

Chapter 27

Emergency Procedures

Emergency procedures are practiced so that the correct response becomes automatic when an emergency occurs. In a real emergency, there is rarely time to stop and think through a procedure step by step.

The purpose of emergency training is not just to learn the correct actions, but to develop the habit of responding calmly and consistently under pressure. Throughout all emergency situations, the safety of people comes first, followed by the protection of equipment.

When in doubt, stop the engine, maintain awareness of boiler water level, and seek assistance from experienced operators.

27.1 Emergency Stop

It is important to be able to bring a traction engine to an immediate stop when a person, animal, vehicle, or obstacle enters the path of the machine and there is imminent danger of injury or collision.

27.1.1 Example Scenario

During exhibition, fair, and parade operations, spectators may be close to the operating area. A classic training scenario involves a child unexpectedly running from the crowd and entering the path of the engine.

Driver examinations may include a surprise hazard test in which the examiner introduces an obstacle in front of the moving engine. The purpose of this exercise is to verify that the driver can react immediately and correctly under pressure.

27.1.2 Immediate Actions

1. Close the throttle immediately.
2. Move the reversing quadrant into reverse.
3. Open the throttle briefly to admit a short shot of steam.
4. Close the throttle immediately.
5. Keep both hands on the controls and remain on the footplate until the engine has completely stopped.

27.1.3 Training Practice

A full emergency stop places significant stress on the engine, gearing, and transmission components. During routine training, students often practice the same sequence using gentler stops with the clutch disengaged. This allows the operator to build the required muscle memory while reducing wear on the machinery.

The sequence of motions must become automatic. In a real emergency, there is no time to think through the procedure step-by-step.

When an immediate hazard exists, the safety of people always takes precedence over concern for mechanical strain or equipment wear.

27.1.4 Common Errors

- Hesitating before closing the throttle.
- Failing to move fully into reverse.
- Applying reverse steam for too long.
- Focusing on the engine rather than the hazard.
- Forgetting to close the throttle after the reverse steam application.

27.2 Broken Water Glass

If a water glass breaks, it must be safely isolated and boiler water level monitored using alternate methods.

27.2.1 Prevention and Inspection

Inspection of the water glass is part of every startup procedure. Before raising steam or placing the engine in service:

- Inspect the water glass for cracks, chips, or other damage.
- Pay particular attention to the areas near the upper and lower retaining nuts, where failures commonly occur.
- Verify the water and steam valves operate freely.
- Confirm that try cocks are functional and accessible.

27.2.2 Equipment Required

Every engine should carry a short-handled shovel for emergency use, even when operating on fuels other than coal.

If a short-handled shovel is not available, a wide board from the wood supply may be used as a protective shield.

A broken water glass is usually obvious. Common indications include:

- Sudden release of steam and water from the water column.
- A cloud of steam around the engineer's position.
- Loss of visibility near the water glass.
- Inability to determine boiler water level from the glass.

27.2.3 Immediate Actions

1. Put on gloves and any other available personal protective equipment.
2. Approach the water glass cautiously, using the shovel or board as a shield between yourself and the escaping steam and water.
3. Close the **water valve first**.
4. Close the **steam valve second**.

Hot water presents a greater burn hazard than escaping steam in this situation. Closing the water valve first reduces the discharge of hot boiler water before isolating the steam side of the gauge.

Although the engineer should already have a good understanding of the boiler's water level through regular observation, the water level must be confirmed after the water glass has been isolated.

Use the try cocks to determine the actual boiler water level before continuing operation or taking further action.

27.2.4 Important Notes

- Continue monitoring boiler water level using approved alternate methods until repairs are completed.
- This procedure assumes a side-mounted water column and water glass.
- Operators must understand the arrangement of the specific engine they are operating and adjust the procedure as required.
- Test the try cocks regularly during normal operation so that their indications are familiar before an emergency occurs.

27.2.5 Common Errors

- Failing to inspect the glass before operation.
- Approaching the failed glass without protection.
- Closing the steam valve before the water valve.
- Assuming the water level without verification.
- Forgetting that different engine designs may require a modified procedure.

27.3 Low Water Emergency

Every trade has a fundamental rule.

- Plumbers: Water flows downhill.
- Electricians: The black wire is hot.
- Boiler operators: **Keep the water over the crown sheet.**

A low-water condition may be indicated by:

- Water disappearing from the water glass.
- No water showing on the try cocks.
- Uncertainty about the actual water level.
- Failure of feedwater equipment combined with a falling water level.

27.3.1 Immediate Actions

1. Stop the engine.
2. Safe the fire.
3. Do not leave the boiler unattended.
4. Continue to monitor the situation and seek assistance from experienced crew members.

27.3.2 Common Errors

- Becoming distracted from water-level duties.
- Ignoring a steadily falling water level.
- Delaying action when water level becomes uncertain.
- Assuming someone else is monitoring the boiler.

When in doubt, stop the engine and treat the situation as a low-water emergency until proven otherwise.

27.4 Injector Failure

An injector failure is indicated when the injector will not pick up, will not deliver water to the boiler, or will not maintain a steady feed. Before troubleshooting the injector, confirm that there is water in the tender.

27.4.1 Common Causes

The most common cause of an injector that will not pick up is overheating.

Possible causes include:

- A faulty injector check valve allowing hot water to back up into the injector.
- A faulty feedwater-line check valve allowing hot water to back up through the system.
- A leaking steam throttle valve heating the injector when it is not in use.
- High ambient temperatures on a hot day.
- A leak in the suction line.
- An empty water tender.

27.4.2 Initial Checks

Before attempting repairs, determine whether a simple cause is responsible for the failure.

Check for:

- Adequate water in the tender.
- Obvious suction-line leaks.
- Excessive injector temperature.
- Steam or water leaks around injector fittings and valves.

27.4.3 Cooling an Overheated Injector

In many cases, an overheated injector can be returned to service quickly.

1. Wrap a rag around the body of the injector.
2. Thoroughly wet the rag with water, preferably cold water.
3. Continue cooling until the injector temperature is reduced.
4. Attempt to restart the injector.

The wet rag helps draw heat away from the injector and can often restore normal operation.

27.4.4 Repeated Overheating

If the injector repeatedly overheats, the underlying cause should be investigated.

Potential problems include:

- Defective injector check valves.
- Defective feedwater check valves.
- Leaking steam valves.
- Conditions that allow hot water to circulate back into the injector.

Repeated cooling may restore operation temporarily, but the source of the overheating should be corrected when practical.

27.4.5 If the Injector Cannot Be Restored

If the injector cannot be returned to service:

- Use the other available source of feedwater.
- Continue monitoring boiler water level closely.
- Evaluate whether the engine should remain in service.
- Prepare for the possibility of safing the fire and removing the engine from operation.

Every boiler is required to have two independent means of feeding water. If one feedwater source fails, place the alternate source into service immediately.

27.4.6 Common Errors

- Assuming the injector is mechanically damaged before checking for overheating.
- Forgetting to verify water level in the tender.
- Ignoring suction-line leaks.
- Failing to investigate the cause of repeated overheating.
- Continuing operation without a reliable means of feeding water to the boiler.

27.5 Boiler Overfill

An overfilled boiler can compromise the reliability of the water glass.

A boiler may become overfilled if an injector is left operating longer than intended.

When severely overfilled:

- The water glass may become sluggish or unresponsive.
- A small pocket of trapped air may remain at the top of the water glass.
- The indicated water level may no longer accurately represent the true boiler water level.

27.5.1 Immediate Actions

1. Reduce the boiler water level carefully using the blowdown.
2. Lower the water level only until the water glass becomes responsive and provides a reliable indication of boiler water level.
3. Continue normal monitoring of the water glass and try cocks as required.

The goal is not to lower the water level to a specific point, but to restore a reliable indication in the water glass.

27.5.2 Prevention

For novice operators, a simple rule applies:

When injecting, do nothing else.

While feeding water:

- Keep one hand on the steam-side injector valve.
- Do not remove it until injection is complete.
- Watch the water glass continuously.

27.5.3 Common Errors

- Becoming distracted while feeding water.

27.6 Broken Governor Belt

If the governor belt fails while the engine is operating, the governor will no longer regulate engine speed. Depending on operating conditions, the engine may accelerate rapidly and reach dangerously high speeds.

This risk is particularly high when the engine is belted to machinery and operating under load, but a governor failure should always be treated as a

serious event regardless of the engine's current work.

Common indications include:

- Sudden increase in engine speed.
- Visible failure or loss of the governor belt.
- Governor no longer responding to changes in engine speed.
- Unusual engine behavior requiring immediate throttle control.

27.6.1 Immediate Actions

1. Close the throttle immediately.
2. Bring the engine to a complete stop.
3. Secure the engine and assess the situation before resuming operation.

27.6.2 Inspection

Once the engine has stopped, perform a brief inspection to determine whether any damage may have occurred during the overspeed event.

- Inspect the governor belt and governor components.
- Check for visible damage to moving parts.
- Roll the engine over slowly by hand.
- Listen for any unusual knocks, impacts, or mechanical noises that were not previously present.

27.6.3 If Damage Is Suspected

If there is any reason to believe the engine has been damaged or can no longer be operated safely:

- Remove the engine from service.
- Safe the fire.
- Continue monitoring boiler water level.
- Make arrangements to have the engine towed back to the yard or repair facility.

27.6.4 If No Damage Is Found

An engine can often be operated without a functioning governor, provided the crew understands the risks, exercises appropriate caution, and gives constant attention to throttle position and engine speed.

Possible responses may include:

- Repairing the governor belt in the field.
- Fabricating a replacement governor belt in a nearby shop.
- Continuing operation without a governor.
- Driving the engine back to the yard without a governor.

27.6.5 Decision Making

The best course of action will depend on the condition of the engine and the availability of repairs.

Consult with:

- The engine crew.
- Nearby operators.
- Event organizers or operating supervisors, where applicable.

Determine whether repair, restricted operation, towing, or removal from service is the safest option.

Because show engines are not performing work that is critical to operations, there should be no hesitation in removing an engine from service if there is any doubt about its condition.

27.6.6 Common Errors

- Delaying throttle closure.
- Continuing to operate without inspecting for damage.
- Assuming overspeed caused no harm.
- Becoming distracted while operating without a governor.
- Continuing operation when repair or towing would be the safer choice.

27.7 Grass Fire and Ash Pan Fire

Steam engines operate around dry vegetation, hot ash, sparks, and open fire. Grass fires are not uncommon, particularly during plowing operations in dry stubble.

The most important tool for preventing grass fires is situational awareness.

27.7.1 Prevention

- Watch for dry grass, straw, and stubble near the engine.
- Pay attention to the area beneath the ash pan when stopping.
- During plowing operations, stop on plowed ground rather than standing stubble whenever possible.
- Ensure suitable firefighting equipment is available before operations begin.

Depending on the activity and location, this may include:

- Water barrels with buckets.
- A water wagon equipped with a pump.
- Shovels for smothering small fires with soil.

27.7.2 Immediate Actions

1. Stop the engine in a safe location.
2. If possible, stop on plowed ground, bare soil, or another non-combustible surface.
3. Close the draft to reduce airflow through the fire and ash pan.
4. Determine the source of the fire.
5. Extinguish the fire.

For small grass or stubble fires, loose soil may be used to smother the flames. This is one reason every engine should carry a shovel.

For larger fires, use the firefighting equipment available at the site.

6. Inspect the area for remaining hot spots before resuming operation.

If closing the draft does not significantly reduce an ash-pan fire, the condition of the draft doors should be examined before the next operating session.

27.7.3 Common Errors

- Stopping in dry grass while responding to a grass fire.
- Failing to monitor ground conditions around the engine.
- Leaving the area before confirming the fire is completely extinguished.

Remember: **Stop on the plowed part, not the grass.**

27.8 When in Doubt

No emergency chapter can anticipate every problem that may be encountered around a steam engine. When faced with an unfamiliar situation, follow these principles:

1. Stop the engine.
2. Maintain awareness of boiler water level.
3. Safe the fire if necessary.
4. Consult experienced crew members.
5. Do not continue operation until the situation is understood.