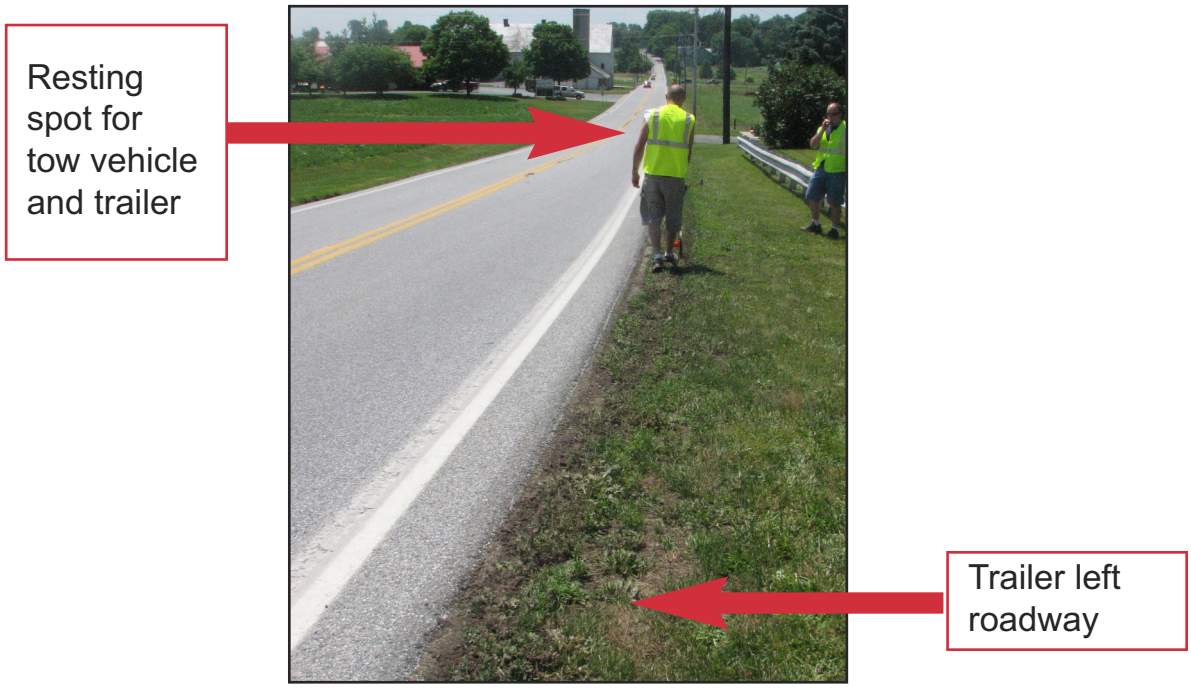
Conclusion

These stations will test the basic skills the driver needs to maneuver the trailer in many situations. Certainly, these stations do not cover all possible scenarios; however, the driver should be familiar with the use of mirrors going forward and backward and turning left and right. The driver should also be familiar with pivot points, hand signals and judging distances. Course practice and over the road driving will sharpen the necessary skills.

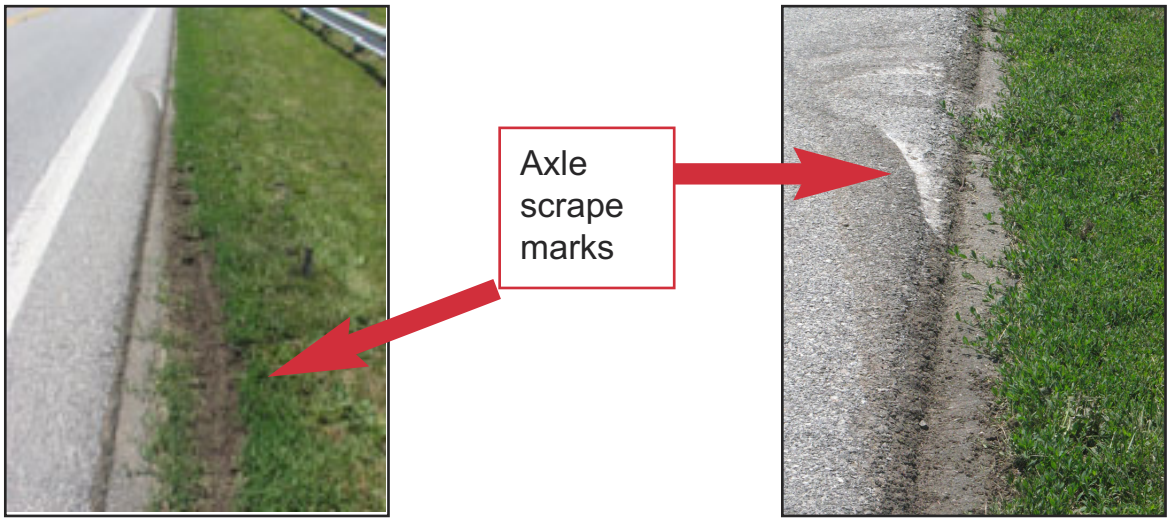
Annual education, training and skills maintenance should occur. Like any skill, driving with a trailer should be practiced and utilized frequently and important points must be reinforced.

Case Study

Driver was responding to assist neighboring department on a dwelling fire. Weather was clear, road was dry. Road speed limit was 45 mph. The driver was heading south in the proper lane on a two lane road. Double yellow line divided the travel lanes. As the driver was rounding a bend he felt a pull on his vehicle. The driver looked back to see the trailer dragging on the roadway. The driver slowed down, crossed the double yellow line onto the east bound lane and went off the roadway into an open field.



Findings: The right wheel dropped off of the roadway.



Approximately 3 inch offset.

The trailer returned to the roadway, unhooked from the tow vehicle and rolled over. The chains kept the trailer and tow vehicle together. When the trailer flipped the light mast punctured the rear cab of the tow vehicle.

Damages:

The light tower was a complete loss.

Direct Cost:

Light tower	$14,000
Squad	$ 3,500
Total	$17,500

Indirect Cost:

Also consider indirect costs, such as the time spent by the fire chief on the insurance claim and administration, time spent by the department restoring good will or providing input on property damage, time spent restoring the company's credibility in the community, stress felt by driver, need for refresher training, and other items that an incident such as this bring to the forefront.

Insight from Fire Chief:

1) The tow vehicle was bigger than the trailer, so the driver was unable to see the trailer while driving, nor could the driver see the trailer while backing. **(Consider trailer width or some means of seeing the trailer, such as a spotter)**
2) Two different insurance carriers **(Consolidate carriers if possible)**
3) Driver speed relative to call, road conditions, equipment. **(Slow down when hauling a trailer. The speed limit is set for normal vehicle operations. Towing a trailer is not a normal vehicle. The chief noted that emergency drivers may focus on the tow vehicle and forget about the trailer)**
4) Training – All drivers have EVOC. Driver training for trailers was hands on through cones. Drivers use their own experience to judge how to drive. **(Institute a trailer operation program)**
5) If trailer tips over or becomes unhooked – never slam on the tow vehicle's brakes. **(Don't panic)**
6) Light tower bounced when driving. Believes this was a sign to slow down while towing. **(Trailer should be heavier. Weight of trailer was 1,600 lbs.)**
7) All company SOPs were followed. **(Review SOPs in light of accident)**

Interpreting Hand Signals

Objectives

Successful participants will be able to:

1. Identify the hand signals used during day and night operations.
2. Demonstrate the proper hand positions for each hand signal.

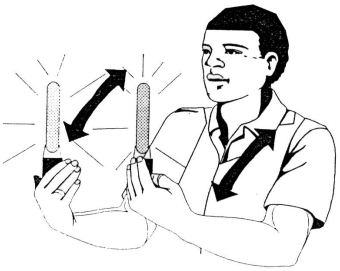
Signal One: Come Ahead

Day

Extend arms in front of body, palms facing up. Move arms toward body, bending at the elbows.

Night

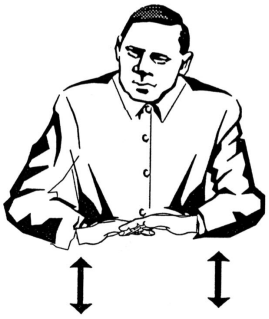
When using conventional flashlights, direct lights forward.



Signal Two: Slow Down

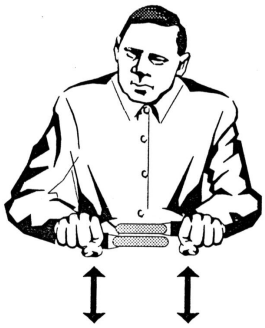
Day

Turn palms facing downward with thumbs toward body at waist level. Move hands down and up.



Night

When using conventional flashlights, direct lights forward.



Signal Three: Stop or Halt

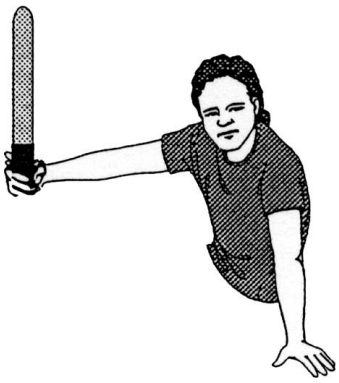
Day

Extend right arm forward with palm facing outward.

Night

Light in right hand pointed upward, blinking.

When using conventional flashlights, direct light in right hand forward, blinking.



Signal Four: Move in Reverse

Day

Extend both arms in front, palms facing forward. Move hands forward and back.

Night

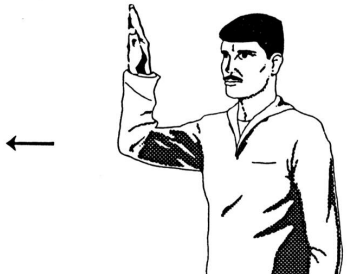
When using conventional flashlights, direct lights forward and back.

Signal Five: Turn Left

Day

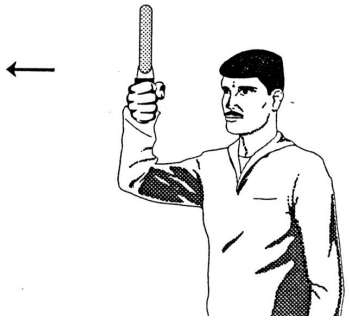
Facing the vehicle, raise right arm to side, bending at the elbow.

Face palm outward and move hand to right.



Night

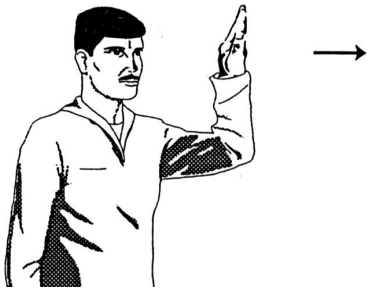
When using conventional flashlights, direct light in right hand forward.



Signal Six: Turn Right

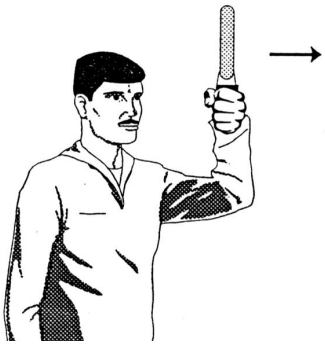
Day

Facing the vehicle, raise left hand to side bending at the elbow. Face palm outward and move hand to left.



Night

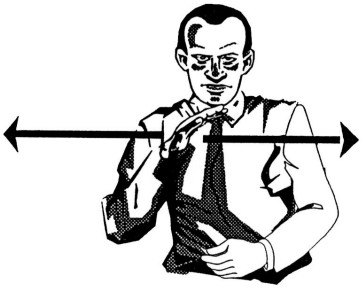
When using conventional flashlights, direct lights forward.



Signal Seven: Turn Off Engine

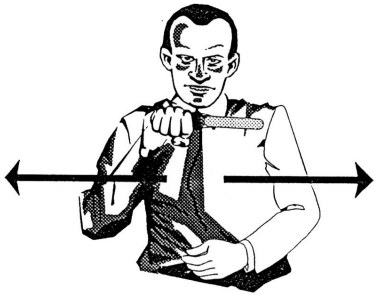
Day

Place right hand above chest level, with elbow at side, and palm facing downward. Move hand from right to left.



Night

When using conventional flashlights, direct light in right hand forward.



Signal Eight: Increase Speed

Day

Extend right arm above with a closed fist, palm forward. Move arm up and down in front of body.

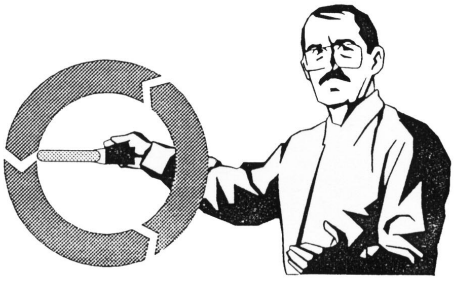
Night

When using conventional flashlights, direct light in right hand forward.

Signal Nine: Start Engines

Day
Circle right arm clockwise in front of body.

Night
When using conventional flashlights, direct light in right hand forward.



Signal Ten: As You Were

Day
Extend arms above head, cross and uncross hands at the wrists.

Night
When using conventional flashlights, direct lights forward.

Signal Eleven: Attention

Day

Extend right arm above, palm facing outward. Wave hand right and left above head.

Night

When using conventional flashlights, direct light in right hand forward.

Formulas

1) GVWR – GVW = ATW (Allowable Tongue Weight)
   Determine how much tongue weight can be added to the tow vehicle. Divide allowable tongue weight and divide again by .12 to arrive at the maximum allowable trailer weight.

2) GCWR – GVW = TGVWR (Total Gross Vehicle Weight Rating)
   Another formula for determining maximum trailer weight. Compare to the ATW arrived at by using formula one (above) and use the smaller number.

Glossary

Axle – the shaft that attaches the wheels to the trailer or tow vehicle.

Ball – the hitch ball connects the hitch to the trailer. Ball sizes and capacity vary. Common sizes include:

1 7/8" with a 3/4" or 1" shank: 2,000 lb. capacity
2" ball with 3/4" shank: 3,500 to 5,000 lb. capacity
2" ball with 1" shank: 5,000 to 6,000 lb. capacity
2" ball with 1 1/4" shank: 6,000 to 8,000 lb. capacity
2 5/16" ball with 1" shank: 6,000 lb. capacity
2 5/16" ball with 1 1/4" shank: 10,000 lb. capacity
2 5/16" ball with 1 1/4" heat treated shank: 14,000 to 30,000 lb. capacity
3" ball with 2" shank (goose neck): 30,000 lb. capacity

Ball mount – part of the hitch system that connects it to the coupler. It is slid into the receiver and secured by a lynch pin. Ball mounts can be load-carrying and weight-distributing configurations. An adjustable ball mount allows a hitch ball to be raised or lowered and tilted to match the spring bar set-up.

Base curb weight (BCW) – the weight of a vehicle with a full tank of fuel but WITHOUT passengers, cargo, luggage or equipment.

Brake controller – a control in the tow vehicle that allows the electric brakes on the trailer to become automatically or manually activated.

Breakaway switch – safety device that automatically activates the trailer brakes if the trailer becomes disconnected from the hitch.

Bumper pull – a trailer that is pulled from a ball. Also called a tag-along.

Cargo carrying capacity (CCC) – the difference between the UVW and the TGVWR.

Cargo weight – the sum weight of all cargo added to the BCW, including passengers and equipment.

Chassis – the tow vehicles main structure or frame.

Coupler – The trailer's A-frame section that attaches to the hitch ball.

Curb Weight (CW) – the weight of the tow vehicle or trailer or both together.

Deep drop – a bumper shaped like a "V" used to lower the step surface in the center and the hitch.

Dually – a tow vehicle with four tires on one rear axle.

Electrical connector – a device connecting the lights and brake system on the trailer to the light and brake controls on the tow vehicle.

Fifth-wheel trailer – a towed vehicle designed to be mounted to a special hitch that extends the bed of a truck.

Frame mount hitch – Class II and higher hitches that are bolted to the tow vehicle's frame or cross member.

Gross Axle Weight (GAW) – the total weight supported by each axle, front or back.

Gross Axle Weight Rating (GAWR) – the manufacturer's rating for the axle's maximum towing load.

Gross Combined Weight (GCW) – the actual weight of a vehicle and trailer combined. Both vehicles are weighed together.

Gross Combined Weight Rating (GCWR) – the maximum allowable weight of a tow vehicle and trailer together.

Gross Trailer Weight (GTW) – the weight of the trailer fully loaded.

Gross Vehicle Weight (GVW) – the curb weight added to the cargo weight

Gross Vehicle Weight Rating (GVWR) – the maximum allowable weight of a vehicle including passengers, fuel, cargo and hitch. Can be found on the inside frame of the driver's door, in the engine compartment or in the owner's manual. For trailers the label may be located toward the front of the trailer.

Hitch capacity – the maximum load the hitch is capable of carrying. This must be matched to the tow vehicle capacity.

Hitch ratings – Five classes of hitch ratings are discussed in this program.

Class 1 – 1,000 to 2,500 GTW
Class 2 – 3,500 to 4,000 GTW
Class 3 – 5,000 to 7,500 GTW
Class 4 – 10,000 GTW
Class 5 – greater than 10,000 GTW

Hitch weight – the weight on the hitch when the trailer is coupled. Also referred to as tongue weight. This should not exceed 10 to 15% of overall weight.

Jack-knife – when the trailer is at a sharp angle to the tow vehicle.

King pin – anchor pin at the center of a semi's trailer upper coupler; this is captured by the jaws of the tow vehicle's fifth wheel.

Lift axle – an additional unpowered axle used when the vehicle is loaded for weighing purposes.

Payload – the maximum allowable weight of cargo, passengers and trailers that a vehicle is designed to carry.

Receiver – that portion of a hitch that accepts the ball mount or shank.

Retarder – an auxiliary braking device.

Safety Chains – chains permanently mounted to the trailer's frame with a set of hooks either attached to a specific place on the hitch or to the tow vehicle's subframe. The chains should cross under the tongue of the trailer and will catch the tongue and keep it off the road if accidentally separated.

Shank – the removable part of the hitch that holds the ball or adjustable ball mount and slides into the receiver, also known as a hitch bar or stinger.

Spring bar – part of the weight distribution hitch setup. The spring bar is installed and tensioned to distribute some of the trailer's hitch weight to the front axle of the tow vehicle and the trailer.

Sway bar – a device used to limit the swaying or fishtailing of a trailer by friction or a cam action.

Tongue weight – the amount of the trailer's weight that is transferred to the tow vehicle through the tongue, gooseneck or fifth wheel. Also referred to as the "hitch weight."

Tow rating – the manufacturer's rating of the weight limit that can safely be towed by a vehicle. Ratings are determined by weight not size. Ratings are determined by the vehicle manufacturer according to engine size, transmission, axle ratio, brakes, chassis, cooling system and special equipment.

Trailer brakes – devices that are activated either electrically or by a surge mechanism. Electric brakes are activated when the tow vehicle's brakes are operated or when a brake controller is used. Surge brakes use a mechanism positioned near the coupler that "feels" when the tow vehicle is slowing or stopping and activates the trailer brakes using hydraulics.

Trailer Gross Vehicle Weight Rating (TGVWR) – used to distinguish between trailer GVWR.

Umbilical cord – electrical wiring harness attaching the tow vehicle to the trailer.

Unloaded Vehicle Weight (UVW) – the "dry" weight of the vehicle not including dealer or options, and before fuel and supplies are added.

Weight carrying hitch – a hitch that accepts the entire hitch weight of the trailer (also called "dead weight hitch").

Weight distributing hitch – an equalizing setup that uses spring bars under tension to reapportion the trailer's hitch weight to the tow vehicle's front axle and the trailer's axles. Also known as an Equilizer.

Weight distribution (WD) – a weight distribution hitch used to even the weight of the cargo between the front and rear wheels of the trailer.

Yaw – the fishtailing action caused by external forces that causes the trailer to move side to side. The trailer's wheels serve as the pivot point.

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Notes

EDUCATION | TRAINING | CONSULTING

Trailers are often used when emergency service organizations need additional equipment during a response. However, many departments lack the expertise or training to hook up and move a trailer. This program was developed to teach the emergency vehicle operator the proper techiques and procedures for towing a trailer.

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