



DIESEL ENGINE RUNAWAY:

THE UNEXPECTED DANGER ON DRILLING SITES

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AGENDA.



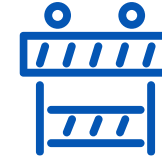
DANGER

What is diesel engine runaway?



ACCIDENT HISTORY

Accident history shows a need for safety devices.



SAFETY STRATEGY

Other US states are not fully aware of the dangers and solutions.



O&G OPERATIONS RISKY BUSINESS



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OSHA FATALITIES IN UPSTREAM OIL & GAS 2011-2015.



55% STRUCK

15% FIRES & EXPLOSIONS

10% FALLS

6% CHEMICAL EXPOSURE

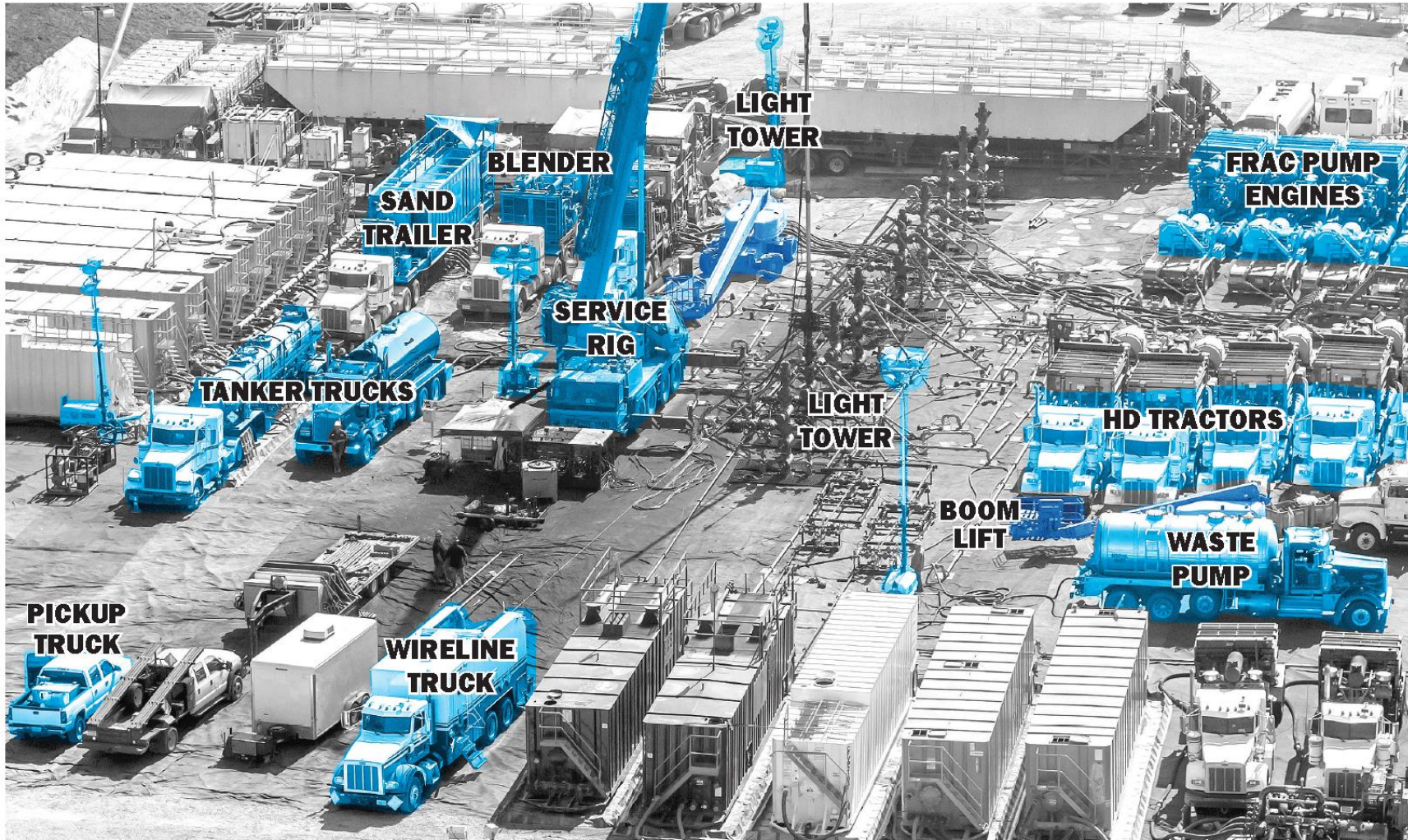
85 Fatalities associated with fire & explosions 2005-2015.

29 Fatalities where mobile engine was ignition source 2005-2015.

In 2014, 7 fatalities were due to combustion of vapors, gases, or fluids where the ignition source was diesel powered equipment.

Source: NIOSH FOG Report

POTENTIAL IGNITION SOURCES.





DIESEL ENGINE RUNAWAY



NEXT

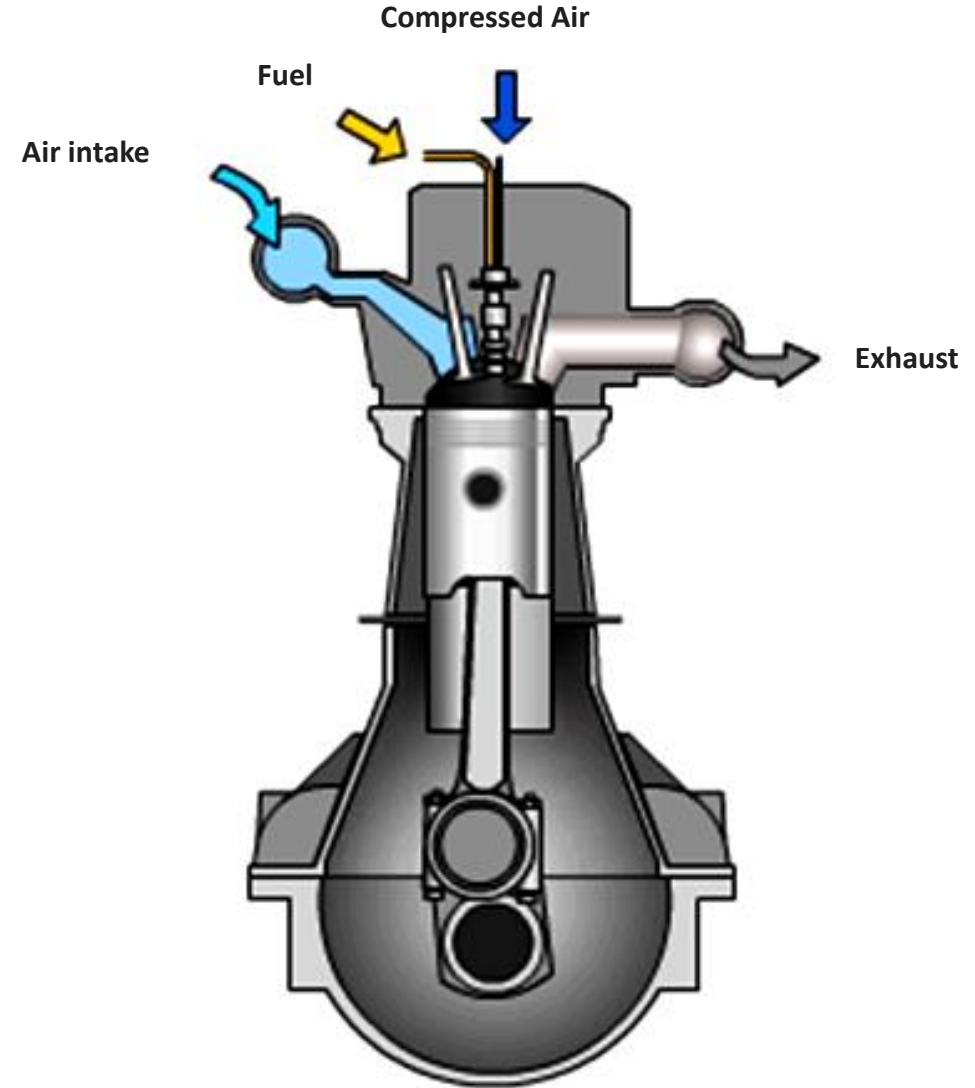
DIESEL ENGINE PRINCIPLE.

**1. COMPRESSION IGNITION – NO
SPARK PLUGS!**

**2. FUEL IS METERED TO GOVERN
SPEED.**

3. METHODS TO SHUTOFF ENGINE:

- Remove Fuel Supply
- Remove Air Supply



DIESEL ENGINE RUNAWAY.



**STOP
ENGINE
RUNAWAY**



U.S. ACCIDENT HISTORY

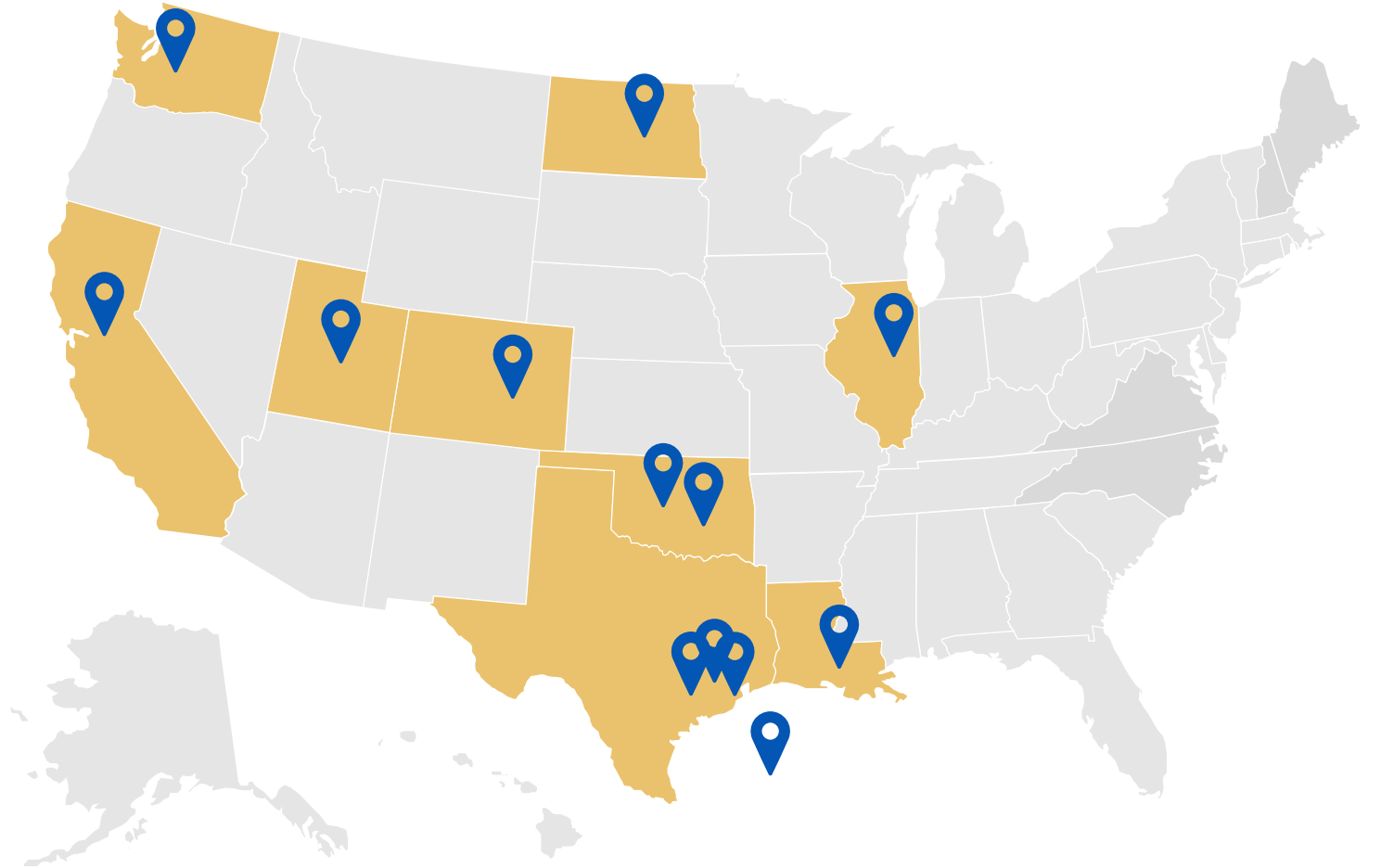


NEXT



**PROVEN
DIESEL
ENGINE
RUNAWAY
ACCIDENTS.**

A complete, international list
is available upon request.





REFINERY EXPLOSION.

**BP TEXAS CITY
MARCH 23, 2005
TEXAS CITY, TX
INJURIES: 180
FATALITIES:15**

A vapor cloud is ignited by an idling diesel pickup truck which witnesses reported hearing rev when the vapor neared the truck.

<https://www.csb.gov>





WASTE DISPOSAL FACILITY.

BLSR OPERATING, LTD.
JANUARY 13, 2003
ROSHARON, TX
INJURIES: 4
FATALITIES: 3

A vapor cloud is drawn into the engines of two vacuum trucks delivering waste product to the facility.

<https://www.csb.gov>





OIL WELL EXPLOSION.

FRENCH CREEK OIL COMPANY
OCTOBER 29, 2008
CARMI, IL
INJURIES: 4
FATALITIES: 2

A service crew was preparing to plug a well when a witness saw a gas cloud leaking from the well. The engine on a nearby pump started to rev, the crew attempted to turn off the fuel, but the engine continued to run. The pump backfired and the well exploded.

<https://www.carmitimes.com>





ACCIDENTS.



IMPACT TO COMMUNITIES.



OIL & GAS DEVELOPMENT ERIE, COLORADO 2017

Next to homes, baseball fields,
town skate park



CHEVRON REFINERY EXPLOSION RICHMOND, CA AUGUST 6, 2012

5700 Area residents needed medical
treatment





COMMON PREVENTIVE MEASURES: WHY THEY DON'T WORK



NEXT

TURNING OFF THE IGNITION KEY.

**IF THE ENGINE HAS ALREADY BEGUN
TO RUNAWAY IT IS TOO LATE AND
TURNING OFF THE KEY WILL NOT WORK**



GAS DETECTION WITH ALARMS.

ONLY AN ALERT SYSTEM

FIXED SYSTEMS

DOES NOT STOP THE ENGINE



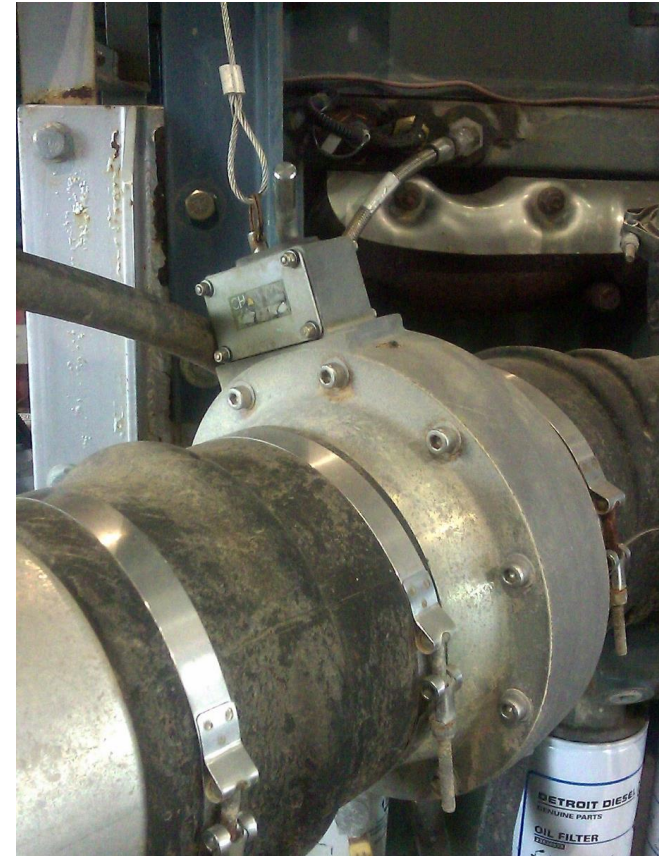
TRAFFIC MANAGEMENT & CONTROL RULES.

Useful for many reasons – but cannot
control wind direction or risk of runaway



CAUTION

MANUAL AIR SHUT OFF VALVES.





PREVENTIVE MEASURES: WHAT DOES WORK?



NEXT

TAKE A LOOK.



**STOP
ENGINE
RUNAWAY**

PICKUP TRUCK INSTALLATION.



COMPLETIONS EQUIPMENT INSTALLATION.





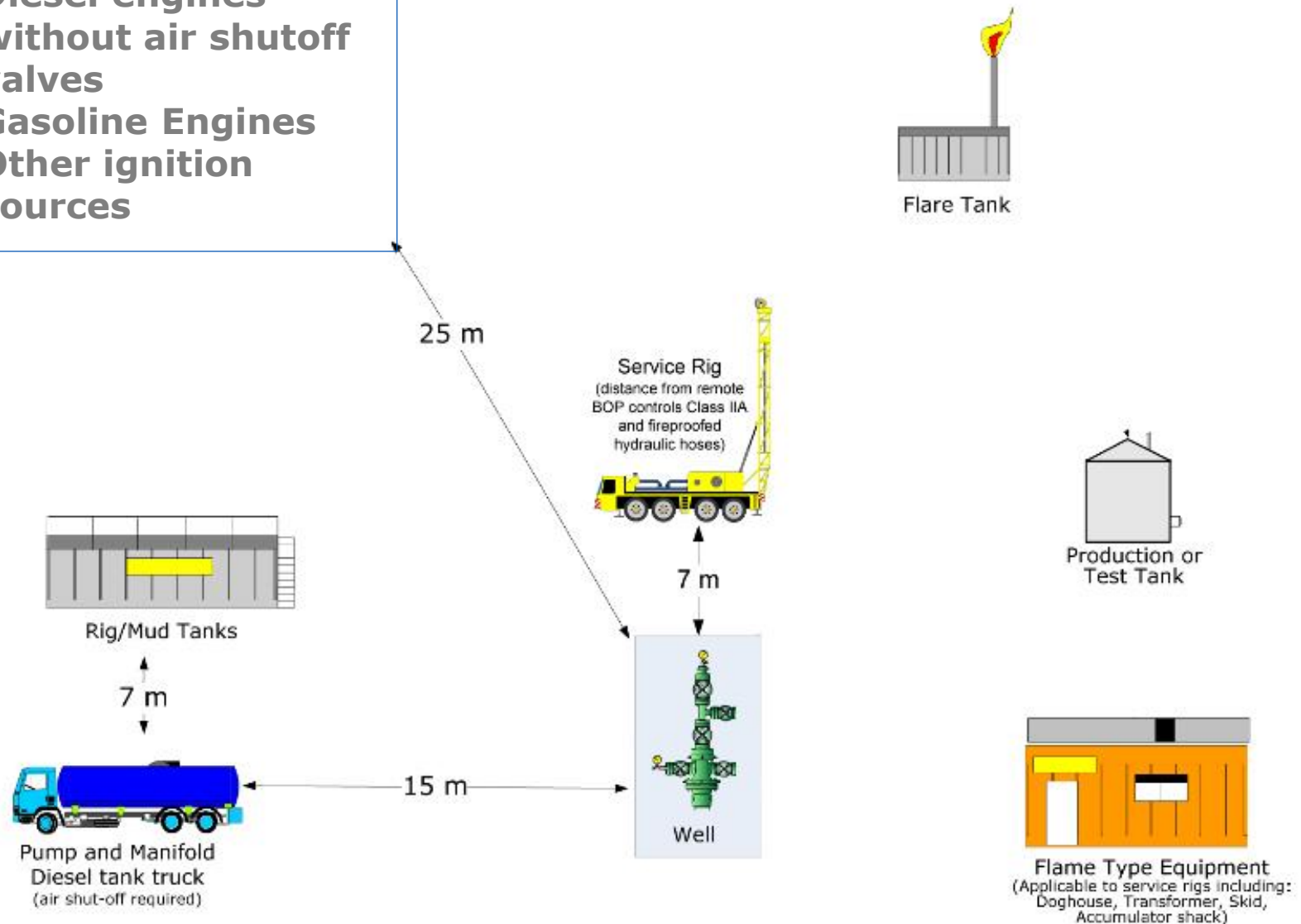
NORTH AMERICAN REGULATIONS & INDUSTRY PRACTICES



NEXT

CANADA: 151-71 REGULATION

- Diesel engines without air shutoff valves
- Gasoline Engines
- Other ignition sources



Cal OSHA

Petroleum Safety Orders Div 1, Chapter 4, Subchapter 14 Article 6, Section 6625.1

<https://www.dir.ca.gov/oshsb>

(a) In order to prevent diesel engine runaway as defined in Section 6505, no employer shall operate a stationary, vehicular or mobile diesel engine within 50 feet of the open well bore or other source of ignitable gas or vapor, unless the employer complies with subsection (b) through (f).

(b) The concentration of the flammable gases or vapors shall be at all times 10 percent or less of the lower explosive limit (LEL). Where concentration of the flammable gases or vapors is found to be greater than 10 percent of the LEL, the diesel engine(s) shall be shut down immediately.

(c) The air shall be continuously monitored at the well bore or at other sources of ignitable gas or vapor with an approved device to determine if a flammable atmosphere exists at concentrations greater than 10 percent of the LEL, or

(d) Where the air is not continuously monitored pursuant to subsection (c), diesel engines shall be operated under at least one of the following conditions:

(1) The diesel engine has an approved automatically actuated air intake shut-off valve that is equipped with a remote control readily accessible from the operator location or the equipment control panel where an operator is present, or

Cal OSHA Adopts New Safety Standard Diesel Engine Protection for Oil & Gas Drilling and Production Facilities

On September 20, 2012, Cal OSHA adopted new standards (attached) that enhance safety requirements for operating at California well sites and production facilities. The newly adopted Cal OSHA standard will be effective beginning November 30, 2012.



Drilling Sites

Open Well Bore-when a well is open to the atmosphere during well drilling, workover, maintenance/repair or abandonment operations.



Production Facilities

Process areas and piping that contains ignitable gas or vapor in production facilities such as oil and gas production and gas treatment.

Summary of Revised Standard:

1. Defines diesel engine runaway as a hazard.
2. Identifies method of control required to shut down diesel engines in the event of a runaway.
3. Includes diesel engines that power stationary, mobile and vehicular equipment operating near the well sites and production facilities.
4. Requires installation of a manual emergency stop device on all power drilling and well servicing equipment to effectively stop a runaway.
5. Enhanced requirements at drilling sites and production facilities:
 - a. Shut down the diesel engine if the concentration of the flammable gas or vapor is greater than 10 percent of the lower explosive limit (LEL)
 - b. Continuously monitor ignitable gas or vapor
 - c. Install automatic air intake shut-off valve or equivalent within 50 feet of potential source of ignitable gas or vapor when not monitored continuously.

OSHA Wyoming

**Workforce Services Department (053)
Oil & Gas Well Drilling (0011)
Chapter 6 (Facilities), Section 8
Ref. No. 053.011.6.08302013**

<https://rules.wyo.gov/Search.aspx>



(c) Facilities and Equipment

(ii) **Emergency shut-down device(s) that will close off the combustion** air shall be properly installed and identified on all diesel engines that are integral part of the drilling rig or are operated as a stationary or mobile engine of a drilling rig within the radius of the rig anchors or within seventy five (75) feet of the well bore, whichever is greater.

New Wyoming State OSHA Standard Diesel Engine Protection for Oil & Gas Drilling

On October 5, 2012, Wyoming State OSHA adopted a new standard to enhance safety requirements for operating at Wyoming drilling sites. The anticipated effective date of the new standard is February 2013.



Summary of New Standard:

Chapter 6, Section 8:

(c) Facilities and Equipment.

(i) An exhaust pipe from any ground level internal combustion engine, located within seventy-five (75) feet of any well bore, process vessel, oil storage tank or other source of ignitable vapor, shall be so constructed that any emission of flame along its length or at its end is prevented.

(A) Emergency shut-down device(s) that will close off the combustion air shall be properly installed and identified on all diesel engines that are an integral part of the drilling rig or are operated as a stationary or mobile engine of a drilling rig within the radius of the rig anchors or within seventy five (75) feet of the well bore, whichever is greater.

(ii) All CBMNG drilling rigs and auxiliary equipment (mobile and vehicular engines) shall be equipped with an over rev device (automatic air intake shutoff valve) installed on the motor, and approved spark arrestors attached to exhaust.

ALL OTHER STATES

API RP 54 (2019) Recommended Practice for Occupational Safety for Oil and Gas Well Drilling and Servicing Operations



7.13.1 Emergency shut-down devices that will close off the combustion air should be installed on all rig and skid mounted diesel engines.



Section 7.13

Internal Combustion Engine Safety

STATES UNDER FEDERAL OSHA

Q: I don't work in CA or WY – so why should I make a risk assessment on site diesel machine safety?

A: General Duty Clause Section 5 (29 USC 654) OSH 1970

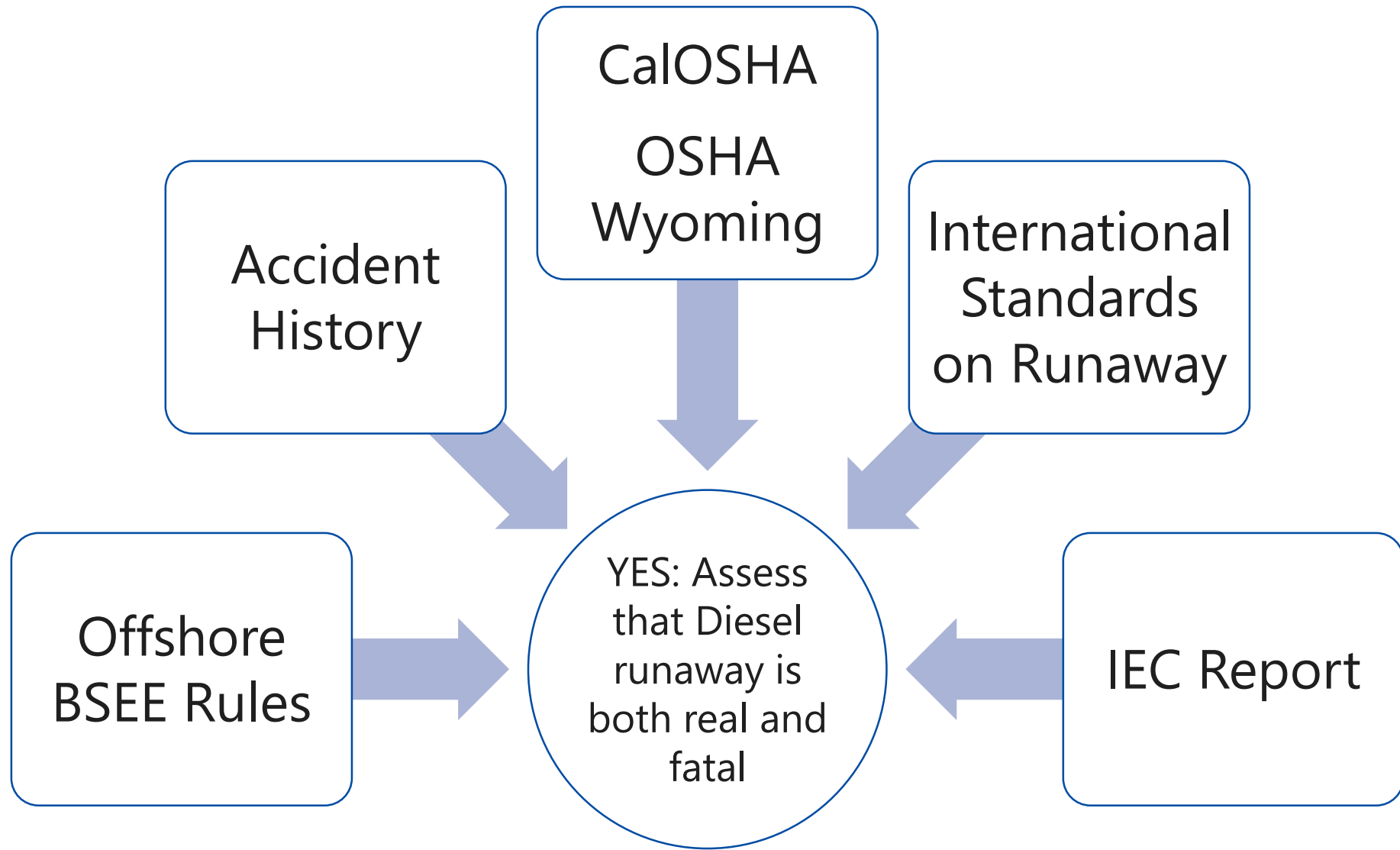


(a) Each employer –

(1) Shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

(2) shall comply with occupational safety and health standards promulgated under this Act.

<https://www.osha.gov/laws-regs/oshact/section5-duties>





Assessing the Risk



NEXT

LOW EVENT PROBABILITY – VERY HIGH CONSEQUENCES

Qualitative Risk

Probability of Occurrence	Consequence of Occurrence				
	Very Low	Low	Moderate	High	Very High
Very Low					
Low					
Moderate					
High					
Very High					

Low Risk



Medium Risk



High Risk



Diesel Runaway

DIESEL ENGINE AS IGNITION SOURCE?

Low Frequency – but consequences are
devastating






What Can We do to Reduce Accidents?



NEXT

1. EDUCATION & TRAINING



OSHA[®] FactSheet


Internal Combustion Engines as Ignition Sources

Internal combustion engines present an ignition hazard when used in facilities processing flammable liquids and gases. If flammable vapors or gases are released in these facilities, an internal combustion engine could ignite the flammable materials with catastrophic consequences. Investigations by OSHA and the U.S. Chemical Safety Board (CSB) document a history of fires and explosions at workplaces (oilfields, refineries, chemical plants, and other facilities) where an internal combustion engine was identified as or suspected to be the source of ignition.¹

Understanding the Hazard

Internal combustion engines, whether fueled by gasoline, diesel, propane, natural gas, or other fuels, can act as ignition sources. Examples include:

- Stationary engines such as compressors, generators and pumps.
- Mobile equipment or transports such as vans, trucks, forklifts, cranes, well servicing equipment, drilling rigs, excavators, portable generators and welding trucks.
- Contractor vehicles and motorized equipment.
- Emergency response vehicles such as fire engines and ambulances.
- Vehicle-mounted engines on vacuum trucks, tanker trucks and waste haulers.
- Small portable engines such as mowers, blowers, generators, compressors, welders and



An explosion at a refinery site killed 15 and injured nearly 200; an idling diesel pickup truck was the most likely ignition point.
Source: U.S. Chemical Safety Board


OSHA FactSheet 3589

Oil & Gas Wellsites Hazard Alert Oil & Gas Wellsites Hazard Alert Oil


Prevention of Fatalities from Ignition of Vapors by Mobile Engines and Auxiliary Motors

Between 2005 and 2015
85
DEATHS due to fires or explosions
including 27 mobile engines/motors deaths


Vehicles and motorized equipment present an ignition hazard if located too close to the wellbore or other potential flammable vapor sources (e.g., flowback tanks, frac tanks, production tanks). When flammable vapors or gases are released, non-intrinsically safe engines and motors can ignite the vapors and cause explosions with catastrophic consequences. Conducting a Fire Risk Assessment to ensure safe positioning of all motorized equipment during drilling and completions, servicing, and production operations is essential to preventing fires and explosions.



diesel trucks



light plants



motors & pumps

EVACUATE!

If an engine “over revs” or “runs away,” you run away too

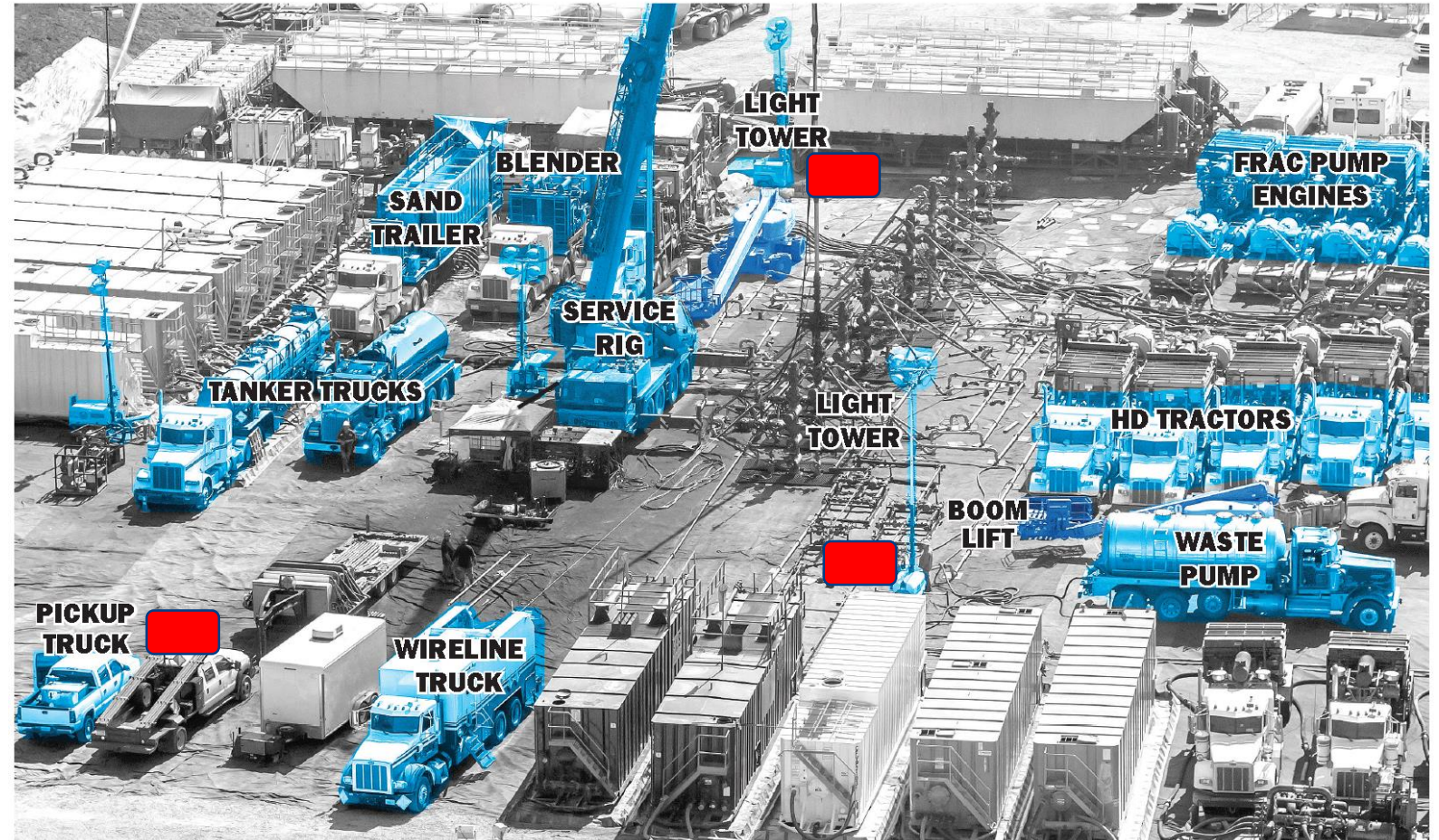
Employers

STEPS Network Hazard Alert

2. LOOK FOR SHUTOFF VALVES ON EQUIPMENT IN THE SITE



- Is it functioning properly?



3. ASK ABOUT CURRENT COMPANY POLICIES

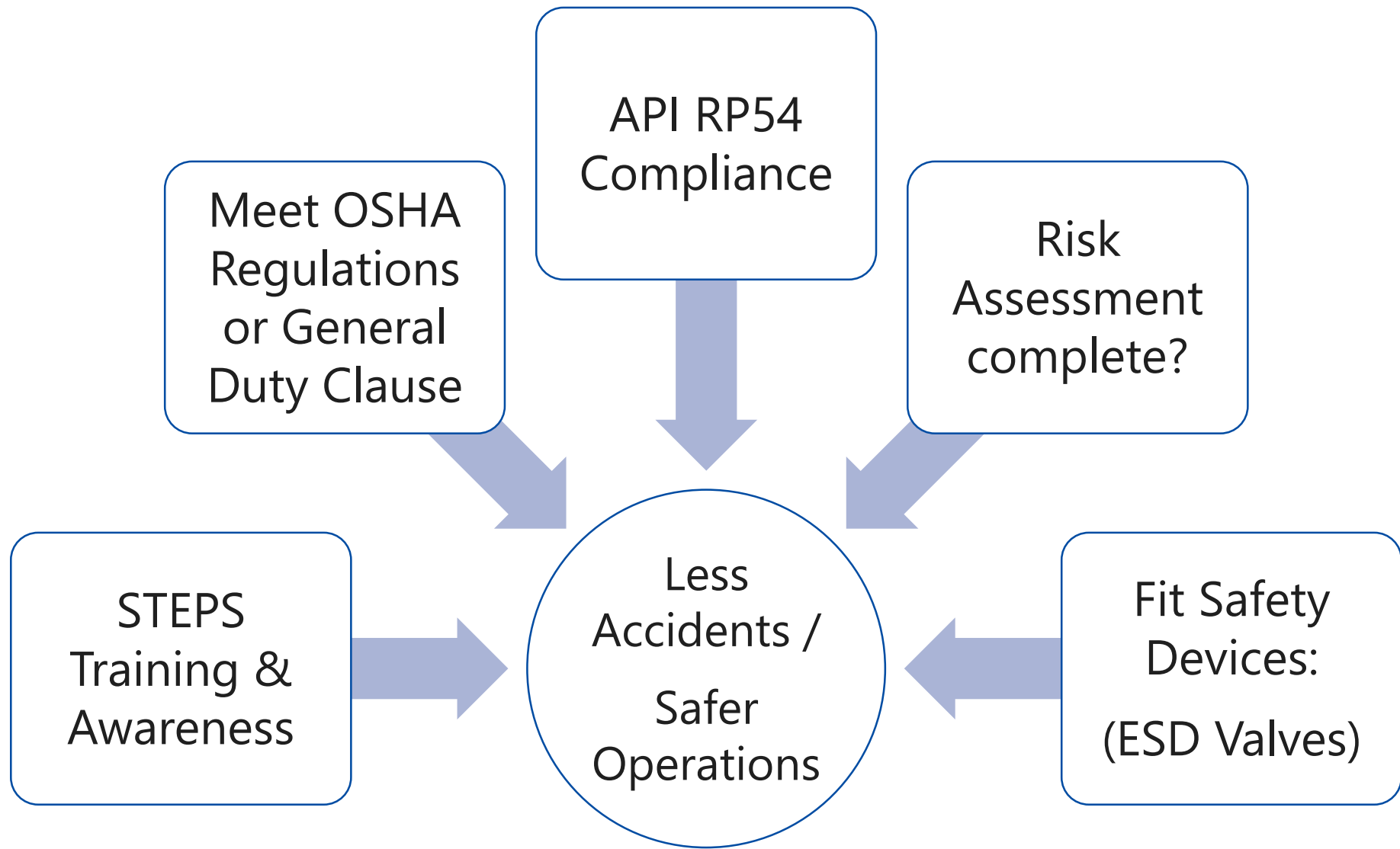
- Does policy ask for shutdown systems?
- What is the test program to ensure shutdown systems are working properly?



4. CONSIDER PROACTIVE IMPLEMENTATION OF SAFETY DEVICES

Air Intake Shutoff Valves







QUESTIONS?

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