

*2014 Utah Tow Truck Driver's
Safety Certification Program*

Study Guide



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NOTE TO THE READER

THE WRITTEN TEST FOR A TOW TRUCK DRIVER CERTIFICATION CONTAINS QUESTIONS FROM **ALL** PARTS OF THIS BOOKLET AS WELL AS THE VIDEO PORTION YOU WILL WATCH UPON REGISTERING. BE SURE TO READ AND STUDY THE **ENTIRE** BOOKLET **BEFORE** YOU REGISTER AND SUBMIT PAYMENT. ONCE YOU BEGIN THE ONLINE CERTIFICATION PROCESS **YOU MUST COMPLETE THE PROGRAM DURING THAT SESSION**. YOU SHOULD ALSO BE FAMILIAR WITH THE UTAH STATE VEHICLE AND TRAFFIC LAWS, AND WITH FEDERAL AND STATE SAFETY REGULATIONS.

This Tow Truck Driver Safety Certification program was developed by the Utah Safety Council with support and feedback from; Utah State Department of Transportation and Motor Carrier Division, Utah Towing and Recovery Association, Utah Highway Patrol, as well as a focus group of several Utah towing & recovery business owners. We would like to say thank you for the feedback during the development process and for supporting the Utah Safety Council.

CHAPTER 1 - INTRODUCTION

In this study guide you will learn the basics of light duty towing including some of the most important laws and regulations regarding the towing industry. After reading this study guide you will take an online test at www.utahsafetycouncil.org. In order to pass you will need a score of 75% or better. Upon completion of this program you will be issued a tow truck driver certification card from the Utah Safety Council. This card will expire every two years.

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CHAPTER 2 - TYPES OF TOW TRUCKS

This chapter describes tow trucks (including car carriers) by weight and body type.

Terms explained in this chapter: light-duty, medium-duty, heavy-duty tow trucks; car carrier.

A. TOW TRUCKS

Tow trucks are generally classified by weight (light-duty, medium-duty or heavy-duty) and by body type (tow-only or car carrier). Characteristics by weight are as follows:

1. Light-Duty: Light-duty tow trucks have a GVWR of 8,600 to 10,000 pounds. They are designed to tow or transport automobiles, pickup trucks and small vans.

2. Medium-Duty: Medium-duty tow trucks have a GVWR of 10,001 to 26,000 pounds. They can tow or transport medium-size trucks, buses and recreational vehicles, as well as smaller vehicles.

3. Heavy-Duty: Heavy-duty tow trucks have a GVWR of over 26,000 pounds. They are designed to tow or transport large buses, trucks, trailers and heavy construction equipment.

B. CAR CARRIERS

Car carriers are designed to transport one to three motor vehicles on a flat platform that slides or tilts to the ground to facilitate the loading and unloading of the vehicle(s). In addition, they are generally equipped with a wheel-lift or under-lift that enables them to tow an additional vehicle behind them. Car carriers are sometimes referred to as slidebacks, rollbacks, equipment transporters, or flatbeds. Car carriers are up to 40 feet in length, bumper to bumper, including bed load. They generally transport (and tow) automobiles, pickup trucks and small vans, although large car carriers (often referred to as equipment transporters) transport large vehicles, farm machinery and construction equipment. Car carriers

are also often used to transport vehicles that would be damaged by conventional towing techniques, or vehicles with severe wheel damage.



Note: This image depicts a typical car carrier.

CHAPTER 3 - TOW TRUCK AND EQUIPMENT LIMITATIONS

The purpose of this manual is to explain how to perform proper towing procedures, and to help ensure your safety when you tow. This chapter will define various ratings that are used to determine safe towing capacity for tow trucks and working load limits for equipment that is generally used in towing operations.

Terms explained in this chapter: gross vehicle weight rating (GVWR); gross axle weight rating (GAWR); curb weight; overhang (OH); safe towing capacity (STC); front axle weight (FAW); wheelbase (WB); breaking strength rating; and working load limit (WLL).

The most common cause of accidents that lead to death of and injury to tow truck operators is equipment failure. In the vast majority of cases, these accidents are caused by exceeding working load limits for the equipment. Pay special attention to the manufacturer's equipment ratings, which indicate the limits for its use. When you exceed the rating posted on your equipment, you, not the manufacturer, will be at fault if the equipment fails. Exceeding equipment ratings can also put you and others at risk of injury or death. You should never exceed the working load limit set by the manufacturer. **Even a one-time overload can cause undetected damage, weakening the equipment significantly, and causing equipment failure that can result in injury or death.**

Your ability to tow properly and safely is limited by the weakest component on your tow truck. For example, if a tow truck that is rated for 16 tons operates with L-arms that are rated for only 2 tons, the L-arm is a weak link. NEVER EXCEED THE RATING OF THE WEAKEST LINK. The rest of this chapter describes how tow trucks and their equipment are generally rated.

A. TOW TRUCK RATINGS

The most widely recognized rating for tow trucks (or any other type of truck) is the manufacturer's **gross vehicle weight rating (GVWR)**. This rating consists of the unladen (unloaded or "**curb**") weight of a vehicle, plus the maximum carrying capacity recommended by the vehicle's manufacturer. The axles on a truck are also rated. A truck's **gross axle weight rating (GAWR)** is the amount of weight that a single axle, or a combination of axles, is designed to carry. The total GAWR for all axles equals the truck's GVWR (see Diagram 1 below). For example, a tow truck might have a GVWR of 27,500 pounds, with the front axle(s) rated at 9,000 pounds, and the rear axle(s) rated at 18,500 pounds. But to use this information to gauge the load you can tow, you also need to know the unloaded weight of the truck (sometimes referred to as the "**curb weight**"). Suppose that the truck in the example above has a curb weight of approximately 17,000 pounds, with 7,000 pounds on the front axle(s) and 10,000 pounds on the rear axle(s). This means that the rear axle(s) should be able to lift a weight of 8,500 pounds (18,500 pounds GAWR, less 10,000 pounds unloaded, or curb, weight), as long as this weight will not exceed the safe towing capacity (see Diagram 1 below).



DIAGRAM 1

Example of tow truck chassis loads that operators should keep within ratings

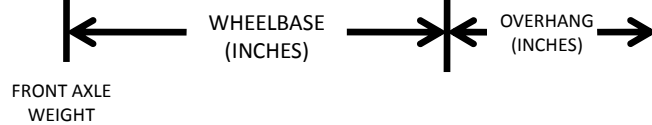
In actuality, the safe towing capacity (STC - see Diagram 2 below) of a tow truck is considerably less than its GAWR. So you must not only stay within the rating, but you must also stay within the safe towing capacity for your truck. Manufacturers' ratings assume that the weight, or load, is being placed directly over the rear axle(s). With a tow truck, the weight (that is, the vehicle being lifted) is actually being placed at various distances behind the rear axle(s). As this distance (called "**overhang**") increases, the safe towing capacity of the tow truck decreases. **Overhang** is measured from the center of the lift point to the center of the rear axle(s) of the tow truck. This is because a tow truck acts like a see-saw. As a load becomes heavier, or moves further away from the rear axle(s), it tends to lift the front axle off the

ground. When the amount of weight on the front axle decreases by fifty percent, it is no longer safe to tow. This is because steering and braking are adversely affected by this front axle weight loss.

Therefore, the **safe towing capacity (STC)** may be defined as the amount of weight or load that does not cause more than a 50% loss of the original unloaded front axle weight (FAW). A mathematical formula has been devised for the purpose of calculating this maximum weight or load. To use this formula, you must know your truck's **front axle weight [FAW** - the curb weight of the front axle], its **wheelbase [WB** - the distance from the centerline of the front axle to the centerline of the rear axle(s)] and its overhang (OH - as defined above). The formula is as follows [Note: The “x” means “multiplied by”, and the “/” means “divided by”.]:

$$(FAW \times WB / OH) / 2 = STC$$

Using this formula, and assuming a wheelbase of 200 inches and an overhang of 89 inches, the safe towing capacity (STC) of the 27,500 pound GVWR truck discussed earlier, with a curb front axle weight of 7,000 pounds, is only 7,865 pounds $[(7,000 \times 200/89)/2]$. If its overhang were increased to 125 inches, its STC would be reduced to 5,600 pounds $[(7,000 \times 200/125)/2]$. If its wheelbase were decreased to 165 inches, its STC would be reduced to 6,488 pounds $[(7,000 \times 165/89)/2]$. Safe towing capacity is affected by changing any of the factors used in this formula. You must fully understand this concept, particularly if you intend to operate a tow truck with a wheel-lift or under-lift.



$$(\text{FRONT AXLE WEIGHT} \times \text{WHEELBASE} \div \text{OVERHANG}) \div 2 = \text{SAFE TOWING CAPACITY}$$

B. TIRE CAPACITY

Manufacturers consider tire capacity in determining gross vehicle weight ratings (GVWR). For this reason, you should never use tires that do not meet manufacturer's specifications, and you should always keep your tires properly inflated. Be sure to check tire pressure when the tires are cold. A discrepancy of five to ten pounds of pressure can affect the carrying capacity of a tow truck, particularly when using a wheel-lift or under-lift. Tire capacity becomes increasingly important when operating near the design capacity of your tow truck. This is particularly true with single axle tow trucks that are used in heavy-duty towing operations.

C. EQUIPMENT CAPACITIES

The equipment on a tow truck (that is, winches, cable, chain and snatch blocks) is also rated. Generally speaking, equipment carries two ratings: a breaking strength rating and a working load limit.

The **breaking strength rating** is established by the manufacturer as the maximum weight or load that new, unused equipment can bear, under ideal laboratory conditions, without being damaged. The **working load limit (WLL)** is the maximum weight or load that equipment (allowing for reasonable wear and tear) can bear under normal operating conditions. In all cases, the working load limit is considerably lower than the breaking strength rating. For example, most chains, cables and snatch blocks have working load limits of either 3 to 1 or 4 to 1. This means that the working load limit is either one-third or one-quarter of the breaking strength rating. Therefore, a chain with a 3 to 1 rating and a breaking strength rating of 18,000 pounds can be used to lift a load of 6,000 pounds. It is important to realize that these are only approximate ratings. You should always follow the exact ratings that manufacturers provide with their products.

The Society of Automotive Engineers (SAE) rating for winches applies to a bare drum with its first layer of cable. As the diameter of the drum increases from additional layers of cable, the rating decreases, meaning that the more layers of cable on the drum, the less weight the winch can lift.

Booms that extend and retract have a rating that applies to each circumstance. A retracted rating will be higher than an extended rating. Towing devices usually show a lift rating and a tow rating. Do not lift or tow a vehicle that exceeds these ratings. Like booms, wheel-lifts and under-lifts may also have retracted and extended ratings.

Care should be taken in selecting attachments (that is, hooks, repair links or rings) for the chain or cable.

The attachments must have a working load limit that meets or exceeds the chain's or cable's working load limit. The attachments must also be marked for the same size as the chain or cable.

You should never exceed the working load limit set by the manufacturer. Even a one-time overload of tow truck equipment can cause undetected damage that weakens the equipment significantly, causing subsequent equipment failure that can result in injury or death. Damaged rigging equipment should NEVER be used.

Exceeding working load limits can cause a chain, cable, block or strap to break and recoil with damaging force. A hook pulled loose can be even deadlier because it will fly along with its accessory. To avoid a flying hook, make sure that its point is facing upward. In this position, it will fly toward the ground if it slips or pulls loose. Anticipate the path that the hook might take if it were to come loose, and keep yourself and others out of this path.

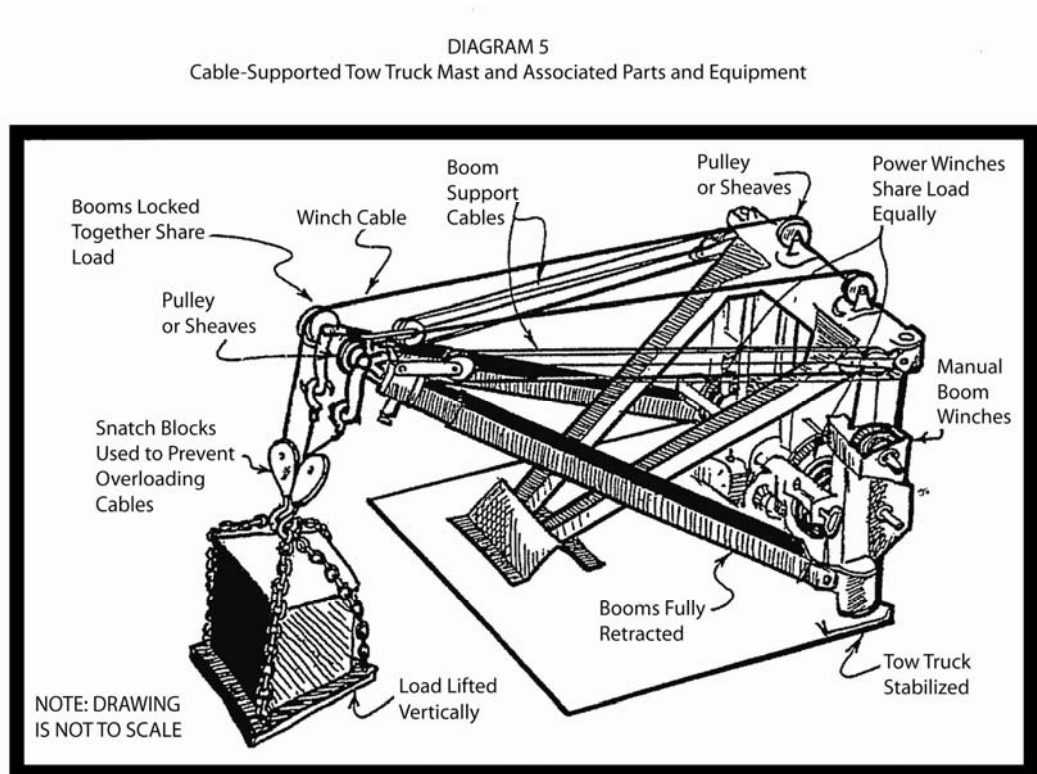
USE THE PROPER EQUIPMENT.

DON'T TAKE SHORTCUTS.

TAKE YOUR TIME and BE SAFE.

CHAPTER 4 - TOW TRUCK PARTS AND EQUIPMENT

This chapter describes many of the working parts of a tow truck and the equipment that may be found on tow trucks (see Diagram 5 below).



Terms explained in this chapter: boom; mast; winch; auxiliary winch; drag winch; power takeoff (PTO); cable; wrap; swage; thimble; wedge socket; sheaves; snatch block; chain grade or strength rating; tow sling; truck hitch; tow hitch; wheel-lift; under-lift; securing devices; dolly; hazard light(s); auxiliary tow lights; drag lights; work lights.

A. BOOMS

A **boom** is a structural member of a tow truck that extends from a **mast** (the structure that houses the boom and winches) to support the load and to hold, extend or lift a load free of the ground and clear of the tow truck body. Generally, tow trucks have either one or two booms, which may be operated either mechanically or hydraulically. Mechanical booms are raised and lowered with the aid of a manual winch. A manual winch must be operated **ONLY** when there is **NO** load on the boom. A hydraulic boom, on the other hand, can usually be raised, lowered, extended or retracted, while it is loaded, to increase or decrease winch cable elevation.

B. WINCHES

A **winch** is a device for winding and unwinding cable that is used to pull, hoist, raise or lower the load or sling free of the ground. The cable is wound, or wrapped, on a drum. To help prevent the cable from pulling loose from the winch drum and dropping the load, always maintain a minimum of three to five wraps of cable on the drum, or the number of wraps the winch manufacturer recommends. The winch cable is normally routed over the end of the boom and then down to a sling or tow bar. Some tow trucks have **auxiliary winches** called **drag winches**.

The cable on drag winches goes directly to the load, and not over the end of the boom. The power to most hydraulic and mechanical winches is provided by the **power takeoff (PTO)**, which is a device that transmits engine power to auxiliary equipment. The controls for the PTO are located in the cab of the truck.

CAUTION: Traveling with the PTO engaged will cause PTO and/or truck transmission damage. The suggested normal range it should be operated in 1000-1200 RPM's.

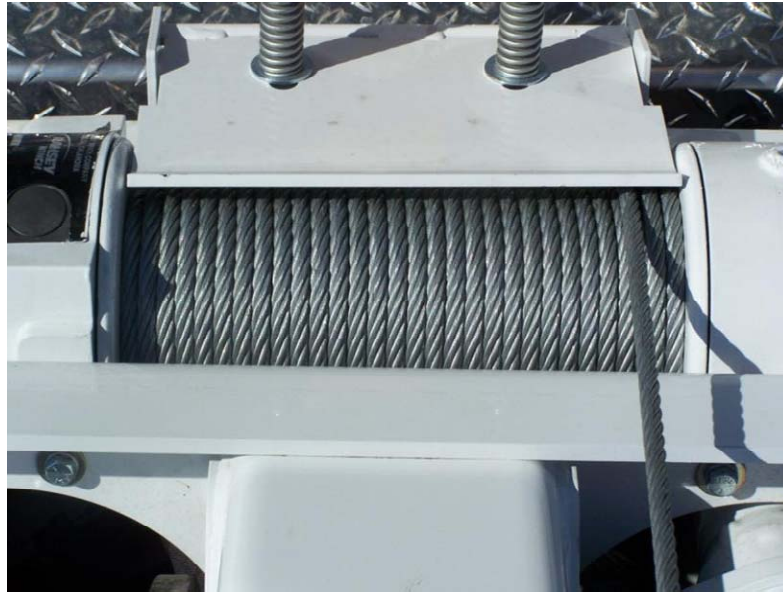
C. CABLE (STEEL WIRE ROPE)

Cable is steel wire rope used for pulling or supporting a load. Care must be taken to wind cable tightly and evenly, because loose or uneven cable can become crushed, bent or kinked. Also, if the cable is not wound tightly and evenly, when a heavy load is lifted, the cable can become buried and wedged among other wraps of cable on the drum. Not only does this cause extensive damage to the cable, but it can cause a load to slip and can possibly dislodge the vehicle being towed. It is NEVER ok to use damaged wire ropes.

Cable Working Load Limits	
Wire Rope (6 x 37, Fiber Core)	
Diameter mm (inches)	WLL kg (pounds)
7 (1/4)	640 (1,400)
8 (5/16)	950 (2,100)
10 (3/8)	1,360 (3,000)
11 (7/16)	1,860 (4,100)
13 (1/2)	2,400 (5,300)
16 (5/8)	3,770 (8,300)
20 (3/4)	4,940 (10,900)
22 (7/8)	7,300 (16,100)
25 (1)	9,480 (20,900)
The table below shows cable diameter and its respective working load limits.	

If the cable completely unwinds from a winch, the cable may pull loose from the drum and drop the load. To help prevent this from happening, always maintain a minimum of three to five **wraps** of cable on the drum (see Diagram 6 below), or the number of wraps the winch manufacturer recommends. One **wrap** is a single coil of wire rope/cable wound on a drum.

DIAGRAM 6



Keep at least three to five wraps on your winch

1. Cable Terminations: Cable is no stronger than its end attachments, or terminations. The termination recommended for towing is a **swage** end, in which the cable ends are braided and a sleeve is placed over the end of the cable and pressed together by a special hydraulic press. A swage end provides 90% to 100% of cable strength.

Although less desirable, it is sometimes necessary to terminate cable by using cable clamps, clips and/or U-bolts. These should only be used as a temporary repair. **Manufacturer specifications must be consulted** before making repairs to terminations so that the terminations provide at least

75% of cable strength. Always install a **thimble** (a shield to protect the cable at the hook assembly) in the loop end of the cable.

A **wedge socket** is a device that cable is threaded through to form a loop. The wedge socket is held in place by pressure that is applied to the wedge by the weight of the load being lifted. A sudden loss of pressure (caused by going over a bump, for example) can drive the wedge loose and cause the load to fall. For this reason, a wedge socket should NEVER be used to terminate a cable that is to be used for towing.

2. Cable Wear and Damage: Cable may be damaged by overloading, by continued variations of stress or vibration, by being bent around sharp corners, or by being drawn across **sheaves** (pulleys) that are too small. Types of cable damage are: wear, fatigue (subjected to stress), tensile (stretched or drawn out), and shear (cut or clipped). You should continually inspect cable for wear and for frayed, distorted or crushed wires. Pay particular attention to pickup points (that is, points that are in contact with drums and sheaves when the initial load of a lift is applied) and end attachments. Questionable cable should be discarded.

D. SNATCH BLOCKS

A **snatch block** is a single or multiple pulley system that is used to reduce line tension or change cable direction. A single winch cable can be rigged with a single snatch block to create a two-part line. Each part of the line supports an equal share of the load and effectively reduces, by one-half, the tension to each part of the line. If the snatch block is moving with the load, it is reducing tension; if it is not moving, it is changing the direction of the pull.

E. CHAINS

Chains are used for tie-downs, and to lift, support and pull loads. A wide variety of chains is available, but not all are recommended for towing. Always inspect chains before using them to make sure that they are not twisted, knotted, distorted or damaged.

The National Association of Chain Manufacturers has adopted a system for identifying chain. Chain that is manufactured by these standards bears a letter (which identifies the manufacturer) and a number (which represents the **chain's grade or strength rating**). You should never use chain that cannot be identified by its grade.

The four most common types of chain are:

- 1. Proof Coil (identified as "3" or "30"), which is not heat treated** and is an extremely low grade of chain. It is dangerous when used for pulling or lifting, and is not recommended for use in towing.
- 2. High Test (identified as "4" or "43"), which is not heat treated.** It should not be used for recovery work.
- 3. Transport (identified as "7" or "70"), which is a high-quality, heat-treated chain.** It is widely used in the towing industry, but it is not approved for overhead lifting.
- 4. Alloy (identified as "8" or "80"), which is a heat-treated chain that is stronger than Transport,** but is very expensive. It is the only chain recommended by OSHA, the Occupational Safety and Health Administration, for overhead lifting.

Please refer to the table below for the dimensions and working load limits of these four grades of chain.

DEPARTMENT OF TRANSPORTATION

FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION

Tables to §393.108 [Working load limits (WLL), chain]					
Size mm (inches)	WLL in kg (pounds)				
	Grade 30 proof coil	Grade 43 high test	Grade 70 transport	Grade 80 alloy	Grade 100 alloy
1. 17 (¹ / ₄)	580 (1,300)	1,180 (2,600)	1,430 (3,150)	1,570 (3,500)	1,950 (4,300)
2. 8 (⁵ / ₁₆)	860 (1,900)	1,770 (3,900)	2,130 (4,700)	2,000 (4,500)	2,600 (5,700)
3. 10 (³ / ₈)	1,200 (2,650)	2,450 (5,400)	2,990 (6,600)	3,200 (7,100)	4,000 (8,800)
4. 11 (⁷ / ₁₆)	1,680 (3,700)	3,270 (7,200)	3,970 (8,750)		
5. 13 (¹ / ₂)	2,030 (4,500)	4,170 (9,200)	5,130 (11,300)	5,400 (12,000)	6,800 (15,000)
6. 16 (⁵ / ₈)	3,130 (6,900)	5,910 (13,000)	7,170 (15,800)	8,200 (18,100)	10,300 (22,600)
Chain Mark Examples					
Example 1	3	4	7	8	10
Example 2	30	43	70	80	100
Example 3	300	430	700	800	1000

F. TOWING DEVICES

Towing devices are used to attach motor vehicles to tow trucks. Examples of these devices are tow slings, truck hitches, wheel-lifts and under-lifts.

1. Tow slings are devices used for lifting and towing vehicles, with part of the load supported on rubber belts. They may lift and tow automobiles, light trucks or small vans, and are generally used only for transporting damaged vehicles. Tow slings are usually rated for a lifting capacity of 3,500 pounds, and a towing capacity of 7,000 pounds. Always consult the manufacturer's rating. The rating is for a maximum load and should NEVER be exceeded. Overloading can cause a tow sling to fail unexpectedly, resulting in an accident. Even a one-time overload may cause undetected damage that significantly weakens the equipment, and causes equipment failure. Equipment failure may cause injury or death to you or others.

2. Truck hitches are devices used to position and support one end of a towed vehicle behind the tow truck. They are used in medium- and heavy-duty towing to tow buses, motor homes, medium and large trucks, large box vans or off-highway equipment. **Tow hitches** perform the same function as truck hitches, but are used for towing lighter loads.

3. Wheel-lifts are devices used for towing vehicles by lifting one end of the towed vehicle by the wheels. Because they position the load further back than tow slings do, they help eliminate the risk of damage to modern vehicles that use plastics, air foils and other aerodynamic styling features. However, a wheel-lift can cause damage if it is allowed to contact any part of the disabled vehicle other than the tires or wheels. Wheel-lifts can be grouped into four basic designs: Grid, Add-On Scoop, Claw (Auto Load) or L-Bar (Wheel Retainer). Most light-duty wheel-lifts are designed to tow light cars, trucks or vans. Consult the manufacturer's rating. The rating is for a maximum load, and should NEVER be exceeded.

4. Under-lifts are devices used for towing vehicles by lifting (with forks) one end of the towed vehicle from under the axle or structural member. They are generally used on medium-duty and heavy-duty tow trucks. Consult the manufacturer's rating, and NEVER exceed the rating.

- Most wheel-lifts and under-lifts are hydraulically powered. Hydraulic power can be used to raise, lower, extend or retract the boom or inner boom. Each movement is usually controlled independently. Some have a tilt control, but others do not.
- Wheel straps and auxiliary **securing devices** help prevent the separation of the disabled vehicle from the wheel-lift or under-lift. Two wheel-securing devices are necessary, one for each side or wheel. These are primary securing systems and are subject to stress during routine tows. In addition to the securing devices, at least two safety chains must be attached from the disabled vehicle to the tow truck. This is required by law.

G. DOLLIES

Dollies are four-wheeled carriages used, in towing, to support the trailing end of the towed vehicle.

Dollies are sometimes used to load and transport a vehicle with damaged tires, or vehicles that cannot be lifted by their drive wheels. Remember that, under Utah State law, a vehicle must be securely fastened to a dolly to ensure that it does not become dislodged in transit.

Two-wheeled dollies are sometimes used to lift the drive wheels of a vehicle that is being towed. They are commonly used with recreational vehicles, but are gaining popularity in the commercial towing industry. This type of dolly may properly be classified as a towing device. Dolly capacity is governed by the tire manufacturer's specifications. Be sure to check that tires are inflated to the proper pressure, and are free from dry rot.

H. TOW TRUCK LIGHTS

A tow truck should be equipped with the following types of lights:

1. Hazard light(s): A tow truck is defined as a "hazard vehicle" under the Vehicle and Traffic Law. As such, it must be equipped with hazard light(s), which are defined as, "one or more flashing, rotating, revolving or oscillating amber lights visible to all approaching traffic for a distance of five hundred feet".

These light(s) are to be displayed only when a tow truck or car carrier is engaged in a "hazardous operation", which is defined as "the operation, or parking, of a vehicle on or immediately adjacent to a public highway while such vehicle is actually engaged in an operation which would restrict, impede or interfere with the normal flow of traffic". With two exceptions, hazard light(s) should **NEVER** be displayed while a tow truck is underway. These exceptions are: (1) when a vehicle can only be towed at speeds that impede the normal flow of traffic, and (2) when a towed (or carried) vehicle protrudes into other lanes of traffic.

2. Auxiliary tow lights: Tow trucks must also be equipped with auxiliary tow lights (sometimes referred to as "**drag lights**"), which are attached to the trailing end of the vehicle that is being towed, and are operated as part of the towing vehicle's lighting system. Auxiliary tow lights must display all of the lights (that is, taillights, brake lights and directional signals) that would be displayed if the towed vehicle were traveling under its own power. Failure to attach these lights to a towed vehicle is a violation of the Utah State and federal law.

3. Work lights: Lastly, tow trucks should also be equipped with work lights that may be used to illuminate the scene of an accident or disablement. Extreme care should be exercised to shield these lights from oncoming traffic, because they can blind passing motorists. For this reason, the

headlights on a tow truck should also be turned off after dark while preparing a disabled vehicle for towing. Recent studies have demonstrated that "less is better" when illuminating an accident scene, because too much lighting can confuse, distract and temporarily blind motorists who approach or pass through the scene.

USE THE PROPER EQUIPMENT.

DON'T TAKE SHORTCUTS.

TAKE YOUR TIME and BE SAFE.

CHAPTER 5 - LIGHT-DUTY SAFE TOWING PRACTICES

This chapter will recommend procedures for hooking up and towing a disabled light-duty vehicle.

Terms explained in this chapter: wheel chock; L-arm/wheel arm; wheel straps; wheel securing devices; T-hook; grab hook; J-hook; safety wrap; air dam; fascia; spoiler; spacer block.

A. BEFORE YOU TOW

Approach as follows:

When you are within 500 feet of the disabled vehicle, turn on your hazard light(s) and flashers, and begin to reduce speed. Pull over in front of the disabled vehicle, onto the shoulder, if possible. If the vehicle is in a traffic lane instead of on the shoulder of the road, you may need to contact police to assist with traffic. Always have the number handy so that you can contact police quickly to assist with any unsafe situation.

First and foremost, **be safe and be seen**. For your own safety at the scene, it is recommended that you wear your personal protective equipment and reflective clothing so that you do not become a casualty while preparing to tow.

Determine vehicle type, assess damage, and decide on equipment:

Upon arriving at the scene, decide what type of equipment is necessary to safely tow the disabled vehicle (wheel lift, tow sling or car carrier). Also, note any damage to the disabled vehicle on the invoice. The previous chapter described limitations that are placed on tow trucks and on equipment that is used in commercial towing operations. The disabled vehicles you tow also have limitations. Some vehicles can suffer serious damage if they are towed by tow slings. Others cannot be towed by any type of tow truck; they must be transported by car carrier. In most circumstances, unless safety considerations dictate

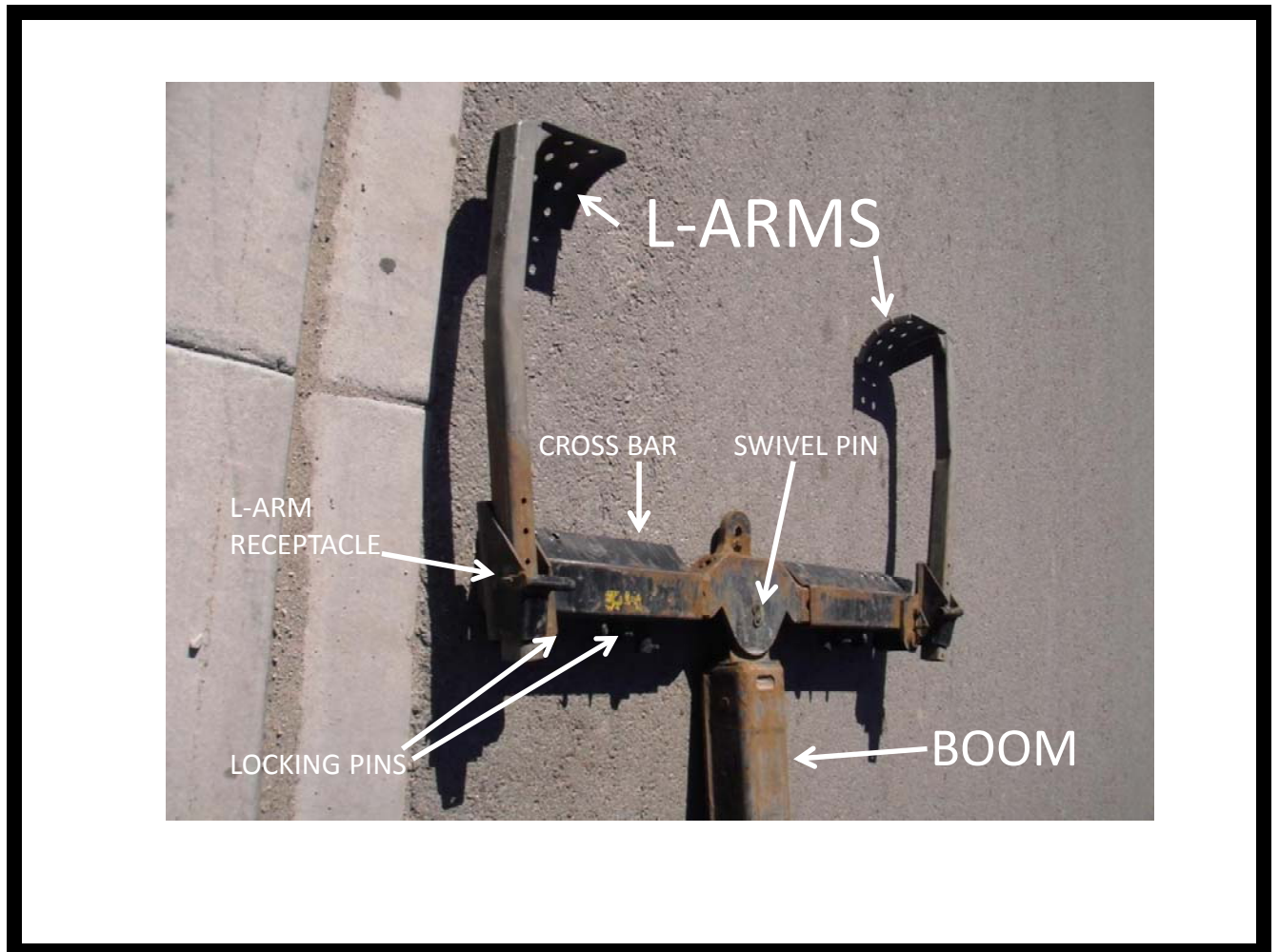
otherwise, the preferred practice is to tow with the drive wheels off the ground. To protect its transmission, a rear-wheel drive vehicle may need to have its drive shaft removed from the driveline before towing (see Chapter 6, Section A). To find out if the drive shaft of a vehicle should be removed before towing, or **if you have any doubts or questions as to how a vehicle should be towed (or if it can be towed), consult the owner's manual or the AAA Towing & Service Manual.**

You should also determine if damage to the disabled vehicle prevents it from being towed by conventional means. It may be necessary to use a car carrier to transport vehicles that have suffered severe damage to steering systems, wheels, tires or wheel bearings. At times, however, it may be possible to tow these severely damaged vehicles by using a tow sling and dolly combination. Be sure to use a dolly under the drive wheels if the drive wheels are going to be on the ground.

Communication between towing and recovery operators and law enforcement personnel, describing an incident and the vehicles involved, can ensure quick and efficient clearing of these scenes and less disruption to traffic flow.

B. TOWING WITH A WHEEL-LIFT

DIAGRAM 7



Proper towing procedures are as follows:

- Back the tow truck to the point where the crossbar of the wheel-lift is about one foot from the front bumper of the disabled vehicle.
- Put the tow truck's transmission in NEUTRAL (or PARK, if it is an automatic transmission), set the parking brake and engage the PTO. **Chock** the wheels of the tow truck.
- Set the parking brake on the disabled vehicle so that it cannot roll freely during loading. Use **wheel chocks** (usually triangular in shape) to block both the front and the rear of the trailing end tires. (**NOTE:** Turn on the disabled vehicle's four-way flashers during loading.)

- Lower the wheel-lift so the crossbar almost touches the ground.
- Extend the wheel-lift so that both outer crosstubes are in firm contact with both tires.
- The crosstubes may have to be adjusted so that the **L-arm** receptacles are closer to the outer sidewalls of the tires. (This does not apply to auto-load wheel-lifts.)
- Insert the **L-arms (wheel arms** - the devices that attach to the lift bar to engage the tires of the towed vehicle) firmly against the rear side of the tires, and lock them in place. (This does not apply to auto-load wheel-lifts.)
- Slowly start the lift so that it supports the disabled vehicle.
- Put the transmission of the disabled vehicle in NEUTRAL, remove the wheel chocks from its tires, and release the parking brake. This will center the disabled vehicle in the L-arms.
- Secure the steering wheel in the straight-ahead tracking position. This will minimize the possibility that the disabled vehicle will veer out of control if it becomes dislodged from the towing apparatus. Do not rely on the disabled vehicle's steering wheel locking device to secure the steering wheel. Use a dolly if you cannot secure the steering wheel in a straight-ahead tracking position.
- Raise the wheel-lift so that the bottoms of the tires on the raised end of the disabled vehicle are at least six inches above the ground.
- Retract the wheel-lift to where the disabled vehicle will not come into contact with the tow truck when the truck is making turns. Remember, positioning the disabled vehicle closer to the tow truck will reduce the amount of overhang, and increase the truck's steering control.
- Install **wheel straps** (two must be used) or **wheel securing devices** (attached to the lift bar) as tightly as possible to tie down the wheels of the towed vehicle, and to secure the disabled vehicle and help prevent it from separating from the towing apparatus.
- Attach safety chains so that they do not drag on the ground or interfere with the turning radius.
- Install auxiliary tow lights on the trailing end of the disabled vehicle to alert following traffic when you are stopping or turning. Tow lights must include stop lights, turn signals and taillights.

Do not use the headlights of the disabled vehicle as a substitute; they may blind oncoming or following traffic.

- Make sure that all windows and doors are closed and that the hood is firmly latched, and put the disabled vehicle's transmission in PARK.
- Do a walk-around inspection to check the trailing end of the disabled vehicle for ground clearance, and to make sure that the lights are working. Use a dolly if there is not sufficient ground clearance.
- **TURN OFF THE DISABLED VEHICLE'S FOUR-WAY FLASHERS.**
- Remove the tow truck wheel chocks.

C. TOWING WITH A SLING OR TRUCK HITCH (see Diagram 8 below)

This section applies to a tow truck that uses a tow sling or truck hitch. Procedures for wheel-lifts are covered in Section B.

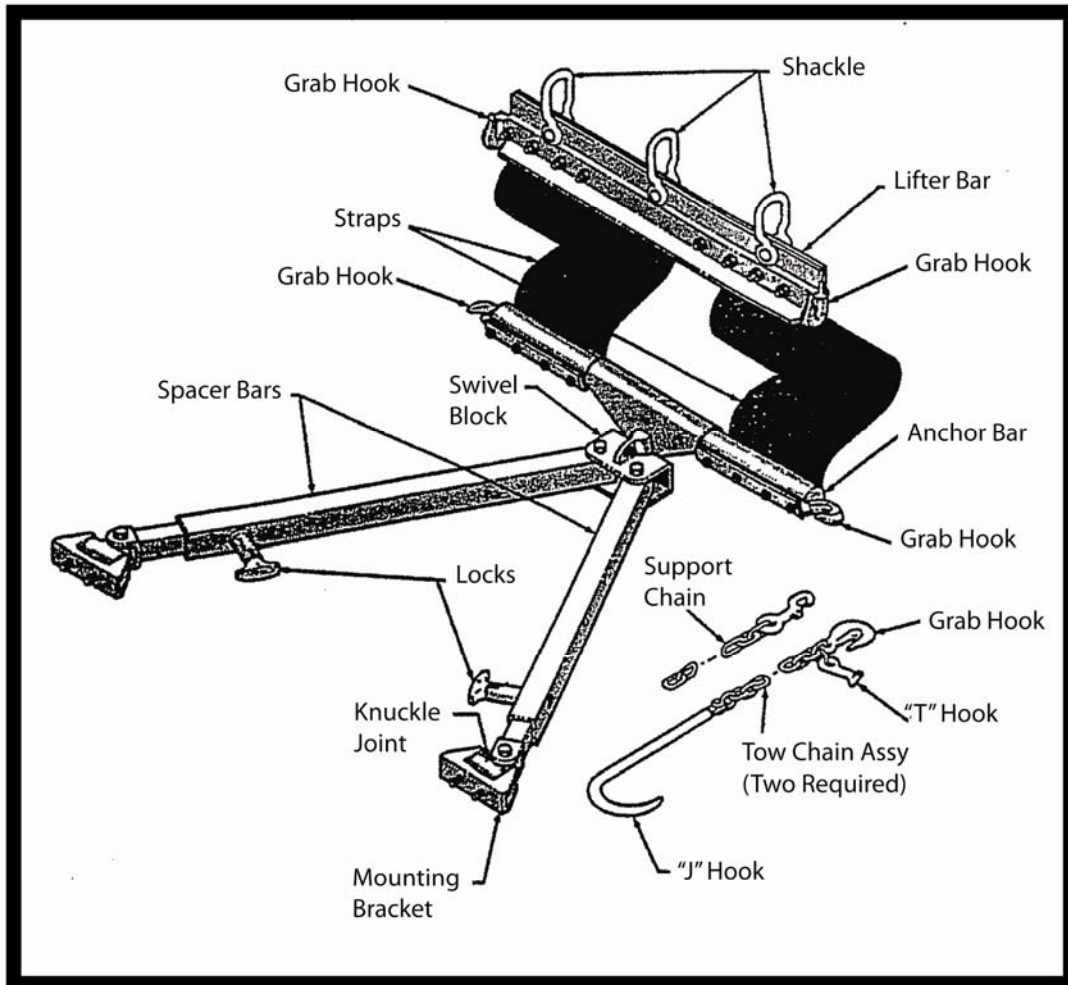


DIAGRAM 8
Tow Sling

It is assumed that **T-hooks** will be used as attachment devices, because most cars manufactured after 1980 come equipped with directional holes or slots to accommodate these hooks. A **T-hook** is a device, usually at the end of a chain, used instead of a **grab hook** (a chain hook that will not slide), to secure a vehicle being towed.

If a T-hook cannot be used (such as on pre-1980 cars and some smaller cars), it may be necessary to use other attachment devices. **J-hooks**, for example, are placed under the lower control arms of a disabled vehicle's suspension. Placing J-hooks elsewhere can cause the vehicle to ride up on a sling and become dislodged during sudden stops. Hooks should always be attached so that the point of the hook is facing up and the load is applied to the "throat" (or bend) of the hook. Placing a load on the tip of a hook can cause the hook to bend. Care should also be taken to ensure that hooks do not come in contact with steering linkages or axles, or the rubber boots that may cover, or partially cover, them.

Proper towing procedures are as follows:

- Back the tow truck to the point where the tow sling comes within six inches of the front bumper of the disabled vehicle.
- Put the tow truck's transmission in NEUTRAL (or PARK, if it is an automatic transmission), set the parking brake and engage the PTO.
- Chock the wheels of the tow truck.
- Set the parking brake on the disabled vehicle so that it cannot roll freely during loading. Use wheel chocks to block both the front and the rear of the trailing end tires. (**NOTE:** Turn on the disabled vehicle's four-way flashers during loading.)
- If using a tow sling or truck hitch, insert the appropriate attachment device, pull each chain tightly, and secure it in the grab hook on the anchor bar.
- **Safety-wrap** the tow chains around the grab hooks on the tow sling anchor bar or truck hitch. This prevents the tow chains from accidentally coming out of the grab hooks.
- Do not allow chains to push against fragile parts such as **air dams** (a flexible, air-deflecting panel usually located below the radiator support), **fascia** (flexible material covering, and sometimes extending below, a bumper), fuel tanks, exhaust systems, CV drive shaft boots, tie rods, steering linkage, sway bars, brake lines, hoses or **spoilers** (a cosmetic, wind drag device mounted on the

trunk lid). The use of wooden cross beams and **spacer blocks** (blocks used to provide additional clearance) may assist you in keeping chains away from these parts.

- Engage the winches to take all of the slack out of the chains.
- Lock the spacer extension bars in the appropriate position.
- Put the disabled vehicle's transmission in NEUTRAL, remove the wheel chocks, and release the parking brake.
- Start the lift slowly, avoiding any sudden loading. Raise the vehicle until the tires are clear of the ground. Cars or light trucks should be raised until there is at least six inches of clearance between the bottoms of the tires and the ground. Watch the rear of the vehicle to make sure there is no contact with the ground. NEVER raise the tow sling or truck hitch higher than the mounting brackets on the rear of the tow truck.
- Attach safety chains so that they do not drag on the ground, bounce loose or interfere with the turning radius.
- Secure the steering wheel to keep the front wheels in the straight-ahead tracking position. This will minimize the possibility that the disabled vehicle will veer out of control if it becomes dislodged from the towing apparatus. Never rely on the disabled vehicle's steering wheel locking device to secure the steering wheel.
- Install auxiliary tow lights on the trailing end of the disabled vehicle to alert following traffic when you are stopping or turning. Tow lights must include stop lights, turn signals and taillights. Do not use the headlights of the disabled vehicle as a substitute; doing so may blind oncoming or following traffic.
- Make sure that all windows and doors are closed and that the hood is firmly latched.
- Do a walk-around inspection to check the trailing end of the disabled vehicle for ground clearance, and to make sure that the lights are working. Use a dolly if there is not sufficient ground clearance.
- Turn off the disabled vehicle's four-way flashers & remove the wheel chocks.

D. DURING THE TOW

Merge as follows:

After the disabled vehicle is hooked up and secure, you should begin your merge into traffic. This should be done from the shoulder, if possible, and you should not enter a lane until you have reached an appropriate traveling speed. When you are done merging, the hazard light(s) should be turned OFF (refer to Chapter 4, Section H, 1, paragraph 3 for exceptions).

General Rules and Responsibilities for Safety:

- Follow the recommended maintenance and inspection procedures provided by the manufacturers of all the equipment that you use.
- Never exceed the gross vehicle weight rating or the safe towing capacity of the tow truck.
- Never exceed the working load limits of the tow truck or its accessories.
- When traveling, avoid fast starts or rapid acceleration.
- Check the mirrors of the tow truck to make sure that the disabled vehicle is tracking properly.
- Check the wheel-lift or tow sling periodically to make sure that its position has not changed, and check the wheel-securing straps or securing devices to make sure that they are tight, and that the vehicle has not shifted position.
- When driving on uneven ground (crossing driveways, speed bumps, dips, potholes or railroad tracks), proceed slowly, so you do not dislodge the disabled vehicle or damage it's under parts.
- Never jackknife the tow truck and the disabled vehicle when parking or maneuvering. Jackknifing will damage both the towing devices and the disabled vehicle.
- **DRIVE SLOWER, AND ALLOW GREATER DISTANCES FOR STOPPING, TO HELP ENSURE BETTER BRAKING ABILITY AND STEERING CONTROL.**

Driving Safety

Workers are more likely to be killed or seriously injured in incidents involving motor vehicles than in any other workplace incident...

When operating your tow truck it is vital that you focus on driving safely at all times. You must follow the posted speed limits, *no matter where you are going*. It is a misconception that you are allowed to ignore posted signs when responding to a traffic accident. A loaded tow truck cannot be driven the same way you would drive your personal vehicle.

Using a Safe Following Distance

What is the best defense for dealing with all types of driving conditions? Always keep a four-second following distance behind the vehicle in front of you. Why four seconds? Four seconds gives you plenty of time to see hazards, react to them, and stop safely to avoid a crash. Whenever driving conditions are poor—heavy traffic, bad weather, or poor visibility—or as vehicle speed increases, add one or more extra seconds following distance for each hazard.

Rain

- Increase your following distance. Add two seconds to the four-second rule.
- Do not drive through standing or flowing water. Your truck may hydroplane.
- Use low beams.

Snow

- Increase your following distance (do not tailgate). Drive as slowly as you need to keep your truck under control at all times. Even trucks and snow tires slide in the snow. Add at least two seconds to the four-second rule.
- Remove snow from windows before driving.
- Be wary of bridges where the road may be more slippery.

Fog

- Use low beams.
- Increase your following distance.

Changing Lanes Safely

1. Always signal when making a lane change
2. Before changing lanes, check the mirrors and look for vehicles
3. Obey all posted traffic signs, signals and pavement markings

Pavement markings indicate:

- Where on the roadway you should drive
- Passing and no passing zones
- Road edges

Pavement marking colors:

- YELLOW lines divide 2-way traffic
- WHITE lines divide same way traffic



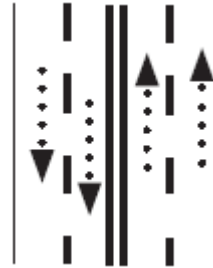
Two-way traffic, passing permitted.



Two-way traffic. Passing permitted in lane with dashed line.



No passing either direction.



Multi-lane, two-way road.

TAKE THE PROPER STEPS IN THE PROPER ORDER.

DON'T TAKE SHORTCUTS.

TAKE YOUR TIME and BE SAFE.

CHAPTER 6 - MEDIUM-DUTY AND HEAVY-DUTY

SAFE TOWING PRACTICES

This chapter will describe special procedures that should be followed in preparing medium-duty and heavy-duty vehicles for towing.

Terms explained in this chapter: driveline; axle cover; forks; cross-member.

Heavy-duty trucks can be more expensive than automobiles and, consequently, any damage that occurs to these vehicles during towing may be much more costly to repair. While heavy-duty vehicles appear extremely sturdy, in some respects they can be more fragile than automobiles.

A. GENERAL HOOK-UP PROCEDURES

First and foremost, **be seen**. Remember, for your own safety at the scene, it is recommended that you wear reflective clothing so that you do not become a casualty while preparing to tow.

Approach the disabled vehicle as described in Chapter 5, Section A. Contact police immediately for assistance with any situation that appears unsafe.

Set the parking brake on the disabled vehicle so that it cannot roll freely during loading. Use wheel chocks to block both the front and the rear of the trailing end tires.

Assess the damage, and decide on the equipment needed. Note any damage to the disabled vehicle on the invoice. To support the extra weight of trucks with a GVWR of 26,001 lbs. or more, all towing hook-ups should be made, whenever possible, to the vehicle's frame members and not to its suspension. Only in

instances when under-lifts are used in towing should attachments be made to the disabled vehicle's suspension.

- When towing from the front, chains should be attached under the front axle and extended to the frame of the disabled vehicle. This cradles and lifts the axle in the chains as the vehicle is raised, allowing the vehicle to be towed without being lifted too high.

NOTE: Damage can occur to any composite springs if chains or under-lift attachment forks are left to ride against them. It is recommended that all chains used during towing be High Test quality or better. Under NO circumstances should a vehicle having a GVWR of over 7,000 pounds be towed with a sling and J-hooks.

- Truck transmissions are not adequately lubricated during towing. Consequently, when towing from the front, the drive shaft should be removed (or the axle shafts should be removed) to prevent the transmission's tail shaft from turning. In most cases, it is easier to remove a drive shaft than to remove the axle shafts. Removing the drive shaft also minimizes any loss of lubricating fluid, and allows the truck to be towed for longer distances.
- **MARK THE DRIVE SHAFT BEFORE REMOVAL.** The drive shaft is factory-balanced, so unless you mark it, you will not be able to reattach it in the balanced position.

CAUTION: It is very important to note that the removal of a drive shaft from the **driveline** (meaning the drive shaft and its associated joints) is one of the most dangerous procedures in towing. If there is tension on the drive shaft when it is being loosened, it can spin out of control and strike the tow truck operator – often causing serious injury or death. For this reason, you must always ensure that the disabled vehicle is in **NEUTRAL**, and that the brake is released, before removing the drive shaft.

If there is a differential problem, then all drive axle shafts must be removed, and **axle covers** (to cover and protect drive axle shaft openings) should be installed to help prevent contamination or loss of wheel bearing lubrication. NEVER leave the engine of a disabled truck or tractor running while in tow – electronic devices on the towed vehicle may cause brake lock-up.

- To eliminate the need for removing the drive shaft from the driveline, or removing the axle shafts, or when other conditions exist (for example, front axle overloading), trucks and tractors should be towed from the rear, whenever possible. If a disabled vehicle is equipped with air foils or air dams that extend to the rear of the disabled vehicle's cab, it may be necessary to tow it from the front, which requires the removal of the drive shaft or axle shafts. Otherwise, the disabled vehicle will experience wind resistance.
- On some rear axle assemblies, you must supply constant air pressure to the air system. This is to keep the inner differential lock disengaged, spring brakes released, and suspension systems inflated.

B. TOWING TRUCKS OR TRACTORS FROM THE REAR

Try to determine the defect that caused the vehicle to break down, note any damage on the invoice, then proceed as follows:

- Chain up all types of rear suspensions and both sets of drive axles. It is unsafe to let suspension parts hyper-extend or dangle.
- Secure the steering wheel to keep the front wheels in the straight-ahead tracking position. Never rely on the disabled vehicle's steering wheel locking device to secure the steering wheel.
- If necessary, remove the disabled vehicle's rear taillights, or anything that projects from the rear of the frame rail, to minimize the chance of damage.
- Check for any front suspension problem (for example, broken springs, leaking wheel bearings, low tire pressure, or low-hanging aerodynamic fascia).

- Fold down air foils, if possible.
- Make sure that gladhands and electrical cords, etc., are in holders or are secured, to eliminate entanglement or dragging.
- Install an auxiliary towing light bar on the disabled vehicle so that stop lights, turn signals and taillights are visible to following motorists. Do not use the headlights or four-way flashers of the disabled vehicle as a substitute for auxiliary tow lights, because using them may blind following traffic.
- Make sure that all windows and doors are closed, and that the hood is firmly latched.
- When using a truck hitch, attach chains to the frame of the unit, not to the suspension. Wrapping the frame is important. Use a piece of aluminum or steel angle iron, with minimum dimensions of 3 inches \times 4 inches \times 48 inches. This should be placed under the frame rail ends for added support and to prevent the chains from sliding.

If using an under-lift, frame **forks** (lifting devices) should be placed near the outer edge of the chassis's rear **cross-member** (transverse member in the understructure) to prevent the vehicle from sliding during starting, stopping or turning. Do not use frame forks on flat straight frames.

- To prevent the disabled vehicle from lifting out of the forks, under-lifts must be equipped with securing devices (refer to Chapter 4, Section F, 4) to prevent separation of the under-lift from the disabled vehicle.
- Always attach two safety chains from the disabled unit to the tow truck's rear tailplate or boom structure.
- The disabled unit should be elevated enough so that the bottoms of the lowest drive axle tires are a minimum of 10 inches or more above the ground.
- After the disabled unit has been elevated, conduct a walk-around inspection to make sure that the rear axle chains are tight and that the front of the disabled unit, if equipped with aerodynamic

fascia, will not contact the road surface. Remember to consider the effect of bumps and turns on attachments during travel. Ensure that the auxiliary towing light bar and hook-up chains are secure, and remove the wheel chocks.

C. TOWING TRUCKS, TRACTORS, OR TRAILER COMBINATIONS FROM THE FRONT

- When using a truck hitch, it may be necessary to remove the front bumper of the disabled vehicle to avoid possible damage.
- Install hook-up chains under the front axle and attach them to the frame to cradle the front suspension. Place an angle iron under the front spring hangers of the frame extensions. This will support the chains and prevent the truck hitch from sliding into the radiator area and causing further damage. (The angle iron should have the minimum dimensions described in Section B above - 3 inches \times 4 inches \times 48 inches. If you are using an aluminum angle iron, it should be at least 1/2 inch thick.)
- If you are using an under-lift, install front axle forks. (It may be necessary to elevate the truck first and put blocks under the front tires.) Extend the under-lift bar out from under the axle I-beam, and position the forks so that they line up between the U-bolts of the I-beam.
- Elevate the disabled unit so that the bottoms of the steering axle tires are a minimum of 10 inches above the road surface. Be sure that the front axle forks contact the bottom of the axle beam between the U-bolts. If they do not, the wrong forks have been used. To prevent a unit from sliding sideways while turning under tow, do not allow the lift bar to contact the center of the axle I-beam. Place a securing device around the front axle to prevent separation of the under-lift from the disabled vehicle.
- On trucks equipped with air brake systems, in order to charge the primary air system of the disabled vehicle, connect the air line from the tow truck's air reservoir system, preferably to the inlet fitting of the disabled unit's air dryer, or to the main air line of the air compressor.

- Release the emergency/spring brakes of the disabled truck/tractor. Do not back off the slack adjusters!
- Remove the drive shaft or axle shafts, when possible, and place the removed parts in a secure position on the disabled vehicle. Be sure to tape the U-joints together to prevent the needle bearings from falling out. Install axle covers or cardboard over axle openings to protect bearings from contamination and to help ensure retention of lubricant.
- When towing a single truck or tractor, install an auxiliary towing light bar on the rear of the disabled vehicle. Install electrical cord for the light bar through the mirror arms to prevent the cord from dragging on the ground or getting tangled. Place the disabled tractor's gladhands and electrical cords, etc., in holders, or secure them, to prevent dragging or entanglement.
- When towing a tractor-trailer combination, disconnect the gladhands and electrical cord from the front of the trailer. Install service and emergency air lines, with electrical cord from the tow truck, at the front of the trailer, through the disabled truck's mirror arms. Secure the air hoses and electrical cord of the disabled vehicle. This will allow the tow truck to control the trailer's stop lights, turn signals and taillights for the visibility of following traffic, and will allow the tow operator to control braking on the towed vehicle.
- Secure the steering wheel so that the front wheels are pointed in the straight-ahead tracking position. Never rely on the disabled vehicle's steering wheel locking device to secure the steering wheel.
- Make sure that all windows and doors are closed.
- Attach two safety chains to the disabled vehicle and, from there, to the rear plate or boom structure of the tow truck.
- Do a walk-around inspection to make sure that all hoses are properly attached and lights are operating. Remember to consider the effect of bumps or turns on attachments during travel.

D. DURING THE TOW

Merge as follows:

After the disabled vehicle is hooked up and secured, you should begin your merge into traffic. This should be done from the shoulder, if possible, and you should not enter a traffic lane until you have reached an appropriate traveling speed. Once the merge is complete, hazard light(s) should be turned OFF (refer to Chapter 4, Section H, 1, paragraph 3 for exceptions).

General Rules and Responsibilities For Safety:

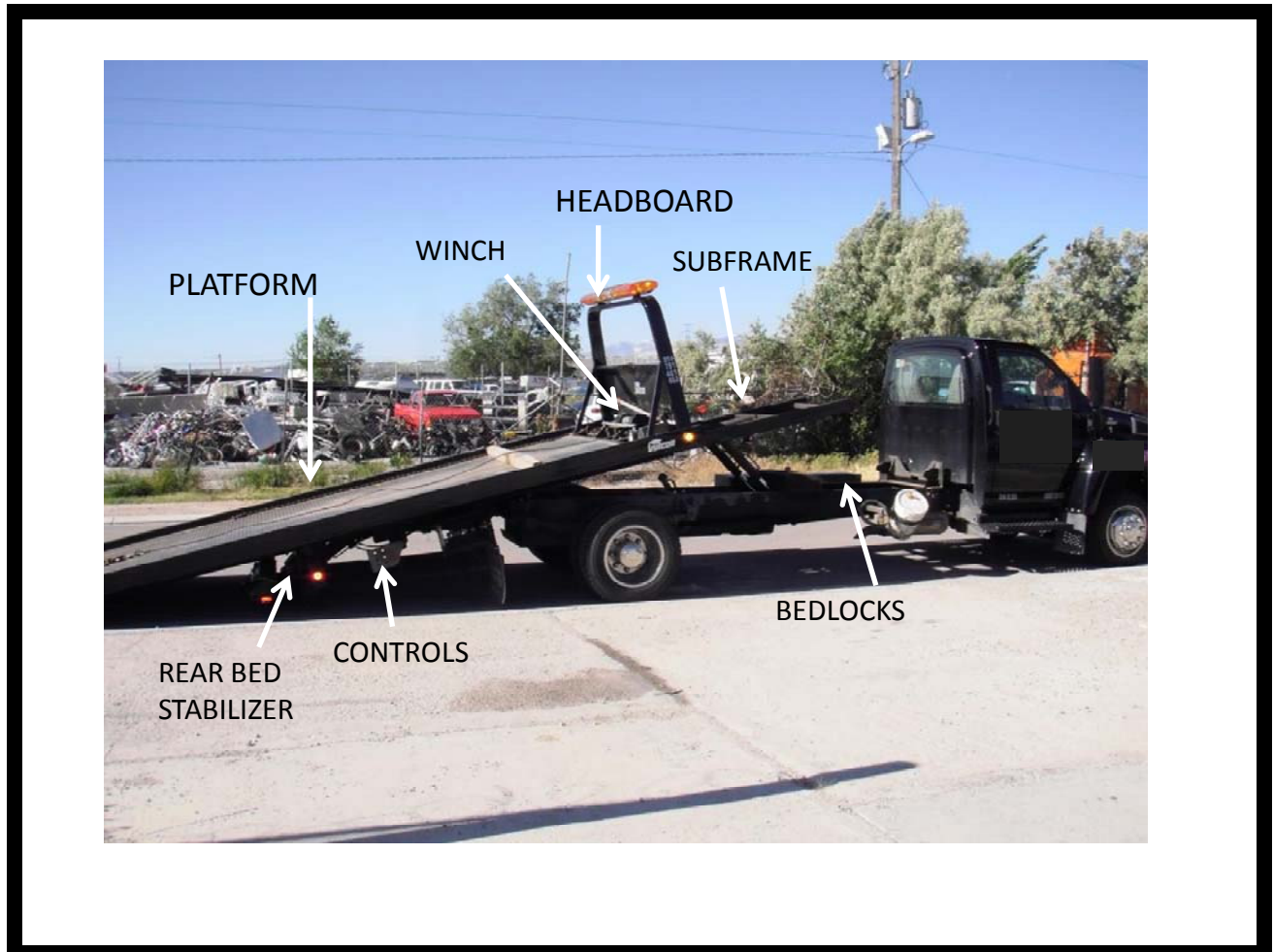
- Follow the recommended maintenance and inspection procedures provided by the manufacturers of all the equipment that you use.
- Never exceed the gross vehicle weight rating or the safe towing capacity of the tow truck.
- Never exceed the working load limits of the tow truck or its accessories.
- When traveling, avoid fast starts or rapid acceleration.
- Check the mirrors of the tow truck to make sure that the disabled vehicle is tracking properly.
- Check the wheel-lift, under-lift or truck hitch periodically to make sure that its position has not changed, and check the wheel-securing straps or securing devices to make sure that they are tight, and that the vehicle has not shifted position.
- When driving on uneven ground (crossing driveways, speed bumps, dips, potholes or railroad tracks), proceed slowly, so you do not dislodge the disabled vehicle or damage its under parts.
- Never jackknife the tow truck and the disabled vehicle when parking or maneuvering. Jackknifing will damage both the towing devices and the disabled vehicle.
- **DRIVE SLOWER, AND ALLOW GREATER DISTANCES FOR STOPPING, TO HELP ENSURE BETTER BRAKING ABILITY AND STEERING CONTROL.**

TAKE THE PROPER STEPS IN THE PROPER ORDER.

DON'T TAKE SHORTCUTS. TAKE YOUR TIME and BE SAFE.

CHAPTER 7 - CAR CARRIERS

This chapter will describe how to safely load and unload a vehicle to be towed using a car carrier (Diagram 10 below).



Terms explained in this chapter: bed locks; rear bed stabilizer; bridle; headboard.

Car carriers are essential to the towing, recovery and salvage industries. Over the years, they have been widely used to transport vehicles that are too badly damaged to be towed. In recent years, car carriers have become even more essential because an increasingly large number of newer vehicles (that is, vehicles with all-wheel drive and vehicles with low-slung air foils) cannot be towed. A car carrier may be

used if the drive wheels of the vehicle would otherwise be on the ground. If you have any doubts or questions as to whether a vehicle should be towed, or transported by a car carrier, consult the owner's manual or the **AAA Towing & Service Manual**.

Proper step-by-step operating procedures are important to ensure safety throughout the loading, transporting and unloading process. Taking shortcuts may cause damage to either vehicle and serious injury or death to operators or bystanders. **REMEMBER: FIRST, BE SEEN; AND SECOND, NEVER EXCEED THE WORKING LOAD LIMITS OF YOUR EQUIPMENT OR ACCESSORIES, OR THE SAFE TOWING CAPACITY OF YOUR TRUCK.**

A. LOADING A VEHICLE

- As you slow down approaching the disablement scene, engage the hazard light(s) of the transporting vehicle. Once at the scene, note any damage to the disabled vehicle on the invoice.
- Position the car carrier so that the vehicle to be loaded is aligned, from left to right, with the carrier bed. Be sure to leave adequate space at the rear for the bed to fully extend. Do not load or unload the carrier when it is on uneven terrain (left to right).
- Set the brakes and engage the PTO of the car carrier.
- Chock both the front surface and rear surface of each rear wheel of the car carrier.
- Clear bystanders from the area.
- Set the parking brake on the disabled vehicle so that the disabled vehicle cannot roll freely during loading. Use wheel chocks to block both the front and the rear of the trailing end tires. (**NOTE:** Turn on the disabled vehicle's four-way flashers during loading.)
- Move the carrier bed rearward so that it clears the **bed locks** (some carriers have bed lock indicator markings on them). The bed locks are the devices that secure the carrier bed in place during travel.

- Tilt the bed until the **rear bed stabilizer** (the fixture extending below the “tilt” bed of the car carrier) just makes contact with the ground. Failure to do so can cause severe damage to the carrier sub-frame.
- Move the bed rearward until it makes contact with the ground.
- Attach the **bridle** (the V or Y type coupling device used to attach and center a cable) to the proper attachment point on the disabled vehicle. Do not connect anything to fragile components such as tie rods, brake lines, etc.
- Disengage the winch drum and pull the cable out by hand. Attach the winch line hook to the bridle, and engage the winch drum. Make sure the point of the hook is facing up.
- Tighten the winch cable until it is snug, but not tight. Inspect all connections and the cable layers on the winch.
- Shift the transmission of the vehicle to be loaded into NEUTRAL and release the parking brake. Remove the wheel chocks. If necessary, move the steering wheel to assist in centering the vehicle onto the carrier bed.
- Winch the vehicle onto the carrier bed. While winching, carefully observe the winch, cable, all connections and the position of the vehicle as it moves onto the bed.

CAUTION: BE AWARE OF THE REAR GROUND CLEARANCE OF THE VEHICLE AS IT IS BEING LOADED.

- Place wheel chocks in front of, and behind, a rear wheel of the loaded vehicle.

CAUTION: NEVER GET BEHIND THE CARRIER BED WHEN IT IS IN A LOADED, TILTED POSITION.

- Move the carrier bed forward. When a major part of the loaded weight is forward of the carrier's rear axle, lower the bed. Remember the bed locks. Damage can occur if the bed is lowered onto them.
- Move the bed fully forward while carefully observing its entry into the bed locks. Be sure that the bed has fully engaged the bed locks.
- Secure the rear of the disabled vehicle to the carrier bed by using two separate securing devices, one on each side.

CAUTION: KEEP ALL ATTACHMENTS CLEAR OF FRAGILE COMPONENTS SUCH AS BRAKE LINES, TIE RODS, EXHAUST SYSTEMS, OIL PANS, ETC.

- Remove the chocks from the loaded vehicle. If you are using chains, carefully engage the winch and move the disabled vehicle forward, preloading the rear securing devices. If you over tighten the winch, you will almost always damage the disabled vehicle.
- Attach and tighten two separate securing devices to the front of the disabled vehicle (one on each side of the vehicle). A minimum of two securing devices is required by federal law for a vehicle with a GVWR of 10,000 pounds or less. A minimum of four securing devices is required by federal law for a vehicle over 10,000 pounds. It is highly recommended that four securing devices be used for all vehicles – two in the front and two in the back.

CAUTION: A WINCH IS NOT A SECURING DEVICE. IT IS TO BE USED ONLY FOR LOADING AND UNLOADING, NOT FOR TRANSPORTING.

- Do a final walk-around inspection. Carefully check the position of the vehicle on the carrier bed. Check the winch, cable, all connections, and most importantly, the securing devices.

- Check for loose parts, especially on wrecked vehicles. Make sure that the doors, the hood and deck lid are secured.
- Engage the transmission of the disabled vehicle in its lowest gear, or in PARK, and set the parking brake. Turn off the disabled vehicle's four-way flashers.
- Remove the wheel chocks from the car carrier. Enter the car carrier and disengage the PTO.

CAUTION: THE DISABLED VEHICLE ADDS A SUBSTANTIAL AMOUNT OF WEIGHT TO THE CAR CARRIER UNIT, WHICH CHANGES THE FRONT AND REAR AXLE WEIGHTS. BECAUSE THE CAR CARRIER UNIT IS NOW MUCH MORE TOP-HEAVY, YOU MUST ADJUST YOUR DRIVING TECHNIQUE TO ENSURE SAFE STARTING, TURNING AND STOPPING UNDER ALL CONDITIONS.

B. DURING TRANSPORT

Merge as follows:

After the disabled vehicle is loaded and secured, you should begin your merge into traffic. This should be done from the shoulder, if possible, and you should not enter a traffic lane until you have reached an appropriate traveling speed. Once the merge is complete, hazard light(s) should be turned OFF (refer to Chapter 4, Section H, 1, paragraph 3 for exceptions).

C. UNLOADING A VEHICLE

- As you slow down approaching the scene or delivery point, engage the hazard light(s).
- Park the car carrier in a position that is level (left to right). Leave adequate space at the rear (that is, at least twice the length of the car carrier).
- Set the parking brake and engage the PTO.

- Position the wheel chocks in front of and behind the rear wheels of the car carrier.
- Clear bystanders from the area.
- Be sure that the winch cable is still tight. Remove both securing devices from the front of the loaded vehicle.
- Move the carrier bed rearward so that it clears the bed locks.
- Tilt the bed so that the loaded vehicle is on a very slight incline.
- Put the transmission of the disabled vehicle in NEUTRAL, and release the parking brake.
- Carefully engage the winch to let some of the cable out, allowing the disabled vehicle to roll back slightly. Be sure that the rear securing devices have become loose enough to be disconnected, but do not disconnect them yet.
- Place wheel chocks snugly behind the rear wheels of the disabled vehicle.

CAUTION: NEVER GET BEHIND THE BED WHEN IT IS IN A LOADED, TILTED POSITION.

- Remove both rear securing devices.
- Be sure that the bed locks are clear, and tilt the bed until the rear bed stabilizer makes contact with the ground.
- Move the bed rearward until it makes contact with the ground. Remove the wheel chocks from the disabled vehicle.
- Carefully engage the winch to let the cable out, allowing the loaded vehicle to roll rearward, safely onto the ground.

CAUTION: BE AWARE OF THE REAR GROUND CLEARANCE OF THE VEHICLE AS IT IS BEING UNLOADED.

- Put the disabled vehicle in PARK, or its lowest gear, and set the parking brake, so the vehicle will not roll.
- Disconnect all remaining loading attachments from the disabled vehicle.

- Return the carrier bed to the horizontal and locked position.
- Clear all oil, antifreeze and broken or loose debris from the deck.
- Secure winch lines and accessories (blocking wheel chocks, chains, brooms and shovels) in the travel position.
- Remove the carrier's wheel chocks, disengage the PTO and turn off the hazard light(s).

CHAPTER 8 - CUSTOMER SERVICE AND PROFESSIONALISM

Customer Service is the provision of service to customers before, during, and after a transaction takes place. Going out of your way to be helpful even when there is not a guarantee of making additional or immediate profits is what sets the professionals apart from the rest. In this section we will talk about what good customer service is and why it is important not only to ourselves but to our industry that we always present ourselves in a professional and courteous manner.

Look the Part

First impressions last a lifetime in this business and every other business. You don't want your dentist to wear dirty denim jeans and a tank top and people don't want their tow truck driver dressed unprofessionally either. Dressing like a professional puts people at ease. A clean, pressed uniform tells your customers to rest assured; their needs will be taken care of in a careful and timely manner. You'll notice that when you dress the part people will treat you with the respect you deserve as a professional.

Be Friendly

Make sure that you greet your customers in a friendly manner. Customers want to feel welcome and that you are looking out for their interests. It is most important that you present a friendly and welcoming image from the very beginning. This creates an atmosphere that will set everyone at ease and make performing the services more agreeable for all parties.

Listen To Concerns

It's important to listen to your customers concerns before performing any services. You might know exactly what is going on, but don't forget to take the time to listen to and explain the situation to your customers. By doing this you are giving your customers a sense of control and an understanding that will make them feel comfortable with the situation and happy with your services. This is also an opportunity for you to ask any questions you might have. After everyone has had the opportunity to ask questions,

it's important to get an agreement on the operation that is to take place. This agreement should include specific details such as when the operation is going to take place, where, and by whom.

Unhappy Customers

The best way to avoid unhappy customers is to perform services in the timely and efficient manner that was agreed upon. In a perfect world there would not be unhappy customers, unfortunately, this is not the case. However, it is sometimes impossible to avoid unhappy customers; here's how you can deal with them:

Stay cool. Remember that the professional tower never loses their cool. Remain calm, and take a positive approach to the problem. Don't take complaints personally. Let the customer vent their anger, and then help them solve the problem. Great towers look at complaints as an opportunity to make things right and become a more efficient and professional company.

CHAPTER 9 - UTAH SPECIFIC REGULATIONS

R909-19 is the title of Utah's Transportation Motor Carrier regulation. This piece of legislation covers many aspects of the towing industry. We won't cover it in full but we'll touch on some important aspects of it.

Certification

In Utah there are three areas of certification that must be adhered to:

1. All tow truck drivers in the state of Utah must be certified.

According to R909 this certification must meet National Driver Certification Procedure (NDCP) standards. This course meets those requirements and upon completion will certify you as a professional tow truck driver.

2. Tow Truck Vehicle Certification.

All tow trucks must be inspected and certified biannually. All trucks must be equipped with required safety equipment, must have required regular maintenance, and must have required load capacity information onboard. You'll find a complete list of these topics in a later section.



- 3. Tow Truck Motor Carrier Certification.** All tow truck motor carriers need to be certified biannually to ensure compliance with the Federal Motor Carrier Safety Regulations and local laws. This area of certification is primarily the responsibility of the owners or managers of the company.

Insurance

All tow trucks must carry and maintain an insurance policy of at least \$1,000,000 liability. Proof of this insurance policy must be kept at the principle place of business.

Towing Receipts

Not only is it a good business practice but a detailed towing receipt is the law in Utah. The receipt given to customers must have the following 9 pieces of information included:

- 1. Company Name**
- 2. Address**
- 3. Phone Number**
- 4. Towing and Storage Fees**
- 5. Name of Company Driver**
- 6. Unit Number of Truck**
- 7. License Plate Number of Towed Vehicle**
- 8. Make, Model, and the year of the Towed Vehicle**
- 9. Start and End Time for Services Provided.**

Maximum Towing Rates

Police generated Non-Consent Tows-

State law regulates that \$145 is the maximum amount that a tow company can charge its customers for towing. However, an additional 15% can be charged if the vehicle requires a Hazardous Materials placard under 49 CFR 172.

Non-Police generated Non-Consent Tows-

State law regulates that \$145 is the maximum charge per hour of towing a “Light Duty” vehicle without the consent of the owner or legal operator. However, if the owner of the vehicle is attempting to remove the vehicle before the vehicle is mechanically connected no fees will be charged.

(A fuel surcharge of 10% is allowed if the cost of diesel per gallon increases \$.50 beyond the base rate of \$3.00)

Maximum Storage Rates

State law regulates the maximum amount that can be charged for the storage of a towed vehicle. Storage fees are as follows:

\$25 Maximum per day, per unit, for storage of “Light Duty” vehicles outside.

\$30 maximum per day, per unit for inside storage of “Light Duty” vehicles at the owner’s request (or at the request of a law enforcement agency).

Towing Notice Requirements

If you perform a Non-Consent tow on a vehicle without the owner's knowledge and without being ordered to do so by a police officer, **you must *immediately* contact by radio, or telephone the law enforcement agency having jurisdiction over the area where the vehicle was towed from.**

Reporting must be done upon arriving at the place of storage or impound of the vehicle if the tow was completed during posted office hours.

If the vehicle was towed, after posted business hours than it must be reported within two hours of the following business day.

CHAPTER 10 – TRUCK AND EQUIPMENT

Tow Truck Certification Requirements

A tow truck will be certified when all of the required safety equipment is on the vehicle and properly functioning, when no critical violations are noted on the vehicle, and when all required data plates (or official documentation) are available.

1. Required Safety Equipment:

- **Amber rotating lights**--used to alert public of emergency situations; permanent fixtures; on top of towing vehicle cab; at least one 6" diameter light.
- **Portable lights**--used to allow public to see flashing lights when permanent rotating lights are blocked.
- **Long light cord**--used to connect portable lights to two truck batteries.
- **Fire extinguisher** (min. 10BC)--used to put out small fires; must be readily available, secured, and charged.
- **Tie down chains or straps** (min. 4)--used to ensure load remains secured.
- **Door and steering wheel ties**--used to ensure doors remain closed while towing; also locks steering (and tires) in place.
- **Cones or triangles** (min. 3)--used for traffic control; required as emergency equipment on commercial motor vehicles.
- **Scoop shovel**--used to clean up glass, etc. from roadway.
- **Broom**--used to clean up glass, etc. from roadway.
- **Safety chains** (min. grade 7)--used to lock towed vehicle to boom or bed; prevent excessive swaying and possible breaking away from boom or bed.
- **Oil absorbent**--used to assist in absorbing spilled diesel fuel, anti-freeze, battery acid, and etc. from roadway.
- **Debris container** (5 gal)--used to contain glass, etc. swept from roadway.
- **Chock blocks (2) or stiff legs**--used to stabilize the recover vehicle when on ice or other slippery surfaces during recovery operations.

- **Safety vest**--used to highlight the tow truck driver to the public.

2. Required Vehicle Maintenance and Inspection:

- **Front of truck**--operating head lamps, turn signals, four-way flashers, marker and ID lights; proper lamp color, mounting, and visibility; windshield free of cracks; and check for operating wipers.
- **Steering axle--steering system**; front suspension; frame and frame assembly; front brakes.
- **Brake adjustment**--insure air pressure is between 90 and 100 psi. Make full brake application and measure push rods.
- **Side of truck**--check wheels, rims, and tires.
- **Rear of truck**--check tail lamps, stop lamps, turn signals, and 4-way flashers.
- **Cargo area**--ensure all equipment and other cargo is properly secured.
- **Low air pressure warning device**--check for audible and visual devices (if applicable).

3. Vehicle Load Capacity Requirements:

- **Truck data plate**--must be attached to vehicle (or official document available in vehicle); must state manufacture's Gross Vehicle Weight Rating (GVWR).
- **Boom or Bed data plate**--must be attached to boom or bed (or official document available in vehicle); must state boom's (or bed's) maximum load capacity.
- **Wheel Lift data plate**--must be attached to wheel lift, boom, or bad (or official document available in vehicle); must state wheel lift's maximum load capacity.

GENERAL RULES AND RESPONSIBILITIES FOR SAFETY:

- Never use a car carrier that does not have a **headboard** — the strong, permanent, vertical device, affixed between the cab and the load to protect the cab and its occupants.
- Never get beneath the carrier bed after it has been lifted.
- Never get behind the bed when it is loaded and in the tilted position. The winch could release or the connections could come loose.
- Follow the recommended maintenance and inspection procedures provided by the manufacturers of all the equipment that you use.
- Never exceed the gross vehicle weight rating or the safe towing capacity of the car carrier.
- Never exceed the working load limits of the car carrier or its accessories.
- When traveling, avoid fast starts, sharp turns or rapid acceleration.
- Periodically check to make sure that the position of the disabled vehicle on the carrier has not changed, and check the securing devices to make sure that they are tight, so that the vehicle does not shift position.
- When driving on uneven ground (crossing driveways, speed bumps, dips, potholes or railroad tracks), proceed slowly.
- **DRIVE SLOWER, AND ALLOW GREATER DISTANCES FOR STOPPING, TO HELP ENSURE BETTER BRAKING ABILITY AND STEERING CONTROL.**

TAKE THE PROPER STEPS IN THE PROPER ORDER.

DON'T TAKE SHORTCUTS.

TAKE YOUR TIME and BE SAFE.

GLOSSARY

Air Dam - a flexible air-deflecting panel usually located below the radiator support.

Approach Angle - the angle between the plane of the carrier bed or platform and the ground.

Auxiliary Braking Device - a device which attaches to the disabled vehicle to assist the tow truck's brakes in retarding or stopping both vehicles.

Auxiliary Equipment - equipment that is not necessary to perform the basic function of the primary equipment.

Auxiliary Tow Lights - stop, tail and turn signal lights attached to the trailing end of the towed vehicle, and operated as part of the towing vehicle's lighting system. Also see "Drag Lights".

Auxiliary Winch - same as "Drag Winch": a winch whose cable goes directly to the load, and not over the end of the boom.

Axle Covers - devices used to cover drive axle shaft openings to help prevent contamination or loss of wheel bearing lubrication during towing or transporting operations.

Bed Locks - devices on a vehicle with a movable bed that secure the bed in place while traveling.

Boom - a structural member, extending from a mast, that supports the load and is used to hold, extend or lift a load free of the ground and clear of the tow truck body.

Breaking Strength Rating - the maximum weight or load, as established by the manufacturer, that new, unused equipment can bear, under ideal laboratory conditions, without being damaged.

Bridle - a V or Y type coupling device used to attach and center a cable in recovery, loading and unloading operations.

Cab - the driver/passenger-carrying compartment of a truck.

Cab-to-Axle (CA) - the distance from the back of the truck cab to the center of the rear axle. See chassis manufacturer's dimensions.

Cable - steel wire rope used for pulling or supporting a load.

Car Carrier - a vehicle equipped to transport one to three motor vehicles on a flat platform that slides or tilts to the ground to facilitate the loading and unloading of these vehicles; may or may not have an additional assembly attached to the rear to facilitate towing an additional vehicle. These units are also known as slidebacks, rollbacks, transporting equipment carriers and flatbeds.

Chain Grade or Strength Rating - the number placed on chain by the manufacturer as part of the National Association of Chain Manufacturers' system of identifying chain. Chain manufactured by NACM standards also bears a letter that identifies the manufacturer.

Cross-Member - a general term applied to transverse members in the understructure of a vehicle.

Curb Weight - the unloaded weight of a truck, axle or axle combination.

Disabled Vehicle - for purposes of this manual, this term refers to a motor vehicle that is illegally parked, abandoned, or disabled (unable to operate under its own power), or a motor vehicle that has been involved in an accident.

Dolly - A four-wheel carriage used, in towing, to support the trailing end of a towed vehicle.

Drag Lights - same as “Auxiliary Tow Lights”: stop, tail and turn signal lights attached to the trailing end of the towed vehicle, and operated as part of the towing vehicle’s lighting system.

Drag Winch - a winch whose cable goes directly to the load, and not over the end of the boom. Also see “Auxiliary Winch”.

Driveline - a vehicle’s drive shaft and associated joints.

Fascia - flexible material commonly used as a bumper cover (may extend below the bumper).

Forks - devices attached to the lift bar (also see “Tow Bar”) for lifting a vehicle by the axle, frame or structural member. May be classified as chain, axle or frame forks.

Front Axle Weight (FAW) - the curb weight (unloaded weight) of the front axle or front axle combination.

Grab Hook - a chain hook that will not slide; used with safety chains and some tow sling hook-ups.

Gross Axle Weight Rating (GAWR) - the front or rear axle weight. This is the value specified by the vehicle manufacturer as the load-carrying capacity of a single axle system, measured where the tires touch the ground.

Gross Combination Weight Rating (GCWR) - the gross vehicle weight rating (GVWR) of the power unit (tow truck), plus the GVWR of each vehicle in the combination (the vehicles(s) being towed or transported). GCWR includes everything that moves with the towing or transporting vehicle.

Gross Vehicle Weight Rating (GVWR) - the weight of a vehicle, consisting of the unladen weight plus the maximum carrying capacity recommended by the vehicle's manufacturer.

Hazard Light(s) - flashing, rotating/revolving or oscillating yellow or amber light(s) on a tow truck.

Headboard - a vertical device of sufficient strength, permanently affixed (usually to the bed) between the load and the cab of the towing vehicle, that serves to protect the cab and its occupants.

Heavy-Duty - a tow truck with a GVWR of over 26,000 pounds that is designed to tow or transport large buses, trucks or trailers, heavy construction equipment and/or farm machinery.

J-Hook - an attachment device used for towing that is placed under the lower control arms of a disabled vehicle's suspension.

L-Arm - same as "Wheel Arm": a device that attaches to the lift bar for engaging the tires of a towed vehicle.

Lift Bar - a transverse, horizontally pivoting member attached to the boom of a wheel-lift or under-lift, to which towing accessories can be attached.

Light-Duty - a tow truck with a GVWR of 8,600 to 10,000 pounds that is designed to tow or transport automobiles, pickup trucks and small vans.

Mast - the structure that houses the boom and winches. Also called a “winch frame” or “wrecker frame”.

Medium-Duty - a tow truck with a GVWR of 10,001 to 26,000 pounds that is designed to tow or transport medium-size trucks, buses and recreational vehicles, as well as smaller vehicles.

Overhang - the horizontal distance from the centerline of a single rear axle or the center point of a tandem rear axle, where the vertical component load is imposed, to the center of the lift point.

Power Takeoff (PTO) - a mechanical device used to transmit engine power to auxiliary equipment. A power takeoff can be mounted on either a main or an auxiliary transmission. Front-mounted and flywheel-mounted power takeoffs are also used in various applications.

Pulley - a wheel grooved for a cable/belt to transfer power.

Pusher Axle - in a tandem axle, the rear drive axle, with a free-rolling or “dead” axle in front of it. Also see “Tandem Axles”.

Rear Bed Stabilizer - the fixture extending below the tilt bed of a car carrier that makes contact with the ground prior to full extension.

Safe Towing Capacity (STC) - the amount of weight or load that does not cause more than a 50% loss of the original unloaded front axle weight (FAW).

Safety Chain(s)/Cable(s) - devices used as a secondary coupling system to connect the towing and towed vehicles, and to help prevent separation of a vehicle trailer, converter dolly, or towed vehicle from the towing vehicle.

Safety Wrap - to wrap the tow chain(s) around the grab hooks of the tow bar inboard of chain.

Securing Device (primary) - a strap, chain or mechanical device which, when attached from the bed or lift bar, limits the potential for separation of the disabled vehicle from the carrier or towing lift bar.

Sheaves - same as "Pulley": wheels grooved for a cable/belt to transfer power.

Shock Load - a force that results from rapid impacting and/or jerking.

Snatch Block - a single or multiple pulley used to reduce line tension or change cable direction.

Spacer Block - a device used in conjunction with a 4-inch \times 4-inch wood beam to provide additional clearance between the tow bar, chains and the body of the vehicle.

Spoiler - a cosmetic wind drag device mounted on the trunk lid of a vehicle.

Swage - a cable termination in which the cable ends are braided and a sleeve is placed over the end of the cable and pressed together by a special hydraulic press.

T-Hook - a device on a chain (usually at the end) used to secure a vehicle being towed. Generally replaces a grab hook.

Tag Axle - an auxiliary axle installed in conjunction with the rear axles of a truck chassis. A tag axle is installed behind the rearmost drive axle, thereby extending the length of the wheelbase. Also see “Tandem Axles”.

Tandem Axles - two rear axles (three axles placed together is sometimes referred to as a tri-axle tandem).

There are three tandem axle drive types:

- a. Dual Drive Tandem: Both axles have drive mechanisms and are connected to the engine power unit.
- b. Pusher Tandem: Only the rearmost axle is the driving type; the forward unit is free-rolling (load-carrying only), commonly called a "dead axle".
- c. Trailing Axle Tandem (Tag Axle): The forward unit of the tandem is the driving type, while the rear unit (tag axle) is free-rolling.

Thimble - a shield to protect cable at the hook assembly.

Torque - the force that acts to produce a rotation.

Tow Bar - a transverse, horizontally pivoting member to which towing accessories can be attached. Used to position a towed vehicle behind a towing vehicle, especially in flat towing, in which all four wheels of the towed vehicle are on the ground.

Tow Hitch - a device for positioning and supporting one end of a towed vehicle. Used for towing lighter loads. Also see “Truck Hitch”.

Tow Sling - a device used for lifting and towing vehicles, with part of the load supported on rubber belts.

Tow Truck - a motor vehicle that tows or transports a disabled, illegally parked or abandoned motor vehicle, or a motor vehicle that has been involved in an accident (Section 148-b of the New York State Vehicle and Traffic Law).

Truck Hitch - a device for positioning and supporting one end of a towed vehicle. Used for medium-duty and heavy-duty towing. Also see “Tow Hitch”.

Under-lift - a device used for towing vehicles by lifting one end of the towed vehicle from under the axle or structural member.

Wedge Socket - a device through which cable is threaded to form a loop, and which is held in place by the pressure applied by the weight of the load being lifted.

Wheel Arm - a device that attaches to the lift bar for engaging the tires of a towed vehicle. Also see “L-Arm”.

Wheel Chock - a device, usually triangular in shape, placed in front of and/or in back of a wheel to prevent a vehicle from rolling.

Wheel-Lift - a device that tows a vehicle by lifting one end of the towed vehicle by the wheels to minimize the risk of damage to vehicles that use plastics, air foils and other aerodynamic styling features.

Wheelbase - the horizontal dimension from the centerline of the front axle to the effective centerline of the rear axle(s).

Wheel Securing Device - a strap or mechanical device which, when attached to the lift bar, limits the potential for separation of the towed vehicle from the underlift during operating conditions.

Wheel Straps - devices used to tie down the wheels of the towed vehicle, when using wheel-lift, car carrier, or dolly towing equipment, to limit the potential for separation of the towed vehicle from the towing apparatus.

Winch - a device for winding and unwinding cable.

Work Lights - the equipment on a tow truck that is used to illuminate the scene of an accident or disablement.

Working Load Limit (rated capacity) - the maximum weight or load that equipment (allowing for reasonable wear and tear) can bear under normal operating conditions. The working load limit is always considerably lower than the breaking strength rating.

Wrap - a single coil of wire rope/cable wound on a drum.