When truck owners call their vehicle a “workhorse,” it’s not just a term of endearment. Full-size pickups are worthy of the tribute since replacing the horse and buckboard as the personal choice for moving cargo. Owning a truck conveys independence; it signifies not relying on someone else when there is work at hand. While the role of today’s pickup truck has expanded into moving people and supporting lifestyles, its appeal is rooted in and often judged by its ability to haul or tow cargo.
A truck can transport cargo by two means: carry it or tow it. Both methods may be used simultaneously but the safety limitations and manufacturer’s recommendations still apply with equal significance.

**UNDERSTANDING PAYLOAD** *(See chart on page 3)*

A truck’s published payload capacity or rating is the starting guideline for carrying cargo. Payload is the weight of everything that a truck can carry and includes vehicle occupants, optional equipment, contents in the pickup bed or cabin and the tongue weight of a trailer. Many consumers believe that only cargo placed in the pickup bed is counted as payload and mistakenly do not consider passengers or other factors that add weight to a vehicle, such as options or additional equipment.

The maximum payload capacity is determined by subtracting the vehicle curb weight from the manufacturer’s gross vehicle weight rating (GVWR). It’s easy to see that different cab/bed configurations will have different maximum payload ratings if the trucks have the same GVWR. A regular cab truck weighs less than a crew cab, so the payload capacity is usually higher for the regular cab, providing the GVWR is the same for both vehicles. When calculating maximum payload capacity, it’s important to note that the manufacturer’s published curb weight may differ from the actual vehicle weight due to factory or dealer options. And remember that the shipping weight listed with the vehicle documents does not allow for a full tank of fuel. Owners expecting to haul loads approaching the published payload rating for a particular truck configuration should weigh the vehicle at a commercial scale with a full tank of gas to ensure that the GVWR is not exceeded when the expected passengers and cargo are loaded.

* See “CAUTIONS” at end of section
Curb Weight
This is the base weight of a standard-equipped vehicle that’s ready to drive. It has a full tank of fuel, spare tire, coolants and lubricants. Curb weight does not include optional equipment, passengers or cargo.

Payload
The combined weight of all cargo and occupants that a vehicle can carry. Also called cargo weight. The payload rating is the maximum allowable weight as determined by the manufacturer.

GVW
Gross Vehicle Weight is the total of the vehicle weight and the payload.

GVWR
Stands for Gross Vehicle Weight Rating and indicates the maximum allowable weight of a fully loaded vehicle, including passengers and cargo. The GVWR is determined by the truck manufacturer and is indicated on the certification label located on the driver’s doorjam. The GVWR also includes the tongue weight of a trailer when towing.

GAWR
Stands for Gross Axle Weight Rating. It is the maximum weight each axle on the truck can support, as determined by the manufacturer. The GAWR can vary between front and rear axles, and the rating is largely determined by the load-carrying capacity of the weakest link of the respective axle/suspension combination. Therefore, changes to the springs, axle housing, wheels and tires can affect the rating. Attention to the rear GAWR is important when towing to avoid overloading.

GTWR
Stands for Gross Trailer Weight Rating. Trailer manufacturers also calculate the maximum allowable weight for a trailer and its cargo.
Total weight is not the only consideration when carrying loads. The cargo must be properly loaded and secured to ensure the safety of the truck’s occupants as well as other motorists on the road. With trucks serving so many different lifestyles and work needs, some types of cargo need special attention. Load control is another factor that must be addressed. If a load of wet dirt that weighs close to the payload capacity is positioned behind the rear axle and up against the tailgate, it can cause the rear of the truck to sag or droop. This condition may unload the front tires and affect steering control, and this unlevel stance could also redirect the headlights in a manner that blinds oncoming motorists.

**UNDERSTANDING TOWING**
The sight of a truck towing a pair of personal watercraft or travel trailer is one of the most effective advertisements for a pickup. Towing offers a way to escape life’s stresses as much as it provides a means to finish the day’s work. It’s no surprise that a very high percentage of truck buyers request a tow package, even if they don’t have a towing requirement at the time. Many shoppers want the ability to tow for future considerations or simply to enhance the resale value of their purchase.

Whether pulling a trailer full of livestock to auction or a fishing boat to a popular lake, there are challenges to towing. Weight is the critical factor in setting up a reliable towing combination. It does take two to tow but many truck owners put the cart before the horse, so to speak. Responsible towing obliges the truck owner to recognize weight limits and coordinate weight capacities with the proper equipment. A successful towing strategy takes into consideration the following points:

**TOWING CAPACITY:** Automakers publish tow ratings that are specific to individual vehicle configurations and equipment choices. These ratings don’t always match the maximum towing capacity used in advertisements. The advertised maximum towing capacity never applies across the entire

* See “CAUTIONS” at end of section
Towing Capacity

Gross Combined Weight Rating (GCWR)

truck lineup due to different vehicle weights, drivetrain options and suspension tuning. For example, a 2-wheel-drive truck has a higher tow rating than a comparably equipped 4-wheel-drive model. A regular cab is usually rated to tow more than a crew cab design. Remember, the weight of a fully loaded trailer must never exceed the towing capacity of the truck.

Tow ratings are determined by the individual automakers and always come with footnotes that set conditions for the rating. For example, certain ratings may be reduced if 20-inch wheels are used. Most tow ratings are set with just a 150-pound driver as payload. These factors must be considered when making tow-rating comparisons between different brands and different vehicle configurations. Comparing just the maximum advertised ratings can be misleading.
Even if the trailer weight is under the recommended tow rating for a particular vehicle, the total weight of the tow vehicle and trailer cannot exceed the gross combined weight rating (GCRW) of the vehicle. Some competitive manufacturers post aggressive trailer and payload weight ratings that are safe when applied separately. However, when the maximum recommended trailer weight and payload are combined, the total can exceed that same manufacturer’s GCWR.

**HITCH SELECTION:** Hitchs on factory towing packages will correspond to the vehicle’s tow rating. If the truck doesn’t have a hitch, then the following industry guidelines should be observed when selecting one:

- **Class II:** up to 3,500 pounds
- **Class III:** up to 5,000 pounds
- **Class IV:** up to 10,000 pounds

These are ratings were defined by the Society of Automotive Engineers some time ago. In recent years, however, full-size truck manufacturers have set tow ratings beyond 10,000 pounds for their vehicles. Factory tow packages include a hitch sub-frame and receiver constructed to match the automaker’s tow rating. The aftermarket has also responded to the increased towing capacity of full-size trucks by either increasing the ratings of their hitches beyond SAE Class IV, or establishing an independent Class V category.
TOWING & UTILITY

VARIOUS TYPES OF HITCHES

Fifth-wheel Hitch
Pro: Can tow heavier loads because more of the trailer weight can be positioned over the tow vehicle’s rear axle.
Con: Hitch takes up space in the cargo bed, and additional hitch weight of trailer reduces payload capacity.

Bumper-mounted Hitch
Pro: Inexpensive and quick towing solution; just bolt on the proper-size hitch ball.
Con: Limited towing capacity; may result in awkward trailer tongue angle if ball height is not even with trailer.

Weight-carrying Hitch
Pro: Most popular type of hitch with many different styles, capacities and accessories available.
Con: Effective only for small and medium-sized trailer.

Weight-distributing Hitch
Pro: Distributes tongue weight to all the axles of the tow vehicle and trailer, improving steering and brake control.
Con: More expensive than standard hitch; must be adjusted properly or will be ineffective and unsafe.
There are two types of hitches most associated with light-duty trucks: weight-carrying and weight-distributing. Both are usually built with a receiver design that allows easy removal or insertion of the respective hitch-ball assembly when needed. The weight-carrying hitch is most common and works well for small and some midsized trailers. The weight-distributing hitch is frequently used when towing higher loads and may be required for safety reasons to meet the towing capacity recommendation of a manufacturer.

The rear step bumper on a pickup can also be used for towing. A hitch ball is simply bolted to the center platform behind the license plate. It’s important to check the rated tow capacity of a bumper-mounted hitch. Besides a lower tow rating than a frame-mounted hitch, the main limitation of a bumper hitch is that the hitch-ball height is fixed and may not line up properly with the trailer.
Fifth-wheel and gooseneck trailers require special hitches that are mounted over the rear axle in the cargo bed. They are used primarily with larger trailers and heavy-duty pickups. With a bed-mounted hitch, the tongue weight can be up to 25 percent of the trailer weight, and so maneuverability is increased. The downsides are that the increased tongue weight takes up available payload capacity, and the hitch reduces cargo capacity in the bed.

**TONGUE WEIGHT:** This is the weight of the trailer that rests directly on the hitch ball. Sometimes called the hitch weight, it is determined by placing a scale directly under the trailer tongue while the trailer is level and fully loaded. The tongue weight should be about 10 to 15 percent of the total trailer weight, depending on the manufacturer’s recommendations. Negative tongue weight—a condition where the trailer actually lifts up the hitch ball—could unload the rear suspension of the tow vehicle and possibly cause traction and stability problems, especially at highway speeds. Too little tongue weight can cause tracking problems for the trailer, possibly causing it to sway. Too much tongue weight will overload the rear suspension of the tow vehicle, which could affect its steering. A weight-distributing hitch will help shift tongue weight off the rear axle and forward to the front axle. Another critical consideration: tongue weight must be included in the tow vehicle’s payload. With fifth-wheel trailers this measurement is called the kingpin weight.
TRAILER WIRING: Trailers are required by law to have turn signals, running lights and brake lights. Some trailers may also be required to have side markers and backup lights. Power for the trailer lights comes from the tow vehicle’s electrical system. Modern tow packages include either a 4- or 7-way connector, or both. Some trailers are designed with 5- or 6-way systems. The aftermarket offers converters to adapt dissimilar wiring systems.

SAFETY: Towing mirrors, trailer brakes, safety chains and a breakaway switch are usually required by law, depending on the weight of the trailer and state in which the trailer and tow vehicle are registered and/or operating. Common sense makes up the better part of towing safety, including pre-trip inspections, following routine maintenance recommendations, operating at safe speeds and periodic inspections during a trip. It’s also a good idea to have a full complement of emergency equipment such as a first aid kit and road flares/reflectors.
Towing smart is first calculating the critical weight issues and then addressing the details. A final rule of thumb: the towing capacity is really only as high as the weakest link in the system. A 6,000-pound hitch ball on a Class IV hitch that is bolted to a full-size truck rated to tow 10,000 pounds means the towing capacity of the system is 6,000 pounds. In conclusion, double check:

- **Trailer weight does not exceed tow vehicle’s rated tow capacity**
- **Tow-vehicle weight and trailer weight together don’t exceed the tow vehicle’s GCWR**
- **Tongue weight follows the trailer manufacturer’s recommendations**
- **Tongue weight, passengers and cargo do not exceed the tow vehicle’s payload rating**
- **Hitch-receiver rating is relevant to the weight of the trailer, and a weight-distributing hitch is used when appropriate.**

Trucks are used for towing, recreation and utility purposes more often than expected because its simple design is favorable to a growing range of needs. Additional information on towing and other utility operations follows in the form of expanded definitions and a Q&A section. Many of the terms just discussed are examined in depth, as are other truck-related utility topics such as toolboxes and bedliners.
AIR BAG SUSPENSION
Also called an air spring, air bags are made from high-strength rubber, shaped like a cylindrical balloon and usually mounted between the rear axle and frame. When filled with compressed air, the bags act as auxiliary springs to level the vehicle ride height when the truck is carrying heavy cargo. Popular with owners who tow, air suspensions can offer improved ride comfort because they're adjustable over a wide range of vehicle loads. Air bags used for towing and utility purposes can be inflated or deflated by the driver with an on-board compressor. Air pressure can also be maintained with an outside air source using Shrader valves, which are similar to the valve on a tire. The Shrader valve is mounted in a convenient location such as the rear bumper and connects to the air bag via a rubber hose. The bags can be filled up and the pressure checked at a gas station. Air bags designed for towing should not be confused with air-bag suspensions designed to lower a truck for aesthetic purposes (see Off-Road & Customizing section).

ALTERNATOR (HEAVY-DUTY) Device that turns mechanical energy from the engine accessory drive belt into electrical current. Alternators charge the battery and run the vehicle's electrical components. Tow packages often include heavy-duty alternators to support additional electrical devices such as trailer lights or power inverters for recreational purposes. Some truck owners will mount dual alternators for severe-duty use.

Q: What is a tow package?
A: A manufacturer's tow package typically includes preliminary hardware, wiring and vehicle upgrades to properly equip a truck for towing trailers. A base tow package includes a tow hitch frame, wiring connectors to operate the trailer lights and brakes and lower final-drive gears (higher numerical ratio). Premium packages include cooling upgrades for the engine and transmission, tow-haul mode for automatic transmission and outside mirrors designed for improved rear visibility. Items the consumer may have to provide include the brake controller and hitch-ball assembly.
**BALL HEIGHT** Two measurements are needed to select the proper ball mount that is inserted into the hitch receiver. On the tow vehicle, measure from the ground to the center of the hitch ball. On the trailer, measure from the ground to the center of the hitch-ball coupling while the trailer is parked on a level surface and parallel to the ground. The difference will determine the amount of drop or rise needed on the ball mount to maintain a level trailer on the road.

**BALL MOUNT** Part of the hitch system that supports the hitch ball. Ball mounts come in a variety of sizes to accommodate different load-carrying demands and different heights between the tow vehicle and trailer. Typical ball mounts have a hole on the tongue to attach the hitch ball and a shank hole to secure the ball mount to the receiver. Some ball mounts are adjustable to fine-tune the spring-bar setup on a weight-distributing hitch. Quick-change ball mounts have two to four different-sized hitch balls for easy transition between dissimilar trailer couplers. Class I & II fixed ball mounts are often called drawbars.

**Q:** What kinds of specialty utility items are available for pickup beds?

**A:** The aftermarket has taken advantage of a pickup bed’s capacity and potential to solve just about every niche problem: pet restraints, roll-out cargo shelves, 1-person motorcycle loading ramps, sleeping mattresses that fit around the wheelwells, different styles of pop-up camping tents, hydraulic lift gates, and even a sofa bed that can be used as a rear-facing seat for tailgate parties (certainly not to be used while the vehicle is moving).
**BATTERY (HEAVY-DUTY)** Electrochemical device for storing electricity. Tow packages often include heavy-duty batteries for easier starting and to support increased current draw from additional electrical devices on trailers.

**BED CAP** Aftermarket product that covers and encloses the pickup bed. Bed caps differ from tonneau covers in that the bed cap matches or exceeds the height of the cab. Sometimes called a truck cap, shell or topper, they are lockable and provide secure storage. Many are used for weather protection while camping. Caps can be made from aluminum, reinforced fiberglass or composite materials and are usually painted the vehicle’s body color. Different styles are available with optional features such as sliding side windows, rear door, lift hatch, skylight, dome light, brake light, sport wing, carpeted interior, remote keyless entry and roof rack.

**BED EXTENDER** A flexible cargo-control device that is installed in a pickup bed. The extender can flip outward when the tailgate is lowered to increase the capacity of the bed, or it can be flipped forward with the tailgate up, creating a separate organizer for small items.

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**Q:** What do I need for towing, torque or horsepower?

**A:** Torque will get you moving and horsepower will keep you moving. There’s an old saying that horsepower may determine how fast you’ll tow over a hill, but torque determines if you’ll get to the top of the hill.
**BED RAIL CAP** Protective covering for the top of a pickup bed rail. Popular styles include hard plastic with molded ribs, polished stainless steel and diamond-plate aluminum. They can be designed to cover or expose the stake-bed pockets. Matching caps are usually available for the tailgate top or front bed rail.

**BEDLINER** Product designed to protect the inside surface area of the cargo bed. Bedliners generally fall into two categories. A spray-on bedliner is a permanent, protective coating (usually polyurethane) that is applied under pressure through a spray gun to the inside of the bed. A drop-in bedliner is made of molded hard plastic that conforms to the bed shape and can be installed or removed at the owner’s preference.

**BRAKE CONTROLLER**
Electronic device that applies power to the trailer’s electric brakes in proportion to the vehicle’s deceleration. The brake controller is typically mounted within driver’s reach under or in the dash. There are different styles of brake controllers. The first is activated by the brake-light switch. The second is inertia activated and uses a pendulum that senses the inertia of the vehicle slowing down and applies the trailer brakes proportionally. The third is a proportional-activated model that uses a sophisticated accelerometer to measure the g-force of the vehicle’s deceleration and apply the brakes as needed. All three typically feature a switch or lever so that the driver can manually activate the trailer brakes. This is a useful feature should the trailer start to sway. Brake controllers also feature a “gain” control that allows the driver to increase or decrease the trailer brake application.
**BREAKAWAY SWITCH** Safety device that automatically activates the trailer brakes should the trailer become disconnected from the tow vehicle while on the road. Hydraulic surge brakes have a cable or chain connected to the tow vehicle that mechanically operates the master cylinder on the trailer in the event of a breakaway. For trailers with electric brakes, the system must have an emergency backup battery to operate the brakes. A cable with a pull pin operates the electric breakaway switch should a trailer become disconnected from the tow vehicle.

**BUNK TRAILER** Style of boat trailer that uses flat rails to support the boat. The rails can be carpeted or padded to avoid damaging the boat hull. The trailer must be submerged in the water to allow the boat to float on or off.

**COUPLER** Part of the trailer A-frame that attaches to the hitch ball. A cotter pin is typically used to secure the coupler in its locked position. Additionally, locks are available to help prevent theft and accidental separation from the hitch ball.

**DECK RAIL SYSTEM** Clever hardware innovation that allows multiple, adjustable tie-down points along the inside of the bed rails. C-channel brackets mounted on the rails are designed to accept multiple tie-down cleats that can be positioned anywhere along the length of the channel and tightened down to meet precise cargo-restraint needs.

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**Q:** What do I need to know about bed-mounted toolboxes?

**A:** There are many styles and types of construction, but here are the basics.
- Diamond-plate aluminum is the most popular material as it resists rust and is lightweight. Contractors often prefer steel for its lower price and ruggedness. Stainless steel is gaining popularity for its durability, rust resistance and, when polished, premium appearance. Only a small percentage of fiberglass or plastic boxes are built today.

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- A crossover box is the most popular design. It rests on the bed rails and does not extend to the bed floor, allowing lumber or long objects to be stored under the tool box. A crossover box can have a single or dual lid, and those with dual lids can be hinged in the center (called gull wing style) or at the rear of the box.

- The chest design sits on the bed floor and does not take up space on the bed rails. Some may have a raised center section to accommodate long objects.

- Side-mount boxes are usually L-shaped and run along the bed rails. Manufacturers usually have matching crossover and side-mount designs, or the side-mount boxes can run the entire length of the bed. Also called inner side box or low-side box.

- Topsider or top-mount boxes are cabinet-style designs that also run the length of the bed rails but don’t invade the cargo area of the bed.

- A wheelwell box takes up the awkward space behind the wheelwell. Also called pork chop box or saddle box. A saddle pack is a larger design that also takes up the space in front of the wheelwell and covers the entire side of the bed.

- A tailgate box is mounted to the inside of the tailgate. When the tailgate is down, it opens like a briefcase.

- A fifth-wheel box mounts in front of the tailgate and is designed to clear fifth-wheel trailer necks.

Be aware that tool-box manufacturers may use similar names for different designs. Saddle box can mean a single-lid crossover, a large chest or a wheelwell box. So double-check the manufacturer’s description and photo. Specialty boxes such as those designed for firearms or hunting dogs are available.

Tool boxes are available with numerous features and options. Important factors include type of lock, lock location, inside tray design, type of mounting (is drilling required?) and types of finishes (polish, paint, powder coat). Also of interest to truck owners are questions about compatibility with other modifications such as a bedliner or tonneau cover.
**DRAWBAR** The removable part of a ball-mount assembly that slides into the hitch receiver opening. Also called a shank. In some applications, drawbar is the “tongue” portion of a fixed-mount Class I hitch, which is designed for cars.

**DRY WEIGHT** Weight of an RV trailer without water, propane, supplies and passengers.

**ELECTRIC TRAILER BRAKE** Electronically controlled stopping device built into the trailer axle system. Most RV trailers have electric brakes, which can be drum or disc style. They are not recommended for boat trailers because the electronic components are submerged under water during launches. Electric brake systems require a brake controller, usually mounted within driver reach in the cab, and a safety breakaway switch. While there is a certain level of complexity when setting up and tuning an electric trailer-brake system, they are driver adjustable and can be operated manually. Experienced drivers use the manual option to help correct unwanted trailer yaw or fishtailing.

**ENGINE OIL COOLER** External heat exchanger that is similar to a radiator, usually a fluid-to-air type. Hot oil is routed from the oil filter to the oil cooler and back to the engine. Toyota engines typically feature an internal fluid-to-fluid type in which engine coolant is circulated around the oil-filter mount to cool hot oil. Towing, hauling heavy loads, high speeds, long drives and traveling over mountain roads can result in high oil temperatures. Excessive temperatures can reduce the oil's viscosity, reducing the oil's effectiveness. Tow packages can include supplemental oil coolers for the engine oil or automatic transmission fluid or both. (See transmission oil cooler)

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**Q: How do I measure tongue weight?**

**A:** Trailer-specific gauges are available through the aftermarket. The gauge has a hitch-ball-style top that fits inside the trailer coupler. The base of the gauge is positioned on a floor jack or on sturdy blocks so that the trailer is level with the ground. Tongue weight can also be measured at commercial scales. In addition, the vehicle and trailer weights can be measured to calculate gross vehicle weight (GVW), gross trailer weight (GTW) and gross combined weight (GCW).
**FIFTH-WHEEL HITCH** A coupling device for trailers mounted over the rear axle. The name is derived from its wheel-shaped hitch-plate. The trailer is secured with locking jaws that engage the trailer’s king pin. This design allows the trailer mount to rotate around the hitch plate, or fifth-wheel, to improve stability. Fifth-wheel hitches can tow heavier loads because the rear axle supports the trailer kingpin weight. The downside of a fifth-wheel is lost cargo space.

**FRONTAL AREA** The combined area of a vehicle body or trailer as viewed from directly in front. More frontal area means increased aerodynamic drag, or the resistance of air on the vehicle’s forward movement, resulting in lower fuel economy and on-road performance.

**FRONT-MOUNTED HITCH** Receiver hitch that is bolted to the frame in the front of the vehicle. These hitches are used for special-purpose applications such as winches and snow plows.

**FUEL TRANSFER TANK** Auxiliary tank that holds additional fuel to extend the driving range before refueling. The extra tank can also carry an alternative fuel if the truck is designed as a flex-fuel vehicle.

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**Q:** What do the different trailer wiring connectors control?  

**A:** Each wire lead has a specific function in powering accessories or lights and generally follows an industry practice, although the wires could be used to control any function on the trailer the owner desires. Here is how the wires are generally used:

- **4-pin:** Ground wire plus running, brake and turn signals
- **5-pin:** Adds backup lights
- **6-pin:** Adds electric brakes
- **7-pin:** Adds auxiliary power (e.g. refrigerator in camper)
GOOSENECK Type of trailer with a pivoted coupling arm that attaches to a large ball mount in the pickup bed. Sometimes but inaccurately referred to as fifth-wheel trailer. A gooseneck hitch allows more room in the bed than a fifth-wheel hitch. The ball should be located 2-4 inches ahead of the rear axle to distribute some of the trailer weight forward to minimize impact to steering.

HEADACHE RACK Sturdy, metal guard that prevents cargo in the pickup bed from hitting the cab. It’s usually mounted on the top of the pickup bed, using the side and front bed rails for stability. Also called a cab guard, headache racks can be designed with crossbars or wire mesh in the opening, depending on the use. Headache racks that cover the the cab-mounted Center High-Mounted Stop Lamp (CHMSL) and cargo light often have built-in lights or can be fitted with auxiliary lights.

Q: Why do some trucks have nets or bars in place of the tailgate?

A: There’s an old school of thought that driving with the tailgate removed or in the down position will improve fuel economy. The aftermarket responded with replacement tailgates designed with numerous crossbars that control cargo but allow air to flow through. Some open-air gates have large cutouts in the center to clear gooseneck or fifth-wheel trailers. Desert trucks started using nets that were lighter, and that look has carried over to the street. So far there is no conclusive evidence that open-air tailgates improve fuel economy.
HITCH BALL  Sphere-shaped attachment point between trailer coupler and the hitch. Hitch balls come in many sizes to accommodate different trailer designs but the most popular sizes are 1 \( \frac{7}{8} \)-inch, 2-inch and 2 \( \frac{5}{16} \)-inch diameter. The shank on a hitch ball is the threaded portion used for mounting. The hitch-ball rating must match or exceed the weight-class rating of the towing system. Hitch-ball ratings can differ even if the ball diameter is the same.

HYDRAULIC SURGE BRAKE  A self-contained, closed-loop brake system for trailers that does not require electrical or outside hydraulic connections. The trailer has a master cylinder, brake lines and either disc or drum brakes on the axles. There is also a lever-action coupler on the ball mount. When the tow vehicle begins to slow down, the trailer pushes on the truck through the coupler. The lever on the coupler then moves the push rod in the trailer’s master cylinder, activating the brakes. When properly adjusted, the braking action is automatic and proportional to the amount of braking applied to the tow vehicle. Because the surge system cannot tell the difference between braking action while towing and the force applied to the trailer while backing up, trailer manufacturers typically use a reversing solenoid to release all the pressure in the trailer’s brake system. Another solution is to utilize “free backing brakes” that automatically disengage while backing up. Hydraulic systems typically require more maintenance because brake fluid must be replaced on schedule and brake lines must be “bled” periodically to remove air. There is also another type of hydraulic brake system for trailers that taps directly into the tow vehicle’s hydraulic brake lines, but this system is used mostly for heavy-duty applications and rarely applies to recreational or personal-use trailering.
LADDER RACK Also called cargo or utility rack, it is a metal frame that mounts high over the bed rails, frequently in the stake pockets, to support long, awkward cargo such as ladders and pipe. The rack may extend over the pickup’s cab for extra-long items. Aftermarket racks are usually lightweight, easily removable and feature tie-downs or anchor hooks.

OVERLOAD SPRINGS Sometimes called helper springs, these are auxiliary springs usually mounted to leaf springs to help level a heavily loaded vehicle. Overload springs do not increase the vehicle’s GVWR.

PIN AND CLIP Devices used to secure the ball-mount shank or drawbar to the receiver. Different styles are available, including locking and rattle-free models.

Q: What’s the deal with bedliners and fire hazards?

A: Incidents of fires have been reported to the National Institute for Occupational Safety and Health. Government agencies, including NHTSA, and private manufacturers have issued a warning that portable gas cans should not be filled up while in a pickup bed equipped with a plastic bedliner (or in cars with carpeted surfaces). Static electricity may build up on the gas can, either from gas flowing from the pump or the can sliding around on a plastic or carpeted surface. The bedliner can act as an insulator and prevent the static electricity from properly grounding. There is a chance that during refueling, the gas nozzle, which is grounded, can generate a spark and lead to an explosion or fire. Officials recommend that all gas cans be filled up while placed on the ground and outside of the pickup bed.
PINTLE HITCH
Heavy-duty trailer coupling used mostly on military and industrial equipment but sometimes seen on agriculture and ranching applications. It loosely resembles the lobster clasp on a necklace. Mounted to the tow vehicle through a receiver hitch is a pintle hook, which looks like a set of “jaws.” The hook is secured to the trailer through a lunette eye, which is shaped like a round metal ring.

PTO Abbreviation for Power Take-Off. A PTO is a power transfer device driven by the transmission gears. It often drives a hydraulic pump that can be used to operate heavy-duty equipment such as a bed dump or plow. Heavy-duty trucks usually have a PTO fitting on the transmission. A PTO is rarely found on light-duty trucks.

Q: What are the pros and cons of spray-on and drop-in bedliners?
A: • Spray-on pros: available in different colors; very effective in resisting rust; good for dampening sound and vibration.
  • Spray-on cons: bed surface must be scuffed to accept the coating; surface thickness and texture depend on the skill of technician; coating is permanent and difficult to repair if truck is in collision; coatings may fade in sunlight; coatings can add weight to vehicle, depending on thickness.
  • Drop-in pros: easy installation and removal; advanced designs offer load-control options; ribs provide dent protection or two-tier loading; generally less expensive.
  • Drop-in cons: moisture can collect under liner and lead to rust; the liner can rub against the deck of the bed and damage the paint.
**RECEIVER** Square opening on the hitch frame that “receives” the ball-mount shank or drawbar. Sizes of the opening include 1 inch, 1 5⁄8 and 2 inches up through Class IV. In the aftermarket, some hitches labeled as Class V utilize a 2-inch square opening. When not used for towing or utility purposes, the opening should be protected with an end cap. Different designer logos and emblems are available to offer a polished appearance. Some custom-made hitches have a round opening for a more pleasing appearance.

**ROLLER TRAILER** Type of boat trailer that uses self-centering roller assemblies to guide and support the boat. Generally preferred when ramp conditions are poor or where there are extreme tidal conditions.

**SAFETY CHAINS** Set of heavy-duty chains designed to keep the trailer close to the tow vehicle if there is a hitch failure. The chains are connected to the trailer A-frame and attached to the hitch. Most hitches have designated mounting loops or brackets near the receiver or ball mount to attach the chains with positive-latching hardware such as a spring-loaded snap ring. Some states don’t allow S-hooks that could vibrate off the hitch. The chains should always be crossed underneath the hitch to cradle an unhitched trailer. There should also be enough slack to avoid binding during a turn but not too much slack to avoid dragging on the road.

**Q:** What is better, bolt-on or weld-on tow hitch?

**A:** Welding any truck accessory to the frame is unnecessary and may hurt the value of the vehicle. In the event of a collision, repair costs could be much higher. Bolt-on hitches are remarkably strong and can be removed if necessary.
**SHANK** The removable portion of the hitch system that supports the hitch ball or adjustable ball mount. Also called a hitch bar, insert or drawbar, it slides directly into the receiver where it is secured with a pin and clip. The shank must be the same size as the receiver. Ball mounts are offered with different-length and different height shanks to accommodate special needs. Shank length is determined by measuring from the pinhole to the ball-mount hole. A shank also describes the threaded mounting portion of a hitch ball.

**SPRING BAR** Critical parts of a weight-distributing hitch. When installed and tensioned properly, the spring bars operate like the handles of a wheelbarrow, distributing some of the trailer’s hitch weight to the front axle of the tow vehicle and the trailer axles.

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**Q:** Why do some trailers need converters for the trailer taillight wiring?  

**A:** Most late-model tow vehicles use the international lighting system in which the turn-signal lights are separate from the brake lights. The easy way to check is that the amber lens on the taillight is for turn signals and the red lens is for the brake light. This is often called a 3-wire system. Trailers made with the American lighting system combine the turn signal and brake light, creating a 2-wire system. A converter is needed so the different systems can work together. The converter is either a small, waterproof box that must be mounted on the trailer, or it can be built directly into the wiring connector.

**Q:** What are the best ways to secure loads?  

**A:** The aftermarket offers many varieties of ratcheting tie-down straps and cargo nets that are far superior to rope. Cargo storage boxes and organizers are also available for pickup beds. Adjustable tie-down locations, like those on the deck-rail system, provide greater flexibility in securing different-sized cargo loads.
Q: What’s needed to adapt a slide-in camper?

A: First, a little math. Weigh your pickup with a full tank of gas and normal traveling load of passengers and cargo. Subtract this weight from the vehicle’s GVWR, and that number is the proper guideline for selecting a slide-in camper and for determining how much towing capacity might be available in addition to the camper weight. Certain suspension modifications such as air bags or aftermarket shock absorbers will help maintain proper ride height after a camper is installed, but these modifications never increase the GVWR.

STAKE POCKETS Square holes in the top of the bed rails originally used to mount stakes that helped manage unwieldy cargo items. Fences or pens were built around the stakes to hold loose cargo like cotton and even animals. More sophisticated, purpose-built cargo systems and trailers are available today, nearly eliminating the need for stake pockets. While stake pockets can assist with cargo management, many trucks are sold with bed-rail caps that cover up the holes. These caps feature cut-outs to expose the stake pockets when needed. Different styles of tie-downs designed to mount in the stake pocket are available through the aftermarket, including those that pop up when needed.

SUPER LONG LIFE ENGINE COOLANT Pink, silicate-free cooling fluid now standard on all Toyota models. The coolant is designed to last 100,000 miles with initial fill from the factory, then 50,000 miles with each flush and replacement. Cooling and maintenance are critical issues for truck owners who tow or haul heavy loads.
SWAY CONTROL DEVICE
A horizontal shock absorber for the trailer hitch. By using friction or cam-action devices, sway-control systems are designed to dampen trailer yaw or fish-tailing by absorbing the pivot action between the tow vehicle and trailer. Sway controls also help lessen the effects of wind gusts or buffeting caused by other vehicles on the road.

TIE-DOWN Term has two meanings. It is the anchor point in a truck bed, usually designed as a hook, loop or cleat, by which cargo can be secured. Most cargo beds feature between two and eight tie-down points that are either welded or bolted to the bed, typically in the corners. Bed tie-downs can also be mounted on sliding rails, either on the cargo floor or bed rails. Tie-down also refers to a length of nylon webbing with a hook at each end and a ratchet to take up slack. May be referred to as a tie-down strap; these are used to secure motorcycles, ATVs and other bulky cargo in a pickup bed.

Q: How does a tonneau cover improve fuel economy?
A: By reducing the low-pressure area directly behind the pickup. As air flows over the open bed of the truck, turbulence in and around the bed can create drag. A tonneau cover allows air to flow smoothly over the bed. Racetrack and wind-tunnel tests have confirmed the effectiveness of tonneau covers in reducing aerodynamic drag, but fuel economy improvements may not be significant and will vary depending on the design of the truck or tonneau cover.
**TOW MIRROR** Outside rear-view mirror that offers a wider angle of view and can telescope or extend outward from the tow vehicle for a clearer view down the side of a long trailer. Some tow mirrors may offer two elements: one with a normal view and a smaller wide-angle view to eliminate blind spots.

**TOY HAULER** Enthusiast term for a sport recreational trailer equipped with a storage area to hold motorcycles and ATVs and an integral ramp for easy loading and unloading. Big toy haulers usually feature kitchen, sleeping and toilet/shower facilities. They can be equipped to mate with a conventional receiver or fifth-wheel hitch, depending on the weight.

**TRAILER LAWS** Towing regulations are not the same from state to state. The primary differences are lighting requirements, trailer weight that requires a trailer brake, trailer weight that requires breakaway brakes, trailer lengths and whether safety chains are required. States also have specific use laws that cover the height of a trailer or cargo on a trailer and whether brakes are required on every axle.

**TRAILER YAW** Technically the rotation of a trailer about its vertical axis, but in common terms it’s when the trailer fishtails or exhibits an uncontrolled sideways movement. Also called sway.

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**Q:** Why do some owners remove the rear bumpers or ask for bumper-delete trucks?

**A:** With the bumper and tailgate removed, the truck can be backed up flush to a loading dock so a dolly can be used to load or unload cargo. Some owners may replace the rear bumper with a roll pan (see Off Road & Customizing section) purely for aesthetic purposes.
TRANSMISSION COOLER
Similar to the engine oil cooler, vehicles equipped with automatic transmission usually have a fluid cooler built into the radiator. Trucks equipped with tow packages often have a supplemental transmission cooler. The Toyota tow package includes a thermostat mounted on the automatic transmission that monitors fluid temperature. When the transmission fluid reaches the target temperature, the fluid is routed to an auxiliary fluid-to-air cooler mounted in front of the radiator.

Q: What are the vertical slots on the sides of the cargo bed and on some bedliners used for?
A: Load control. Lengths of 2x6 or 2x10 wood can be cut to fit in the slots between bed sides to create partitions in the bed. Different sized items can be easily secured and managed in each partition. If the wood partitions are not too tall, the two-tier loading function can also be utilized at the same time.

TWO-TIER LOADING Method of supporting cargo above the wheelwells in a pickup bed. The sides of the bed are notched to hold lengths of 2x4 wood that are positioned across the width of the bed. A 4-foot wide sheet of plywood will then lie flat across the 2x4s and above the wheelwells, leaving room underneath for smaller items.

V-5 Old industry standard for hitch safety that was established by the hitch manufacturers. The V-5 designation is no longer used. Instead, hitch manufacturers test their products under new guidelines established by the Society of Automotive Engineers. Hitches that meet the new standards are given a SAE J 684 label.
WEIGHT-CARRYING HITCH Type of hitch system where the entire trailer tongue weight is supported by the hitch ball and transferred to the rear axle of the tow vehicle through the hitch framework. Sometimes called a dead-weight hitch.

WEIGHT DISTRIBUTING HITCH
Type of hitch system that uses spring bars to spread a portion of the trailer tongue weight to all axles of the tow vehicle and trailer. The spring bars, when under tension, operate like the handles of a wheelbarrow to shift weight off the tow vehicle’s rear axle. Also called a load-equalizing hitch. If set up improperly, a weight-distributing hitch will technically become a weight-carrying hitch.

WET WEIGHT Weight of an RV trailer with freshwater and propane tanks filled.

Q: What are the dangers of overloading a pickup?
A: Overloading a pickup can lead to unstable handling, sluggish acceleration, poor fuel economy, compromised braking, compromised steering and handling performance, poor response in emergency avoidance maneuvers and a higher center of gravity. Excessive weight may also place undue strain on the engine and transmission, damage vehicle suspension components and cause accelerated or uneven tire wear or failure. A strong word of caution: aftermarket suspension modifications cannot increase the truck’s GVWR or payload capacity beyond the manufacturer's specifications.*

* See “CAUTIONS” at end of section

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CAUTIONS

Payload: Payload is the GVWR minus curb weight and includes weight of occupants, optional equipment and cargo, limited by weight distribution. Payload is not the Vehicle Capacity Weight as defined by FMVSS 110, which will vary according to installed optional equipment.

Towing: Before towing, confirm your vehicle and trailer are compatible, hooked up properly and you have an necessary additional equipment. Do not exceed any weight ratings and follow all instructions and cautions from your trailer hitch manufacturer and vehicle Owner’s Manual. The maximum amount you can tow depends on the total weight of any cargo, occupants and available equipment.