Tanker fundamentals

Liquid surge and vehicle control

Liquid can keep moving after a tanker changes speed or direction. This lesson explains the basic risks and the concepts to review in your official CDL manual.

Liquid movement and inertia

When a tanker brakes, inertia keeps the liquid moving while the vehicle slows. The liquid initially tends toward the **front** relative to the tank. During acceleration, it tends toward the **rear**. Partly filled tanks can allow substantial liquid movement, and movement can continue after a change in speed.

Baffles and rollover risk

Baffles can reduce some front-to-back surge. They do not eliminate side-to-side movement or rollover risk. Tank vehicles also have a high center of gravity, so a baffled tank still requires careful driving.

Outage and cargo weight

Outage is space left for liquid to expand as it warms. The space needed depends on the liquid and its temperature. Cargo density and legal weight limits also limit the amount carried. Space remaining in a tank does not authorize adding more cargo.

Apply the concept

You are approaching a curve with a partially filled tank. Reduce speed before the curve, maintain a smooth path, and avoid sudden corrections. Use smooth braking and steering.

Suspected leak: Have the concern inspected and resolved before travel. Do not carry liquids or gases in a leaking tank. Follow vehicle inspection instructions and applicable emergency procedures. Do not drive to test whether the leak gets worse.

This sample supplements study. It is not an operating procedure or a substitute for official CDL manuals, required training, vehicle instructions, or employer procedures.

Braking and acceleration

Conceptual side views. The vehicle travels to the right. Each blue arrow shows the liquid's **initial tendency relative to the tank**, not every phase of slosh.

Braking

Vehicle travel →



REAR **FRONT**

Liquid initially tends toward the front.

Acceleration

Vehicle travel →



REAR **FRONT**

Liquid initially tends toward the rear.

Tank shape and liquid surface are simplified. The illustration does not show a safe fill level, baffles, or a loading instruction.

Study takeaway

Slow before curves. Brake and steer smoothly. Baffles do not remove side-to-side movement or rollover risk.

Four knowledge checks

Answer each question in your own words, then compare your explanation with the matching numbered answer on page 4.

1 Surge during braking

What causes liquid surge when a tanker brakes? Which direction does the liquid initially tend to move relative to the tank?

2 Baffles and risk

What type of liquid movement can baffles reduce? Do baffles eliminate side-to-side movement or rollover risk?

3 Outage and weight

What is outage? Why does space remaining in a tank not necessarily mean more cargo can be added?

4 Suspected leaks

What should happen before travel if you suspect a tank leak? Is driving an acceptable way to test whether it gets worse?

Keep this check focused on the concepts. For operating, inspection, loading, or emergency steps, use the applicable official instructions and required training.

Answers and source notes

1 Surge during braking

Inertia keeps the liquid moving while the tanker slows. Its initial tendency is toward the front relative to the tank. During acceleration, the tendency is toward the rear. Smooth inputs help manage the effect.

2 Baffles and risk

Baffles can reduce some front-to-back surge. Side-to-side movement and rollover risk remain, so a baffled tank still requires careful driving.

3 Outage and weight

Outage is space left for liquid expansion. The liquid and its temperature affect the space needed. Cargo density and legal weight limits may limit the load before the tank is physically full. Remaining volume does not authorize more cargo.

4 Suspected leaks

Before travel, have a suspected leak inspected and resolved. Do not carry liquids or gases in a leaking tank. Follow vehicle inspection instructions and applicable emergency procedures. Do not drive to test whether the leak worsens.

Source notes

Federal knowledge scope: 49 CFR 383.119 (eCFR) lists tanker knowledge topics, including surge, braking, baffles, load levels, density, and curves. It is not a step-by-step operating procedure. The checked eCFR version was current through October 29, 2026.

State teaching guidance: Utah CDL Manual, Section 8, Tank Vehicles (dld.utah.gov) and Oregon Commercial Driver Manual, Section 8, Tank Vehicles (oregon.gov/odot/dmv) support the concepts on liquid movement, baffles, outage, weight, curves, and leaks.

Revision scope: These sources received a limited concept check on November 5, 2026, not a complete legal or expert review. The October 2026 preview also cited Florida's July 2022 CDL handbook, Sections 8.2-8.3. That is a historical reference, not a claim of current Florida guidance.