Changing Traction Conditions

Fact Sheet 10.3
Content Information

Traction and Preventing Loss of Traction

Traction

Traction or adhesion is the grip between the tires and the road surface that allows a vehicle to start, stop and/or change direction. Reduced traction increases the risk of skidding, loss of control and a collision.

Slippery conditions

- Traction is reduced when there are any foreign substances on the road surface, such as water, snow, ice, gravel, sand, wet leaves, or loose dirt.
- The effects of limited traction are particularly dangerous in curves and turns.
- Some road surfaces lose some of their surface friction with wear, aggravating the loss of traction with slippery conditions. These roads often have a "slippery when wet" sign posted.
- Wet roads are most dangerous when the temperature is near freezing (30 – 34 degrees).
- On hot days, wet surfaces are most slippery just after a rain has begun to fall, especially if it hasn't rained recently.
- During the first 10 – 15 minutes of rain, water combines with oil and dirt to form a very slick mixture.
- Heavily traveled intersections are especially dangerous because some vehicles stopped for traffic signals leave oil drippings on roads.

Preventing loss of traction

To prevent loss of traction on wet roads a driver can:

- **Reduce speed** – compensates for limited surface friction to reduce stopping distance and reduce the chance of losing control when changing direction
- **Increase space** – increase following distance on slippery surfaces, stop well behind the vehicle ahead to prevent being pushed into it if struck from behind
- **Minimize changes in speed** – when a driver turns, accelerates, or brakes, the chance of losing traction increases, make changes gently and gradually
- **Minimize change in direction** – avoid abrupt changes in direction because this may cause the front tires to slide and result in loss of control
- **Find the best path** – avoid areas of limited traction or place tires in the tracks left by the tires of vehicles ahead, which have channeled some of the water away

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Traction Loss

Traction loss

The causes of traction loss (skidding) can be divided into three categories:

1. **Generated by road surface conditions:**
   - Ice, snow or frost
   - Wet surface; particularly first 15 minutes of rain after a long dry period when drops of oil and rubber particles have collected on the surface
   - Standing water
   - Mud near farm entrances, construction sites and truck crossings
   - Wet leaves
   - Broken or uneven road surface
   - Sand or gravel frequently found on curves in rural areas

2. **Generated by the condition of the vehicle:**
   - Brakes unevenly adjusted. Brakes pulling in one direction or the other can cause a skid, as can wheels out of alignment when brakes are applied
   - Tires with worn tread, front and rear pairs not matched to size, tread depth or type
   - Different pressure on opposite sides have effects similar to uneven brake adjustment since one tire will drag more than others

3. **Actions of the driver:**
   - Sudden steering action on a slippery surface
   - Abrupt or sudden changes in vehicle speed
   - Panic stop or applying brakes too hard on hill, curves or slippery surfaces
   - Most skids are caused by excessive speed, coupled with excessive steering input and/or improper braking when turning, or the same actions at normal speed on ice/ snow or on roadways covered by sand, gravel or water

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Changing Traction Conditions

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Hydroplaning

Hydroplaning is when a vehicle's tires lose contact with the road and ride on top of a film of water.

Causes of hydroplaning

- **Water on the road** – heavy rain causes water to gather on the roadway.
- **Excess speed** – at speeds faster than 35 mph, tires are less effect at channeling water from the road, tires can become overwhelmed by water and lose contact with the road at about 50 mph.
- **Under-inflated tires** – if tires are improperly inflated or worn, hydroplaning can occur well below 50 mph.

Signs of hydroplaning – this is the most difficult loss of traction for a driver to recognize

- Water standing on the roadway.
- Raindrops that bubble as they hit the surface of the road.
- A slushing sound made by tires on the pavement.
- A sensation that the steering wheel is loose, or has become disconnected from the front wheels of the vehicle. Drivers may not realize their car is hydroplaning until they try to turn or stop, and they find the car will not respond.
- A vehicle ahead that is not leaving a track is hydroplaning.

Preventing hydroplaning

- Slow down when there is water standing on the surface of the pavement.
- Tires should be properly inflated and have adequate tread.
- Increase following distance, particularly when behind a large truck.
- Drive in the tracks left by any vehicle ahead.

If hydroplaning occurs

- Ease off the accelerator gradually, decrease speed until your tires regain traction.
- Do not brake until traction has been restored.
- Steer no more than necessary, continue to look and steer where you want to go.

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Detecting Traction Loss

Traction loss identified through feel of the vehicle

The first indication of traction loss should be sensory stimulus generated by bodily movements and tensions, rather than sight. By the time a driver is visually aware that the vehicle is not headed in the desired direction or sliding rather than stopping, the situation is typically more difficult to correct.

Early detection begins with proper seating, safety belt snapped tightly and grasping the steering wheel firmly with fingers rather than the palms of the hands. This position allows the vehicle to more readily communicate changes in motion to the driver. When seated in this manner, employing an aggressive visual search to detect conditions that could reduce available traction should require minor corrections of accelerator, brake or steering wheel to bring the vehicle back to the intended path of travel.

What should drivers do when they realize they are skidding?

Look for an open path of travel and release the accelerator or brake pedal to regain vehicle balance.

Having failed to detect early warning signals, how should the driver respond?

While there is no one way to handle a particular skid, there are guidelines that can be applied to help control skidding. Basic rules include:

- Determine which wheels, front or rear, have lost traction.
- Visually target an open path of travel, do not look at object toward which the vehicle is sliding.
- Release accelerator or brake pedal, whichever the driver is applying, to regain vehicle balance.
- Steer toward open path of travel as long as vehicle is in motion.
- Jabbing brake may be necessary to aid in case of front wheel loss of traction, but only after rolling traction has been reestablished.
- Progressive acceleration may aid a rear wheel loss of traction to allow rolling traction to regain control.

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Skidding

Skidding is a situation in which the driver's tires lose all or part of their grip on the road. As the tires lose traction, they will begin to slide, and can cause the vehicle to deviate from its intended path of travel.

Causes of skids

- Slippery surfaces
- Accelerating too hard
- Braking too hard
- Steering too much or too quickly
- Entering a curve with too much speed

Preventing skids

- Apply the brakes in a smooth and progressive manner
- Make smooth, precise steering wheel movements
- Slowing down well in advance of curves
- Maintaining speeds appropriate for conditions

Responding to skids

- Driver needs to recognize s/he is experiencing a skid
- As soon as a skid is detected, s/he needs to take corrective action
- Once the driver responds to a skid s/he should not stop trying to regain traction

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Types of Skids and Recovery Techniques

Front-wheel skid

- Termed "understeer"
- Vehicle moves straight ahead in spite of steering input

To regain traction:

- Continue to look and steer toward the intended path of travel.
- Smoothly ease up on the accelerator to regain traction.
- Smoothly apply brakes to regain enough traction to turn the vehicle toward the intended path of travel, which may take some rapid readjustments as the vehicle responds to the driver's initial steering input.
- Do not steer more than necessary to keep the vehicle directed toward the path of travel. Being able to respond with the steering wheel demands constant attention until the vehicle is safely back on the desired path of travel.

Rear-wheel skid

- Termed "oversteer"
- Vehicle moves sideways without any additional steering input

To regain traction:

- Continue to look and steer toward the intended path of travel
- Ease off the accelerator, avoid using the brakes
- As the rear tire regains traction, continue steering toward the intended path of travel and continue to steer and counter-steer until the vehicle is traveling straight
- Use a light and progressive acceleration if the vehicle does not recover

Counter-steer – once the car starts turning, it will continue past the intended direction. Turn the steering wheel back in the opposite direction just before the vehicle lines up with the intended path.

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Run-Off the Road Crashes

Many run-off the road crashes occur when a driver drifts off the roadway onto the shoulder due to inattention, nodding or falling asleep or steers onto the shoulder to avoid a collision and tries to return to the roadway.

Crashes may occur because:

- As the driver steers back toward the road, the left-side "climbs" onto the pavement"
- As the driver continues turning the wheel, the right-side tires suddenly "climbs" the pavement
- Before the driver can respond, the vehicle has already crossed into the next lane
- The vehicle may collide with a vehicle in the next lane, or drive off the far side of the road

To return to the pavement safely:

- Keep a firm grip on the steering wheel
- Slow down, ease off the accelerator and allow the vehicle to slow gradually, avoid braking
- Straddle the edge of the pavement, after speed is reduced and there is a gap in traffic steer back to the road with small inputs, do not oversteer
- Return to the pavement two wheels at a time, as soon as the front tire is back on the roadway, counter-steer quickly left or right as necessary to stay in the correct lane

Blocked roadside – if an object beside the road such as a tree, bridge abutment or pedestrian forces the driver to return to the road quickly, s/he has little time to slow down, to do this the driver should:

- Steer left or right so the off-road wheels are about 12 inches away from the edge of the pavement
- Remove his/her foot from the accelerator and stay off the brakes. Turn the steering wheel quickly about one-eighth turn toward the roadway
- Immediately, as the outer wheel makes contact with the edge of the pavement, counter-steer about a quarter turn and make steering corrections to straighten vehicle

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