



Oil and Gas Extraction

Safety Training Program



Goal

This program is designed to teach oil and gas workers, supervisors, and new hires to recognize the hazards that injure and kill workers most often in this industry.

Objectives

By the end of this program, workers will be able to:

- Name the top hazards on an oil and gas site.
- Know the warning signs of hydrogen sulfide, fire risks, and other dangers before they turn deadly.
- Follow the safe-work steps that cut the risk of injury or death.

Introduction

Oil and gas work ranks among the most dangerous jobs in the country. In 2024, the

broader mining, quarrying, and oil and gas extraction sector experienced a fatal work-related injury rate nearly four times the rate of all U.S. workers combined (13.8 vs. 3.3 per 100,000 employees)¹. Oil and gas extraction accounted for the majority of those deaths — 65 of the sector's 92 fatalities, or about 71 percent.²

This training program groups oil and gas hazards into two kinds:

1. Hazards that can be fatal in seconds.
2. Hazards that build up slowly and can harm a worker's health over months or years.

A few hazards, such as hydrogen sulfide, can act in both ways. For those hazards, they are listed where its most immediate danger lies. Both kinds deserve a spot in every training session, toolbox talk, and written safety program.

Hazards that can result in sudden injury or death

Vehicle collisions

Highway crashes kill more oil and gas workers than any other hazard. Roughly four of every 10 fatalities in this industry happen on the road, not the well site.⁵ Crews travel long distances to remote locations, often on unfamiliar roads, at odd hours, and after long shifts.

Follow your company's driving policy on every trip, not just the long ones.

- Inspect tires, brakes, and lights before long drives.
- Secure all tools and equipment before you drive.
- Plan routes and set your GPS before you leave.
- Buckle up every trip, every time.
- Keep a safe following distance, and never tailgate the vehicle ahead.⁵
- Use a spotter, back slowly, and check overhead and side clearances whenever you back a vehicle.⁵
- Silence your phone and skip texting behind the wheel.
- Follow your company's drive-time and rest-break rules.
- Pull over and rest before fatigue sets in.

Struck-by, caught-in, and caught-between hazards

These hazards cause three of every five on-site fatalities in oil and gas extraction.⁶ Moving vehicles, falling equipment, unstable derricks, and swinging loads are among the greatest risks. Workers positioned near moving equipment or inside a crane's swing radius face the highest exposure.

- Stay clear of suspended loads and the swing radius of cranes and derricks.
- Never bypass or remove a machine guard.

- Inspect rigging and lifting equipment before each use.
- Complete a [Job Safety Analysis](#) (JSA) before any task involving moving equipment.
- Keep hands, feet, and clothing clear of moving parts at all times.

Fires and explosions

Flammable well gases and vapors can ignite from static electricity, hot work, open flames, or even a cell phone.⁷ A single spark near an unventilated vapor cloud can trigger an explosion. Ignition risks climb sharply during hot work, such as welding or cutting, performed near flammable storage.

- Treat every well site as a potential ignition hazard.
- Get a hot-work permit before you weld, cut, or grind.
- Wear flame-resistant clothing (FRC) in active hydrocarbon zones.
- Bond and ground tanks and trucks to control static electricity during fluid transfer.
- Shut down non-essential engines near open hatches or vapor releases.





Permit-required confined spaces (PRCS) and oxygen-deficient atmospheres

Tanks, mud pits, reserve pits, and sand storage containers can trap flammable vapors or push out breathable oxygen. A worker who enters without testing and monitoring can pass out within seconds, often before noticing any danger.⁹

- Never enter a PRCS without following your written confined space entry procedure.
- Use an entry permit, complete an atmospheric test, and have a trained attendant standing by before entry.

Falls

Crews climb masts, drilling platforms, and other elevated equipment on nearly every job. Falls remain a leading cause of injury and death across the industry.⁸ Missing guardrails, damaged ladders, and cluttered walking surfaces raise the risk.

- Wear and properly anchor fall protection on the mast, derrick, and elevated platforms.
- Inspect harnesses and lanyards before each use.
- Keep walking and working surfaces clear of debris, ice, and spills.
- Keep three points of contact on ladders and stairs.

- Monitor the atmosphere continuously during entry.
- Ventilate the space before and during work.
- Make sure the entry team has a plan for summoning rescue and emergency services before entry.
- Know the rescue plan before entry, not after.

High-pressure lines and equipment

Internal erosion inside a line can cause a sudden leak or burst. A connection that fails under pressure can turn a hose or fitting into a flying object that strikes a worker instantly.¹⁰

- Inspect lines and connections before you pressurize them.
- Stand clear of lines during pressure tests and at the time of equipment start-up.
- Report leaks, unusual noises, or vibration right away.
- Follow blowout-prevention and well-control procedures on every job.

Hydrogen sulfide (H₂S)

Hydrogen sulfide, known as “the silent killer,” occurs naturally in crude oil and natural gas deposits and can escape from wells in seconds. Even a low concentration can knock out or kill a worker almost instantly.¹¹ At lower concentrations, repeated or prolonged exposure can damage the eyes and lungs and raise the risk of depression, fatigue, and neurological problems. The gas smells like rotten eggs at low levels, but that warning smell fades quickly as concentrations climb — often right before exposure turns dangerous. H₂S weighs more than air, so it settles into low areas, pits, and confined spaces. It does not stay there. Air currents, temperature swings, product movement, and worker activity lift it into the breathing zone and into the upper levels of a space. Concentrations often stratify, changing sharply from one height to the next. A single reading tells you about one point in the space — nothing more. Never treat a bottom-of-the-space reading as clearance for the whole space, and never assume a spot is safe because it sits above grade.¹²

- Test the atmosphere at every level of the space. Take readings at intervals of no

more than 4 feet from top to bottom, then repeat the sequence bottom to top.

- Hold the probe at each level long enough for the sample to travel through the tubing and for the sensor to respond. Follow the manufacturer's stated lag time.
- Test in order: oxygen first, then combustible gases and vapors, then toxic gases and vapors.
- Ventilate the full height of the space, then retest at every level before anyone enters.
- Monitor the air continuously with a calibrated H₂S detector, and wear a personal monitor in any area where the gas may occur.
- Wear the right respiratory protection for the job — a full-face pressure-demand SCBA, or a supplied-air respirator with an escape bottle, for concentrations at or above 100 parts per million (ppm).
- Complete H₂S safety training every year before you work in an active zone.
- Know your escape route and rescue plan before you start work.



Electrical and other hazardous energy

Rig equipment runs on electrical, mechanical, and hydraulic power. Contact with live wiring or energized equipment during maintenance can shock, burn, or crush a worker instantly.¹³ Overhead power lines add a second hazard: a crane boom, mast, or load line does not have to touch a wire to draw an arc. Required clearance grows as line voltage grows, so the safe distance for one job site will not carry over to the next.

- [Lock out and tag out](#) equipment before servicing it — every time.
- Verify a zero-energy state before you touch any circuit or line.
- Treat every overhead line as energized until the utility company confirms otherwise in writing.
- Confirm the line voltage with the utility before rig-up, then set your clearance from Table A below. Keep the boom, mast,

load, load line, and rigging outside that distance during the rig-up and rig down.¹⁴

- When voltages cannot be verified or confirmed, check before rig-up whether any part of the equipment, load line, or load can come within 20 feet of a line at full working radius. If it can, pick one of three paths.
 - **Path 1:** Ask the utility to deenergize and visibly ground the line.
 - **Path 2:** Stay at least 20 feet away from the power line. Take these safety steps: hold a crew planning meeting, use nonconductive taglines when needed, and post a warning line. Also use a proximity alarm, a dedicated spotter, or a device that limits how close equipment can get to the line.
 - **Path 3:** Get the line voltage from the utility, then hold the Table A distance with the same safeguards.

TABLE A—MINIMUM CLEARANCE DISTANCES

Voltage (nominal, kV, alternating current)	Minimum clearance distance (feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

Note: The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.

Hydrocarbon gases and vapors (HGVs) while tank gauging and sampling.

Manual tank gauging and sampling require a worker to open a hatch on a production or flowback tank. That action can release a burst of hydrocarbon gases and vapors. In some cases, the burst reaches a level immediately dangerous to life or health. Workers have lost consciousness, suffered cardiac arrest, or died within minutes.¹⁵ The released vapors can also push out breathable oxygen or reach the lower explosive limit. That combination raises fire and explosion risk at the open hatch.

- Use remote or automatic tank gauging whenever your site allows it, instead of manually opening the hatch.
- Stay upwind of an open hatch, and keep your face out of the vapor path.



- Wear the air-monitoring and respiratory protection equipment assigned for gauging and sampling tasks.
- Never gauge or sample a tank alone — keep a second worker within sight or radio contact.
- Treat every hatch opening as a hazardous-gas release, even without an H₂S alarm.

Hazards that build up over time

Hazardous chemicals

Crews handle corrosive, flammable, and toxic chemicals daily — drilling fluids, acids, solvents, and fracturing additives among them. A splash, spill, or inhaled vapor can burn skin or lungs on contact, so treat every chemical task as an immediate hazard, not just a long-term one.¹⁶

- Read the [Safety Data Sheet](#) (SDS) before handling any new chemical.
- Make sure every chemical container is properly labeled.
- Wear the required personal protective equipment (PPE), including chemical-resistant gloves, eye protection, or other protection specified for the task.

- Wash exposed skin immediately after contact with any chemical.
- Report spills, leaks, or skin, eye, or breathing irritation right away.

Respirable crystalline silica dust

Hydraulic fracturing crews breathe in respirable crystalline silica dust released from the sand used in the fracturing process. Silica dust builds up in the lungs over years and can cause silicosis, a progressive lung disease, and increases the risk of lung cancer.¹⁷

- Wear the respiratory protection assigned for the task.
- Use engineering controls, such as dust suppression or enclosed systems, whenever available.

- Stay out of dusty areas whenever possible, and avoid creating unnecessary dust.
- Follow your employer's silica exposure control procedures.

Heat, cold, and fatigue

Well-site work often means long hours outdoors in extreme heat or cold. Heat illness and cold stress can both turn deadly if a worker misses the early warning signs, such as heavy sweating, confusion, or uncontrolled shivering.¹⁸ Long shifts and days worked in a row build fatigue. Fatigue slows reaction time and raises the risk of a crash or injury.

- Drink water often, even before you feel thirsty.
- Take breaks in a shaded, cooled, or heated area, as conditions require.
- Layer clothing, and warm up periodically during cold-weather work.
- Learn to recognize early signs of heat stress, cold stress, and fatigue in coworkers, and speak up early.
- Rest before you drive or operate equipment when fatigue sets in.

Noise

Pumps, compressors, and drilling equipment produce noise loud enough to damage hearing over time. Hearing loss builds gradually and often goes unnoticed until it becomes permanent.¹⁹

- Wear earplugs or earmuffs in posted high-noise areas.
- Get baseline and annual hearing tests if your job requires them.
- Report ringing in the ears or muffled hearing after a shift.

Other hazards

A complete safety program addresses more than the twelve hazards above.

- Rotating wellhead equipment, such as top drives, drawworks, pumps, and conveyors, can strike or trap a worker who works too close.²⁰
- Heavy lifting, awkward postures, and repetitive tasks build ergonomic injuries over months and years.²¹
- Diesel exhaust from site engines and vehicles can harm the lungs with repeated exposure.²²
- Pipe scale and drilling mud can also carry naturally occurring radioactive material, which raises long-term health risks for workers who handle contaminated equipment.²³

Build these hazards into your JSA and training program too.



Building a safety program

OSHA recommends every drilling and servicing company build its own written safety program.²⁴ At minimum, the program should:

- Identify hazards through a JSA.
- Establish safe practices for high-risk tasks, such as confined space entry, hot work, and lockout/tagout.
- Provide PPE at no cost when engineering controls alone cannot remove a hazard.
- Train every worker in a language and vocabulary they understand before that worker starts a task.
- Plan for contractor safety on every site.

New-hire orientation checklist for managers and trainers

Use the following checklist to confirm new hires understand the material before their first day on location.

Review each hazard in this guide, and point out the risk in your specific operation.

- Issue and fit test required PPE (FRC, respirators, hearing protection, fall protection).
- Walk the site, and point out ignition sources, red zones, confined spaces, and high-pressure lines.
- Explain the emergency response plan, muster points, and evacuation routes.
- Confirm the new hire knows how, and to whom, to report a hazard or near miss.
- Introduce the crew's H₂S monitoring and alarm procedures.
- Document the training: names, date, topics covered, and the trainer's name.
- Schedule refresher training, and set a date for a follow-up safety check-in.

Review

1. Highway crashes cause more oil and gas worker deaths than any other hazard.
a. True b. False
2. Struck-by, caught-in, and caught-between hazards cause roughly what share of on-site fatalities in this industry?
a. One of every five. b. Three of every five. c. Nine of every ten.
3. A worker should stand near a hatch or tank opening after a fluid transfer to check for vapor.
a. True b. False
4. Hydrogen sulfide always keeps its rotten-egg smell, even at high, dangerous concentrations.
a. True b. False
5. What must a worker confirm before entering a confined space?
a. A permit, an atmospheric test, and a trained attendant standing by.
b. A hard hat and steel-toed boots.
c. Nothing, as long as the space looks empty.
6. Name two early warning signs of heat illness or cold stress.
7. A worker should read a chemical's safety data sheet (SDS) only after an exposure occurs.
a. True b. False
8. What tool helps a crew spot task hazards and plan controls before work starts?
a. Job Safety Analysis (JSA). b. Weather forecast. c. Vehicle maintenance log.

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