

MST SDEL C Driver Training Program

PURPOSE: This program is designed to prevent injury and property damage associated with the use of University vehicles. Its goal is to ensure that students who use the various trucks and trailers belonging to the SDEL C operate such vehicles in a safe and responsible manner.

Vehicles typically used for SDEL C tasks and events are larger, heavier, incur more risk, and require more caution to operate than standard passenger vehicles.

This training manual is provided for, and limited to, vehicles owned, managed, borrowed, or rented by the MST Student Design & Experiential Learning Center. This includes the one-ton pickup trucks, vans, and associated trailers, and does NOT qualify individuals to operate specialty vehicles such as forklifts, which may be borrowed from other MST departments.

POLICIES:

Licenses: Every faculty, student or staff member must have a **valid driver's license** from Missouri or their home state before being allowed to drive a university vehicle. A Commercial Drivers License, Class E or Chauffeur's License is not necessary to operate SDEL C vehicles.

No student will be allowed to operate SDEL C trucks and trailers without being trained in their proper operation UNLESS they have shown through example or previous training (grandfathered) that they have the necessary skills. This primarily refers to students who have been approved by SDEL C staff based on their previous performance or training.

Driving record. Each student who applies for driver training will submit a copy of their driver's license so that MST police dept can check the individual's driving record for excessive violations.

Seat belt use is mandatory in all University vehicles, regardless of distance driven. It is the responsibility of each vehicle driver to ensure that all passengers comply with this law. If a passenger refuses to comply with this policy the driver will not move the vehicle; if a passenger still refuses to comply with this law they will be removed from the vehicle and barred from riding in any and all SDEL C vehicles. If a passenger is removed from a vehicle for the above reason, transportation costs to or from the event will be the sole responsibility of that passenger, and will not be reimbursed by the team, the SDEL C, or the university.

Long distance trips: no University vehicle may be operated beyond midnight or longer than 18 driving hours regardless of ending time. Teams are prohibited by university policy from driving through the night. Trips may start no earlier than 6 a.m., and must either be completed by midnight, or the team must stop and obtain lodging for the night. No exceptions will be made for using multiple drivers to avoid such restrictions. Drivers should rotate every two hours, and not take more than three driving shifts. In all cases the front seat passenger should remain awake to keep the driver alert during all shifts. Vehicles may be driven on a local basis beyond midnight, such around campus or at competition sites where a team will be based for a specific period of time. Typical examples would be shuttling teams back and forth from event sites to hotels.

Van use is limited to 10 people, including the driver. All vans, especially fifteen-passenger vans, have a higher center of gravity than passenger cars and present a high risk of rollover in the event of loss of control. When cargo is carried all windows must remain clear of obstruction to aid in driver visibility and to keep the center of gravity as low as possible. Vans may not be used to tow trailers, or be equipped with roof-mounted devices (except radio antennas or roof-mounted safety equipment).

Accident reporting procedures: In the event of an accident which causes any property damage or injuries, immediately call the local police, and also notify **all** MST faculty or staff who may be present at the event site. Fill out a MST Form 5, Vehicle Accident Report, immediately. Attempt to locate the owner of any other vehicles or property that may have been damaged. **DO NOT ACKNOWLEDGE RESPONSIBILITY FOR AN INCIDENT.** Any incident, to include theft or vandalism must also be reported to SDEL C staff and the MST Police Dept (573-341-4300) on the day the incident occurs.

VEHICLE OPERATION:

Pre-trip procedures: Before the driver moves a vehicle, first ensure that all obstructions near the vehicle are moved from near the vehicle. Adjust all mirrors. Clean the inside and outside of the windshield for maximum visibility. Clear all windows of ice. Check trailer lights for full operation. Remove all wheel chocks. All occupants use their seat belts.

Diesel engines require different starting and operating procedures than those of gasoline engines. Gas engines use spark plugs to initiate combustion, and diesel engines use compression and glow plugs which must be preheated PRIOR to starting the engine.

Starting procedures: The key must be turned to the "run" position so that all the instruments are illuminated. There is a spiral, or coil, dashboard indicator that indicates the glow plug status. The key must remain in the "run" position until the glow plug light goes out; the time necessary for the light to go out depends on the air temperature and the time since the engine was last running. In colder weather the light may take as long as 15 seconds to go out. Once the glow plug light has turned off, turn the key to the "start" position until the engine starts. If the engine does not start in 5-6 seconds, turn off the key briefly and try again using the same procedures. Do NOT pump the accelerator during this process. If the air temperature is very cold (at or below 20 degrees), allow the engine to idle for thirty seconds or more before driving. In extremely low temperatures the engine may not allow the vehicle to travel more than 5 mph until systems have warmed up. For extreme cold weather (below 20 degrees overnight) engine block heaters must be plugged in overnight to keep the engine warm and to allow it to start without excessive wear on the engine components. Remove the heater cord BEFORE starting the engine, so that the driver does not drive off with the heater cord still attached and cause damage to the cord, the vehicle, the building, or passersby. Once started, allow the vehicle to idle for one minute before operating.

Driving a diesel engine: Diesel engines provide a lot of power and excellent low-end torque compared to gasoline engines, but they still must be driven gently to maximize engine life, fuel economy, and safety. When starting from a dead stop drivers must pull ahead slowly even when not pulling a trailer. Black smoke or soot coming from the tailpipe is an indication of too rapid acceleration. To get the highest MPG increase speed gradually until cruising speed is reached.

Driving a gas engine vehicle: Gas motors are more responsive but must be driven gently to maximize fuel economy and minimize wear on drive train components. Accelerate and decelerate slowly to conserve fuel, minimize passenger discomfort and shifting loads, and increase safety margins for other nearby traffic. In extremely cold conditions allow the engine to warm up for a few minutes before driving at highway speeds.

Post-trip procedures: Always refuel the vehicles so that teams who may use the truck the next day. Clean out the cab and bed of the vehicle. Clean windshield and front driver and passenger windows (inside and out). Turn in all fuel credit cards and receipts.

Multiple vehicles: When teams travel with the truck, trailer, and van, the van should follow the truck/trailer at a safe distance so that the van driver and passengers can observe any problems with the larger vehicles. Tire failure, trailer damage or other problems with the truck/trailer can be quickly reported and remedied. In the event of driving in urban areas or near the team's destination, the van can go ahead to alert the truck driver of traffic conditions and instructions.

Parking/backing procedures: Whenever possible use two spotters/ground guides while backing any van, truck or truck/trailer. It is essential that the driver and spotter have a clearly understood communication system, and that no one else talk to the driver unless there is a dangerous situation. Turn off the radio, and open the front vehicle windows so that each can hear each other. The rear spotter must ensure that he is always visible to the driver, either directly, or in the vehicle's mirror. The other spotter must block traffic whenever a turning vehicle will interfere with traffic, such as when backing into the SDLEC shop areas.

During backing operations the rear spotter must clearly indicate the remaining distance behind the trailer and any other vehicles, either by loudly calling out the distance (10 ft, 5 ft, 3 ft., etc.), or by visual means such as spreading ones arms widely to indicate plenty of room. Simply waving a hand backward does not give the driver

ample information to judge speed and direction. If the driver cannot hear or see the spotter, he must cease all movement until visual and/or verbal communication is restored,

When backing a truck to a trailer to hook up, the spotter must signal which direction the ball needs to go to correctly line up with the trailer tongue. The spotter must also signal the remaining distance as described above, as well as to indicate to the driver to go slower. This is best done by standing on the trailer tongue so that the driver can see the directions in the rear-view mirror.

Trailer Loading: If a trailer doesn't tow properly when all the basic rules have been followed, the answer can be very complex, because the result can be an oscillating trailer. This is usually caused by a trailer that is "tail heavy", and adding more tongue weight will cure the problem. The moment a rig shows any tendency in this direction you should slow down and get some expert help on it. Oscillations are very complex because they can be the result of several components working in unison. Speed and wind are two of these components, so you should never drive faster to try and eliminate the oscillation or any other problem. You should start off by towing the trailer without any load.

Vehicle and trailer brakes: You can't have too much brake. Disk brakes are better than drum brakes. Four electric brakes on your trailer are better than two. New pads are better than old pads. You get the idea. You should be able to stop your rig on a hill without the trailer brakes. If you can't, you'd better pay a lot more attention to that corroded connector you have been hooking up to your trailer.

To develop braking skills, get on a lonely road without any traffic and try practicing panic stops. Of course, don't just slam on your brakes. You should try to slowly shorten your stopping distance by applying more pressure. Don't take it to the point that you lose control; just enough to get a feeling what it takes to make a quick stop and the distances involved. You will find yourself leaving more room in front of you once you make this test. Don't ride the brakes going down hills as this overheats brakes, causing them to lose effectiveness. Use the engine and lower gears to control the downhill speed on long hills. If you think adjustment is necessary, please contact the SDELC staff immediately or take the trailer to a trailer/RV repair shop. Remember that the slightest pressure to the brake pedal will apply the electric brakes. Keep your foot off the brake pedal unless you intend to use them. They shouldn't be allowed to be on for extended periods. The basic "drag" of these brakes are set with the control, not how hard you press the pedal. A pendulum type control will electronically adds more brake as you stop, but if you have your controller turned all the way up, the slightest pressure on the pedal could lock your trailer brakes.

THE TRAILER BALL AND SAFETY CHAINS: The ball should be located so the trailer sits level when connected to the tow vehicle. The vehicle should be able to accept this weight without a major change of attitude. The ball should be lightly greased so the hitch rotates smoothly on it. Safety chains should be long enough for tight turns and be crossed (right to left and left to right). This will help create a "saddle" if you have a tongue failure and will help maintain control while stopping. Don't allow these chains to drag on the pavement, because they can be ground to an unsafe condition in a very short amount of time. Always inspect the hitch and tongue for cracks when hooking up. Rust is your enemy and can cause premature failures. Check lights and brakes each time the trailer is hooked up. Try to do things in the same order each time and use a checklist. Don't forget to **retract the jack all the way up** so that it will not drag when crossing humps and damage the jack or trailer. Don't ever hook a trailer up halfway or you may forget to finish the job. Don't start if you can't finish, and don't ever leave the receptor pin out for a minute.



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TRAILER LIGHTING AND CONNECTIONS: All your lights must work to be legal and safe. The weakest link is the connector. They corrode easily and need constant attention to keep the system working. Be careful when cleaning connectors not to short them out. The wiring to the connector should be carefully routed so that it can't come apart in tight turns or chafe through and short out. Remember, electric brakes also run through this connector. Have an observer confirm your brake lights, blinkers and running lights are working properly each time you hook up.

TIRES AND WHEEL BEARINGS: Tires have to be checked frequently with a trailer because a flat can go unnoticed on multiple axle trailers while it is being towed. Running with a flat can cause it to catch fire and bum up your rig. With multiple axles or tandem wheels it is hard sometimes to see a flat tire as the other tires are supporting the weight of the rig and the flat spot is less noticeable. That is why having the MST or other vehicle follow the truck/trailer is a good policy. A quick check can be made by "thumping" each tire with a tire iron or rod to make sure they all sound the same. Each time you gas up, walk around the trailer and give a quick check by feeling each tire with your hand. A tire that is getting low will be hotter than the rest. There is no substitute, however, for actually measuring tire pressures to make sure they are all within safe limits. This should definitely be done before each trip.

NOTE: The most common causes of tire failure are overloading and under inflation. Both result in excess flexing of the sidewall which causes heat buildup and eventual failure. Continuing to run with a flat can cause it to catch fire.

WHEELS AND LUG NUTS: Trailers have higher wheel loading than passenger cars or trucks. Tandem axles do not steer, and wheels are subjected to high twisting side loads in tight, slow turns. This causes the wheel to flex which tends to loosen wheel lug nuts over time. Always check lug nut torque before each trip. Wheel lug nut torque is usually much higher than that specified for passenger car wheels. Check your particular trailer's recommended specifications. Most are in the 90-95 ft.-lb. range. On a new trailer, check the torque on all wheels after the first 25-50 miles of towing. Also recheck any wheel that has been removed and replaced after towing 25 to 50 miles. Do not drive a loaded trailer with a missing lug nut or damaged lug bolt. Wheel lug nuts are usually torque in a "star" pattern for 5- and 10-bolt wheels, crossing over to opposite sides as you work around the wheel. A "cross" pattern is used for 4-, 6- and 8-bolt wheels. Shown above are some suggested orders for tightening nuts on various bolt patterns. Using the numbers on the above diagram, a popular alternate for the 5-bolt pattern would be a 1-2-5-4-3 star pattern.

WHEEL BEARINGS: Axle wheel bearings also occasionally need attention. Feel with your hand at the hub to check for one that may be running hotter than the rest. (Be careful. If the bearing is adjusted too tight or is running without grease it can get VERY hot!) A hot bearing needs immediate attention. Most often either more grease or proper adjustment will ease the problem, but replacement may be necessary. Boat trailers are a particular source of wheel bearing problems as they are often put in and out of the water. A warm bearing that is suddenly cooled by being immersed in water tends to suck water into the inside as the air cools and shrinks. The water causes the bearings to rust and fail. Spring-loaded pressurized bearing caps are recommended to eliminate this problem. They are cheap and work great.

PLACING THE LOAD: It would be overly simplistic to say, "put the heavy items over the axles". Sometimes a lot of little items can far outweigh one big one. The value of an item should be one of the first considerations of where it is put in a trailer. Arrange the load so that these items are protected by their location. Don't put big, heavy items in a place where they can't be securely tied down. A glued down rug makes a great floor for a cargo trailer. Things stay put and don't slide around. Of course, it would be easy to say everything should be securely tied down but it would be also unrealistic. Start with top-heavy items if you have them. That's usually a good place to start because you must have plenty of room available to properly tie them down.

Tying them straight down is not secure enough. They need to be tied off at several angles or they could fall over in an abrupt change in speed or direction. You need room to accomplish this. Smaller items can be used to fill the spaces around them later.

Once you have the heavy items located, check the tongue weight. If the load is radically off, make the changes necessary to get close. The smaller items can be loaded in such a way that they balance out the load. They should be located so that they will stay put. Placing them next to items that have already been tied down helps, but your main concern should be to not lose the balance of the trailer. Don't forget you can also get one side of a trailer a lot heavier than the other without a little planning. This can cause a very serious problem when cornering, even causing the trailer to turn over in a sudden turn.

Top- heavy loads can cause problems not only in cornering but also in hard braking. They have a tendency to make the trailer "dive" in hard braking conditions. This suddenly increases tongue weight and can decrease front axle loading just when you need steering and those big front disc brakes the most. Center top-heavy items or arrange the remainder of the load to act as a counter weight to minimize this effect.

Never place heavy objects on add-on devices hung on the rear bumper or placed across the tongue frame. A bicycle may be fine to hang out in back, but not a motorcycle. This places heavy objects where they will

dramatically affect handling in corners or bumps. Heavy weights placed well behind the axle can also aggravate swaying in turns.

DETERMINING MAXIMUM GROSS TRAILER WEIGHT

Your trailer's springs, axles, tires and chassis were all designed to handle a certain maximum load. This load consists of the empty trailer itself, plus the added weight of cargo that you add. This is called the Gross Vehicle Weight Rating or GVWR. In addition, each axle has a maximum weight that it was designed to support. This is called the Gross Axle Weight Rating or GA WR.

The total of all axle loads plus the tongue weight should not exceed the GVWR.

CARGO CAPACITY = GVWR - Empty Trailer Weight

Overloading a trailer beyond its rated capacity, even though it may be well balanced and seem to handle fine, is a very dangerous practice. Eventually something is bound to fail with dramatic and unpleasant results. Overloading places excess strain not only on your tow vehicle causing possible failures at the hitch or in your capacity to safely bring it to a stop in an emergency, it also overloads the trailer's frame, axles, bearings and tires.

It is up to you to find out what the maximum gross weight of your trailer should be. Trailers made by reputable manufacturers should contain a tag or instructions which list loading limits. This can be more of a problem if you have a trailer built twenty years ago by a company that no longer exists and the tag or instructions are missing. If you cannot obtain actual figures from the original manufacturer, take it to a reputable trailer sales or repair facility and get an expert to give his best estimate of its capacity.

DRIVING PRACTICES

"EGGSHELL" DRIVING. To minimize fuel consumption and vehicle wear and tear, as well as to promote safety, a driver should always drive as if an egg is situated between the driver's right foot and the accelerator and brake pedals. By using this concept a driver will accelerate gently until cruising speed is reached, and brake more gently at an earlier point on the road. As other traffic moves ahead more quickly the distance between the MST vehicle and cars ahead of it will increase, providing a greater safety zone between the larger SDELIC vehicle and those around it. This will provide a greater braking distance so that the driver can more gradually bring the van/truck or trailer to a full and safe stop.

Steady force on the accelerator: A driver who drives by constantly pushing down on the gas pedal and releasing it will waste fuel, make his passengers uncomfortable, increase maintenance on the vehicle, and be unpredictable and dangerous to other motorists. Maintaining constant speed by applying gentle, steady pressure on the accelerator such that passengers can barely detect acceleration/ deceleration is the sign of a highly competent driver. Application of the 'eggshell' concept is a good reminder; pushing and releasing the pedal excessively is risky to the "egg".

Cruise control: Cruise control is a convenience feature, but it can't anticipate need. Cruise control will accelerate heavily when going up a hill, and continue to do so even when the crest of the hill has been reached.

Driving in hilly terrain: Due to the size of the SDELIC vehicles, driving in hilly terrain presents challenges. When a driver know that he will be going up an incline, it is best to build up some additional speed on the preceding flat ground so that the vehicle has a better "running start" going up a hill. The driver won't have to "muscle" the truck up a hill; he will be able to use a light touch on the accelerator, allowing the vehicle to lose some speed as the crest approaches. Just before the crest of the hill the driver can let the vehicle's momentum over the top of the hill.

Going down hills the driver should not ride the brakes; use the engine to keep speed undercontrol. "Just before the bottom of the hill, accelerate gently.

Overdrive cancellation

DRIVING IN WINDY CONDITIONS: Wind can create havoc when towing a trailer, causing oscillations or sudden pulling to one side. Thirty mile an hour crosswinds can blow you off the road with a sudden gust. For

example, say a hard gust of wind hits your rig from the left. Your rig pitches to the right and moves towards right. In order to stay on the road you turn left. With the rig leaning to the right, the centrifugal force generated by the left turn can be the added ingredient that puts you on your side, or worse yet, down the side of a ravine. The only way to help lower the risk traveling in these conditions is to slow down. This eliminates the centrifugal force that happens when you correct, and if the wind did blow you over it wouldn't be such a violent crash. The safest way is not to drive in extremely windy conditions. That's what the professional haulers do, and so should you. Park it until it's safe to continue. Wind can also have a dramatic effect on your fuel mileage when towing a heavy load. Plan your fuel stops accordingly.

WIND FROM PASSING TRUCKS: An interesting thing happens when being passed by faster moving buses or large trucks. Large vehicles develop a high pressure wave of air in front of them and low pressure area to their rear as they go down the highway. This is variable and is dependent on the shape of the truck and the existing wind conditions. The effect is such that as the truck comes up to pass on your left, first your trailer and then your tow vehicle will be pushed to your right by the truck's "bow wave". As the truck passes, the low pressure zone will then pull you back to the left. You must steer first left and then right to counter the effect. It's not particularly dangerous, but it does keep you on your toes.

HANDLING TRAILER SWAY: If swaying occurs, steer as little as possible while you slow down. Because of your natural lag in reaction time, quick steering movements will actually make things worse and cause the oscillation to increase. Application of the trailer brake usually tends to help keep the vehicles aligned, while heavy braking with the tow vehicle may reduce trailer stability. Until the problem is identified and solved, travel at reduced speeds (see previous comments about trailer loading).

URNS: The size of the SDELC bucks/trailers presents its greatest challenge during normal turn in traffic. These vehicles require a different approach to turning than normal personal vehicles.

The general rule is that the driver should pull as far into the intersection as possible before starting the turn so that the trailer wheels don't ride up over the curb, damaging the trailer, other vehicles or obstructions, or pinning pedestrians or cyclists on the curb and injuring them.

When approaching an intersection where the driver plans to turn right, the driver must use the right signal well before the intersection. The driver must check the left side mirrors, and when it is safe, move to the left well before the intersection. In a single lane road, move as far to the left side of your lane as possible; in a four lane road, move slightly into the left lane if it is safe to do so. Do not move into *all* the way into the left lane as it will tempt other drivers to move to the right and block the turn, getting pinned against the inside curb. When entering the intersection drive as far forward as possible and still be able to complete the turn, so that the trailer will be less likely to strike the inside curb. The goal is to keep the trailer traveling in a straight line as long as possible.

If the driver plans to turn left, move as far to the right as possible, and drive as far into the area as possible BEFORE starting the turn, then **make the turn sharply, turning the wheel decisively**. If there are two left-hand turn lanes, choose the *right lane*. This will allow the driver to continue as far as possible into the intersection before starting the turn; smaller vehicles will be able to use the other lane for their turns. If the driver pulls too far into an intersection to complete the turn, crossing traffic may be forced to back up to allow the truck to clear the intersection. When in doubt, proceed SLOWLY. If in serious doubt, skip the turn and go around the block. Left turns are better because unless traffic is blocked in both directions the driver is unlikely to find obstructions on the left side of the trailer.

WATCH YOUR TRAILER'S WHEELS IN TURNS: *The longer the trailer, the wider you must swing in a turn to make sure the trailer wheels clear the inside curb. Have passengers give warning when pedestrians on curb.*

SOMETHING TO THINK ABOUT: A temporary increase in loading occurs during dips or bumps in the road. A severe dip causes increased weight to suddenly be placed on hitch, axles and tires. Though hitch manufacturers take this into consideration in their designs, an overloaded or old, cracked and rusted hitch or tongue can be suddenly stressed beyond capacity, causing it to fail. Watch for bumps and large dips in the road and try to slow down for them. A conservative safety margin in loading will also be helpful in this type of unforeseen circumstance.

NOTE: Whenever the trailer is detached from the tow vehicle, block the wheels so it is impossible for the trailer to roll off on its own. Better yet, don't ever detach the trailer on any grade.

Your ability to handle and control your tow vehicle and trailer is greatly improved when the cargo is properly loaded and distributed. Refer to your tow vehicle and trailer owner's manual to find out how to.

General Handling

- Use the driving gear that the manufacturer recommends for towing.
- Drive at moderate speeds. This will place less strain on your tow vehicle and trailer. Trailer instability (sway) is more likely to occur as speed increases.
- Avoid sudden stops and starts that can cause skidding, sliding, or jackknifing.
- Avoid sudden steering maneuvers that might create sway or undue side force on the trailer.
- Slow down when traveling over bumpy roads, railroad crossings, and ditches.
- Make wider turns at curves and corners. Because your trailer's wheels are closer to the inside of a turn than the wheels of your tow vehicle, they are more likely to hit or ride up over curbs.
- To control swaying caused by air pressure changes and wind buffeting when larger vehicles pass from either direction, release the accelerator pedal to slow down and keep a firm grip on the steering wheel.

Braking

- Allow considerably more distance for stopping.
- If you have an electric trailer brake controller and excessive sway occurs, activate the trailer brake controller by hand. Do not attempt to control trailer sway by applying the tow vehicle brakes; this will generally make the sway worse.
- Always anticipate the need to slow down. To reduce speed, shift to a lower gear and press the brakes lightly.

Acceleration and Passing

- When passing a slower vehicle or changing lanes, signal well in advance and make sure you allow extra distance to clear the vehicle before you pull back into the lane.
- Pass on level terrain with plenty of clearance. Avoid passing on steep upgrades or down grades.
- If necessary, downshift for improved acceleration or speed maintenance.
- When passing on narrow roads, be careful not to go onto a soft shoulder. This could cause your trailer to jackknife or go out of control.

Downgrades and Upgrades

- Downshift to assist with braking on downgrades and to add power for climbing hills.
- On long downgrades, apply brakes at intervals to keep speed in check. Never leave brakes on for extended periods of time or they may overheat.
- Some tow vehicles have specifically calibrated transmission tow-modes. Be sure to use the tow-mode recommended by the manufacturer.

Backing Up

- Put your hand at the bottom of the steering wheel. To turn left, move your hand left. To turn right, move your hand right. Back up slowly. Because mirrors cannot provide all of the visibility you may need when backing up, have someone outside at the rear of the trailer to guide you, whenever possible.
- Use slight movements of the steering wheel to adjust direction. Exaggerated movements will cause greater movement of the trailer. If you have difficulty, pull forward and realign the tow vehicle and trailer and start again.

Parking

- Try to avoid parking on grades. If possible, have someone outside to guide you as you park. Once stopped, but before shifting into Park, have someone place blocks on the downhill side of the trailer wheels. Apply the parking brake, shift into Park, and then remove your foot from the brake pedal. Following this parking sequence is important to make sure your vehicle does not become locked in Park because of extra load on the transmission. For manual transmissions, apply the parking brake and then turn the vehicle off in either first or reverse gear.

- When uncoupling a trailer, place blocks at the front and rear of the trailer tires to ensure that the trailer does not roll away when the coupling is released. An unbalanced load may cause the tongue to suddenly rotate upward; therefore, before uncoupling, place jack stands under the rear of the trailer to prevent injury.
- Before driving, make sure your vehicle and trailer maintenance is current. This is very important because towing puts additional stress on the tow vehicle. (Review the next section of the brochure for an overview of maintenance requirements.)
- Check and correct tire pressure on the tow vehicle and trailer.
- Make sure the wheel lug nuts/bolts on the tow vehicle and trailer are tightened to the correct torque.
- Be sure the hitch, coupler, draw bar, and other equipment that connect the trailer and the tow vehicle are properly secured and adjusted.
- Check that the wiring is properly connected-not touching the road, but loose enough to make turns without disconnecting or damaging the wires.
- Make sure all running lights, brake lights, turn signals, and hazard lights are working.
- Verify that the brakes on the tow vehicle and trailer are operating correctly.
- Check that all items are securely fastened on and in the trailer.
- Be sure the trailer jack, tongue support, and any attached stabilizers are raised and locked in place.

Check load distribution to make sure the tow vehicle and trailer are properly balanced front to back and side to side.

For optimum handling, your trailer must be properly loaded and balanced. Keep the center-of gravity low for best handling. Approximately 60% of the cargo weight should be in the front half of the trailer and 40% in the rear.

When towing a trailer, drive at approximately half the speed that you would normally be going.

When you are braking, allow for much more time to stop. When you change lanes or turn, go slower and allow for greater room.

DO NOT ALLOW PEOPLE IN TRAILER WHILE TOWING.

DRIVING The additional weight of a trailer affects acceleration, braking and handling. Allow extra time for passing, stopping and changing lanes. Severe bumps can damage your towing vehicle, hitch and trailer. Drive slowly on rough roads. **STOP AND MAKE A THOROUGH INSPECTION IF ANY PART OF YOUR TOWING SYSTEM STRIKES THE ROAD. CORRECT ANY PROBLEMS BEFORE RESUMING TRAVEL**

CHECK FOR EXCESSIVE SWAY AND ELIMINATE IT Excessive sway can lead to loss of control. Sway motion should settle out quickly. Sway tends to increase on a downgrade. Starting slowly, increase speed in gradual steps. If sway occurs, adjust your trailer load and equipment. Repeat until the trailer is stable at highway speed. Do this whenever your trailer loading changes.

IF YOUR TRAILER SUDDENLY STARTS TO SWAY Turbulence from another vehicle, a wind gust, or a downgrade can cause sudden sway. So can a shift of the trailers load or a trailer tire blowout. **IF THE TRAILER SWAYS, IT IS THE DRIVER'S RESPONSIBILITY TO ASSESS THE SITUATION AND TAKE APPROPRIATE ACTION.** Below are suggestions that may apply, depending on conditions:

DO

- Reduce your speed gradually.
- Hold the steering wheel as steady as possible.
- If your trailer has electric brakes, apply the trailer brakes alone, without using the tow vehicle's brakes

DON'T

- Don't hit your brake pedal hard unless absolutely necessary. A "jackknife" can result.
- Don't try to steer out of the sway condition. Sudden or violent steering can make it worse.
- Don't speed up. Sway increases as you go faster.
- Don't continue towing a trailer that tends to sway. You may lose control during an emergency maneuver or if the conditions listed above occur.

- Balance weight from side to side
- Distribute cargo weight evenly along the length of the trailer
- Secure and brace all items to prevent them from moving during travel
- Adjust the height of the tow vehicle/trailer interface
- Apply load leveling (weight distributing hitch bars)

Most trailers and tow vehicles should be level (parallel to the ground) during travel. Check the instructions from your trailer manufacturer to make sure this is correct for your combination of vehicles.

Always cross the chains under the trailer tongue to keep tongue from striking the pavement in the event that the hitch fails.

Always chock the trailer wheels BEFORE unhooking the trailer for the tow vehicle.

Always unhook the trailer from the tow vehicle on LEVEL GROUND. If no option exists other than unhooking on sloped pavement, chock the wheels on the downhill side of ALL wheels. Place the chock squarely behind the tires and SNUG against each tire.