TRAIN ▪ SERVE ▪ RESPOND

OSHA TRAINING INSTITUTE SOUTHWEST EDUCATION CENTER

Module 22

Oil and Gas Industry Guidelines

What standards are enforceable?

- OSHA standards
  - By industry and type of operation
  - Take precedence over industry standards
- Standards incorporated by reference
  - Only the parts concerning health and safety
- Recognized hazards
  - Generally accepted industry standards
  - OSHA guidance documents can interpret ambiguities

Elements Required to Prove Violation of General Duty Clause

- The employer failed to keep the workplace free of a **hazard** to which employees of that employer were **exposed**
- The hazard was **recognized**
- The hazard was causing or was likely to cause **death or serious physical harm**
- There was a **feasible and useful method to correct** the hazard

Reference: FIRM Chapter III (C)(2)(c)

- Not the lack of a particular abatement method
- Not a particular accident

SIC 1300 Standards Cited by OSHA Compliance Officers under 5(a)(1)

October 2005 through September 2006

- API RP 54: 19 different sections, some multiple times
- API RP 4G: 5 citations
- ASME/ANSI B30 series: 3 citations
- API 9B: 1 citation
- NEC: 1 citation
- Company safety practices: 3 citations
- Operating manuals: 5 citations

API RP 54

Recommended Practice for Occupational Safety for Oil and Gas Well Drilling and Servicing Operation

1 General

1.1 Purpose: recommend practices and procedures for promotion and maintenance of safe working conditions for personnel engaged in drilling operations and well servicing operations, including special services

1 General

1.2 Scope: rotary drilling rigs, well servicing rigs, special services

- Operations on location
- Not seismic or water well drilling
- Not site preparation or site abandonment

1.3 Responsibility:

- Each employer trains own employees
- Operator and contractor share information
- Immediate supervision of authorized person with authority to commence, modify, cease or improve

2 References

- API standards
- ACGIH TLVs
- ANSI standards
- ASME Boiler and Pressure Vessel Code
- NFPA standards
- Incorporated for special topics

3 Definitions

- 3.1.88 **shall**: Recommended practice has universal application to specific activity
- 3.1.89 **should**: Recommended practice
  - Safe comparable alternative available
  - May be impractical or unnecessary under certain circumstances

4 Injuries and First Aid

4.1 General – immediate reporting and treatment; follow-up reporting; cause investigation and prevention

4.2 Medical services – Information available and arrangements made

4.3 First aid – CPR trained individual and first aid kit at worksite

4.4 Emergency eye or body wash stations where exposed to injurious materials

5 Personal Protective Equipment (PPE)

5.1 General:

- Wear PPE when there is reasonable potential for prevention of harm
- PPE only used when engineering or administrative controls impractical

5.2 Wearing Apparel

- Hard hat: each person
- Eye protection where probable injury
- Safety-toe footwear
  - Alternative practice for extreme cold
- Gloves, apron, boots, other appropriate PPE for chemical handling
- No loose or poorly fitted clothing

5.2 Wearing Apparel

- Never work in clothing saturated with flammable, hazardous, or irritating substances
- Never wear jewelry that could be snagged or hung
- Keep hair contained if long enough to cause hazards
- Hair/beard must not interfere with PPE

5 Personal Protective Equipment (PPE)

5.3 Hearing protection

5.4 Respiratory protection

5.5 Fall protection for work 10 feet above rig floor or other working surface

- Guardrail, net, or PFAS
- Alternative fall protection plan if infeasible

6.1 Operations – General

- **Well control** maintained at all times
- **Rig floor attended** by person qualified in well control
- "Horseplay and careless acts" not permitted
- **Training** and safety program
- Unsafe conditions reported to supervisor and relayed between shifts

6.1 Operations – General

- Pipe threads cleaned with brush to prevent finger wounds
- Hazardous substances properly labeled; users trained
- Blowout prevention where necessary; well control drills
- No field welding on tongs, elevators, bails, or heat treated rig equipment

6.1 Operations – General

- Vehicles not involved in operations: at least 100 feet or derrick height away from wellbore, or other safety measures if not possible
- **Ground** rig substructure, derrick, mast, and other equipment as appropriate

6.2 Over Water Operations

- Instruction in abandonment procedures, emergency signals, water entry
- ≥ 2 emergency escape means to water
- Personal flotation devices & ring buoys
- ≥ 2 life floats or alternatives
- Cold water attire
- Basket stretcher or litter, and instruction

6.2 Over Water Operations

- Rules for crane transport of personnel
- API RP 2D for offshore pedestal cranes
- No crane operation during helicopter takeoff or landing
- Personal flotation devices for crane or swingrope transfer to/from boats
- Tag lines to steady all loads

6.3 Preliminary Rig-Up Operations

- Review planned arrangement to avoid hazardous conditions
  - Pipelines
  - Utility lines
- **Rig up safely before** commencing well operations
- Locate change rooms and outbuildings far enough from boilers and fuel tanks

6.3 Preliminary Rig-Up Operations

- **Check well for pressure**, and remove it or operate safely under pressure
- All personnel out of derrick or mast and cellar and stand clear when
  - Subsurface pump is being unseated or
  - Initial pull on tubing is made

6.4 Blowout Prevention Equipment

- Blowout prevention equipment installed and tested where well might flow
- Install, operate, maintain: API RP 53
- Rig personnel must understand and be able to operate blowout preventer
  - Discuss in pre-job meeting
  - Drills under variety of conditions
- Anchor choke and kill lines – prevent whipping

6.5 Housekeeping

- Clean work areas; remove trip hazards
- Avoid / clean up wet floors (from leaks, spills, or pulling wet pipe)
- Keep cellar clear of fluids or loose equipment/material
- Keep egress routes unblocked
- Store tools & equipment to avoid falling
- Keep fire fighting equipment accessible

6.6 Hydrogen Sulfide Environment

- Safety guidelines referenced
  - API RP 49, 55, 68
- Protect personnel and general public

6.7 Confined Space, Excavations, or Hazardous Environments

- Where unusually hazardous gases present, advise employees, contractors, and service company supervisors of hazards
- Fill the cellar if it is not needed
- Definition of confined space
- Testing, permit system before entry
- Declassification of confined spaces

6.7.5 Excavations

- If deeper than 4 feet and may contain a hazardous atmosphere:
  - Test for oxygen, flammable gases/vapors, toxic air contaminants
- Evaluate whether excavation is a confined space, and permit if necessary
- Precautions to prevent exposures
- Emergency response procedures

6.8 Machinery and Tools

- Personnel only operate machinery on which they are qualified
- Belts, drive chains, gears, and drives must have guards installed
  - Except rotary table, catheads, kelly
- Guards in place and properly maintained for operation
- Maintenance: report to rig supervisor

6.8 Machinery and Tools

- Moving parts guarded or stopped before cleaning, lubrication, or repair
- Maintain tools in safe condition
- Double insulate or ground tools; Use GFCI
- Electric or pneumatic tools: deadman switch or starting switch that cannot be locked in
- Secure materials to body when carrying them up a ladder

6.9 Lockout/Tagout

- Locks/tags identify equipment or circuits being worked on
  - Critical systems: include identity of worker
- Train and discipline personnel
- Lock/tag removed by person who installed it, or authorized replacement
  - If neither available, supervisor may remove after ensuring no hazard created

6.10 Auxiliary Escape

- Land rigs: derrick or mast must have auxiliary means of escape before work in the derrick
  - Securely anchored escape line attached to derrick or mast for escape from derrickman's platform (Geronimo line)
  - Wire rope with safety buggy with braking or controlled descent device
  - Safety buggy releases when weight is applied

6.10 Auxiliary Escape

- Tension on escape line:
  - Periodically checked and adjusted
  - 6-12 feet of sag in middle
  - Ground anchor point distance ≥2x height
  - Ground anchor point should withstand 3000 lb pull
- Alternate fast escape if line is infeasible
- Training on use
- Never ride except in emergency

6.11 Personnel Lifting Systems

- Never ride the elevators.
  - Except in extreme emergency, as determined by supervisor, with full fall protection and no pipe or other equipment
- Bosun's chair attached to traveling block or tugger line for inaccessible location
- Hydraulic or air winch lines allowable under certain conditions

6.12 Racking Tubulars and Drill Collars

- Secure rods, tubulars, drill pipe, drill collars when racked or hung in derrick or mast to keep from falling
- Safety clamps removed before hoisting continues
- Use stops, pins, or chocks to keep round equipment from rolling off storage rack
- Prevent/remove ice plugs in tubulars

6.13 Handling Drilling Fluid Chemicals and Additives

- Never use asbestos as additive
- Instruct personnel handling fluid and additives in handling, disposal, and PPE

7.1 Fire Prevention

- Store combustible and flammable materials safely
- Prevent rubbish accumulation
- No smoking, or source of ignition, near operations that could cause fire hazard – signs necessary
- Change rooms in safe areas for smoking

7.1 Fire Prevention

- Potential ignition sources located at safe distance from wellhead or flammable storage areas
- Only safety-designed heaters near rig floor, substructure, or cellar
- Do not allow oil and gas accumulations
- Store oily waste in covered metal containers

7.1 Fire Prevention

- Never use natural gas or LPG to operate spray guns or pneumatic tools
- Cleaning solutions: flash point ≥100°F
- Conductive containers (e.g. metal) to handle, store, or transport flammable liquids
  - Ground and bond any plastic containers
  - NFPA 77 and API Publication 2003

7.2 Fire Protection

- Fire fighting equipment not tampered with or removed
- Fire fighting water system may be used for wash down if capacity is not compromised
- Equipment accessible, plainly labeled
- Equipment inspected & maintained
- Crew familiar with location & use

7.2 Fire Protection

- Drilling rigs: at least 4 20-pound BC extinguishers, depending on operation
- Well servicing rigs: at least 2 20-pound BC extinguishers, depending on operation
- Fire fighting equipment near all welding
- Fire watch for welding/cutting outside designated welding area

8 Flammable Liquids

- Approved portable containers
- Tanks and Drums properly labeled
- Refueling operations:
  - Procedures for over water transfers
  - Shut down engines while refueling unless shutdown causes greater hazard
  - Assign a person to monitor filling tank to prevent spillage
  - Ground during refueling

8.3 Liquefied Petroleum Gas (LPG)

- Follow NFPA 58
- Ignition source control
- Protective caps on cylinders
- Usual cylinder precautions
- No temperatures >125°F, no direct heat
- Protective gloves for refilling or replacing bottles: freeze burns

8.4 Flammable Liquid Storage

- Storage area requirements: ventilation, exits, housekeeping, warning, extinguishers, classification
- On land:
  - Not within 50 feet of wellbore, or equivalent safety measures
  - LPG tanks >250 gallons at least 150 ft from and parallel to closest side of rig; labeled
- Offshore: appropriate precautions

9.1 Drilling and Well Servicing Rig Equipment – General

- Openings in rotary table kept covered when not occupied
- Rathole and mousehole openings kept covered when not occupied with equipment

9.2 Derricks and Masts

- Substantial, well designed & **maintained**
- Permanent name plate:
  - Manufacturer
  - Model and serial number
  - Rating including static hook load capacity with number of lines
  - Recommended guying pattern if applicable
  - If not noted, guy according to API 4G

9.2 Derricks and Masts

- Raising and lowering masts:
  - Not moved while raised (except for skidding)
  - Visual inspection of raising/lowering mechanism before use
  - Tools and unsecured materials removed from mast before raising/lowering
  - Base level and positioned before raising, lowering or telescoping, or tightening guylines
  - Qualified person in charge of raising/lowering

9.2 Derricks and Masts

- Raising and lowering masts:
  - Bolts, nuts and pins secured
  - No extra personnel in/under mast unless fully raised or lowered
- Guylines tensioned before load applied
- During unusual loading:
  - Only essential personnel on rig floor
  - No one in derrick, mast, or cellar

9.2 Derricks and Masts

- Platforms above rig floor maintained and secured to support stresses
- Materials not kept above rig floor unless in use and secured against falling
- No one on rig floor during overhead repair unless their help is needed
- No unguarded openings big enough for person to fall except ladder opening between supports of crown block

9.2 Derricks and Masts

- Bumper blocks:
  - Safety cable or strap along full length
  - Prevent wood fragment falling with screen
- Counterweights:
  - Safety line anchored to derrick/mast if not encased or in permanent guides
  - Travel of tong counterweights limited to elevations needed for tongs
- Safety devices for jacks

9.3 Ladders, Stairways, and Platforms

- Fixed ladder from rig floor to crown block and to each intermediate platform
- Ladders securely attached by manufacturer specifications
- Ladders must not lean back from vertical
- Minimum clearances for ladders
- Side rails extend ≥42 inches past landing

9.3 Ladders, Stairways, and Platforms

- Cages and platforms not required if PFAS is used
- Platforms wherever ladders are offset, if PFAS is not used
- **Open stairways >4 risers:**
  - Securely fastened
  - Handrails and midrails over entire length
- Uniform, level stair treads

9.3 Ladders, Stairways, and Platforms

- At least 2 stairway exits on drilling rigs from rig floor to ground level
- Rig floor, ramps, stairways, ladders, platforms kept free of slip/trip hazards
- Derrick platforms:
  - Inside mast, except stabbing board, must completely cover space from edge to legs
  - Secured to protect against dislodging

9.3 Ladders, Stairways, and Platforms

- Well servicing rigs:
  - Work not at ground level is on a working platform large enough for 2 people
  - Safety fasteners when folded for storage
- Finger board fingers bolted, welded, hinged-and-pinned, or equivalent, to beam

9.3 Ladders, Stairways, and Platforms

- Guardrails at outer edge ≥4 ft. above ground or other working level
  - 42 inch top rail, intermediate rail, posts
  - Except for
    - Personnel exits and entrances
    - Catwalk and V-door opening when being used
    - Work station used to rack tubulars
    - Alternate arrangements with equivalent safety
- 4 inch toe boards to prevent falling items

9.3 Ladders, Stairways, and Platforms

- Floor and deck openings not left open
- Floor holes people may walk into: securely covered with no more than 1 inch opening

9.4 Drawworks

- Visual inspection once per day
- Guard remains in place and in good condition during operation
- Do not lubricate during operation
- Do not leave brake without securing, unless equipped with automatic driller
- Shut-down switches at drum control console

9.4 Drawworks

- Brake systems inspected and maintained per manufacturer recommendations
- Drilling rigs:
  - Double (auxiliary) braking system
  - Safety device to keep traveling block from striking crown block
    - Tested before each trip and after drill-line slipping or cutting operation

9.5 Catheads and Lines Powered by the Cathead

- Shaft head covered by a thimble a rope cannot wind around
- Rope guide for manually operated rope
- Check for grooves >1/4 inch; rebuild and turn to avoid fouling
- Keep lines from being entangled with cathead line
- No rope or line on unattended cathead

9.5 Catheads and Lines Powered by the Cathead

- Drawworks control attended while manual cathead is in use
- No rope splices on cathead friction surface, except properly spliced endless rope
- Headache post or guard for drawworks control personnel when line is near operator

9.5 Catheads and Lines Powered by the Cathead

- Training required before operation of cathead or lines
- Maintain lines and automatic catheads in safe working condition
- When lifting tubulars, use slings that will not slip off.

9.6 Hoisting lines and other wire rope

- Visually inspect at least once per day; detailed inspection once per month
- Remove when too many broken wires
- Consider removal for corrosion
- **Remove** lines with corroded, cracked, bent, worn, improper end connections
- Remove for kinking, crushing, birdcaging, cutting, cold working

9.6 Hoisting lines and other wire rope

- Hoisting line: End securely fastened; enough extra line on drum to avoid fastener strain
- Anchors at least as strong as line
- Ton-mile limits; see API RP 9B
- Moving hoisting line not to come in contact with anything stationary except crown block sheaves and traveling block sheaves

9.6 Hoisting lines and other wire rope

- Hoisting line not removed from drum until traveling block rests on rig floor or is suspended separately
- Slings should be identified by size, grade, rated capacity, reach

9.7 Hoisting Tools, Hooks, Bails, Elevators, and Related Equipment

- Good engineering practice; maintained safe. See API Spec 8A, 8B, 8C
- Never exceed design load
- Safety latch on hoisting hook to prevent accidental release
- **Traveling blocks guarded** properly
- Crown blocks secured to keep sheaves from jumping out of bearings

9.7 Hoisting Tools, Hooks, Bails, Elevators, and Related Equipment

- Traveling blocks not moved while crown block is being lubricated
- Fasten pump end of rotary hose to derrick/mast by cable or chain
- Fasten swivel end of rotary hose to swivel with similar cable or chain
- Inspect elevators, latches, latch locks, pins, springs; replace if worn/damaged

9.8 Rotary

- Only engage power when rotary table is clear of all people and materials
- Do not use rotary table for initial breakout of tool joints – only spinning out after initial breakout
- Use smooth kelly bushings to prevent catching of people, clothes or material

9.9 Drill String Handling Equipment

- Manual drill pipe slip handles:
  - Use manufacturer's original or equivalent
  - Short enough to not project beyond master bushing
- Lubricate tapered side of drill pipe slips
- Do not kick slips into place
- Attach tongs to fixed structure using wire rope or stiff arm

9.9 Drill String Handling Equipment

- Maintain tongs properly
- Tong safety lines: long enough to use breakout cathead, but short enough to prevent complete rotation of tongs
- Power tongs:
  - Pressure systems: safety relief valve
  - Power input pressure line disconnected to work on tongs

9.10 Weight Indicators

- Used for all rigs that manipulate tubulars
- Maintained to register within 5%
- Checked periodically for calibration
- Gauge visible to operator
- Protected from falling

9.11 Drilling Fluid Tanks

- On land: Pits and tanks used to circulate flammables located ≥100 feet from well, or equivalent
- Drilling fluid tanks treated as confined spaces
- Ventilation, ventilation alarms, gas detectors
- Blowers with appropriate electrical classification

9.12 Pipe Racks and Pipe Tubs

- Pipe handled at the ends while loading, unloading, or transferring
- Keep people out of the way during transfer or loading/unloading
- Prevent pipe from rolling off: Load and unload by layers, with each layer blocked at all 4 corners.
- Temporary supports to skid or roll pipe

9.13 Pressure Equipment

- Pressure relief valve discharges located to prevent hazard with sudden discharge or piping movement
- Lines and hoses secured to prevent unsafe movement
- Never operate above rated pressure
- Hammer unions must be the same thread – some look alike but will fail

9.13 Pressure Equipment

- Pressure relief devices to discharge at or below rated pressure of components
- Automatic air pressure controls for cleaning, sandblasting, etc.
- Pump houses with 2 exit doors in different directions to outside
- Shear-pin relief valves enclosed to prevent flying pins

9.14 Generators, Motors, and Lighting

- Generators ≥100 feet upwind of wellhead or equivalent
- Overload safety device to protect from shorting and burnout
- Adequate illumination, by safe portable lights if necessary. Headlights are not sufficient.
- Extension cords insulated; plugs in good condition

9.14 Generators, Motors, and Lighting

- Lighting and fixtures of appropriate electrical classification (RP 500 & 505)
  - Enclosed and gasketed if not covered by 500/505
- ANSI/IES RP7 1988: Industrial Lighting
- Class I, Division I safeguards for shale shaker motor and area within 5 feet
- Lockout/tagout before repairing electrical equipment
- Ground motors, generators, control panels

9.15 Internal Combustion Engines

- Diesel engines require emergency shut-down devices to shut off air
- Actuation check the rig power emergency shut down devices 1x/week
- Check all other internal combustion engine shutdown devices 1x/30 days
- Spark arrestors or equivalent within 100 feet of wellbore

9.16 Inspection of Critical Equipment

- Periodically inspected by manufacturer recommendation or good engineering practice
- Certified inspectors use recognized methods for nondestructive testing
- Qualified personnel for other inspection types

10.1 Work in Proximity to Exposed Energized Power Sources

- Minimum clearances to power lines:
  - Operating rig: 10 ft + 4 in/10 kV over 50 kV
  - Lowered mast: 4 ft + 4 in/10 kV over 50 kV
  - Individual designated as observer
  - Consider lines live unless owner report or test by qualified person says non-energized

10.2 Rig Electrical Systems Equipment

- Designed for use in hazardous locations if used there
- Maintain: manufacturer recommendation
- Flexible cord, resistant to dampness and petroleum
- Protect wiring from damage; replace or properly repair when insulation damaged
- Offshore: API RP 14F

10.3 Classification of Areas

- See API RP 500 and 505 and NFPA 30
- Adequate ventilation defined
  - <10% of lower explosive limit (LEL)
  - Enclosed areas: 1 cubic foot/minute per square foot, but at least 6 air changes per hour
  - Natural or mechanical

11.1 Well Pumping Units

- Electric power deenergized during well servicing and, if necessary, during rig moves and rig-up or rig-down
- For well servicing:
  - Pumping unit turned off
  - Brake set
  - Power source locked/tagged out

11.1 Well Pumping Units

- Prevent unintended counterweight movement
- Use strong enough sling to handle horsehead
  - Installation: bolt or latch as recommended
- Maintain brake systems in safe working order
- Reinstall guards before startup

12 Special Services

- General
- Equipment
- Communications
- Discharge Line (Temporary Treating or Cementing Lines)
- Lubricator operations

13 Wireline Service

- General
- Placement and Handling of Wireline Service Units
- Gin Poles (Telescoping and Single Poles)
- Rope Falls (Block and Tackle)
- Wellheads, Wellhead Connections, and Adapters
- Lubricators and Wireline Blowout Preventer Equipment
- Wireline Operations
- Perforating
- Swabbing
- Bailing

14 Stripping and Snubbing

- General
- Operations

15 Drill Stem Testing

- General
- Preliminary to Drill Stem Test
- Performing the Drill Stem Test

16 Acidizing, Fracturing, and Hot Oil Operations

- General
- Pumping Operations

17 Cementing Operations

- General
- Pumping Operations

18 Gas, Air, or Mist Drilling Operations

- General (All other requirements apply)
- Training
- Equipment
- Procedures
- **Minimizing Sources of Ignition**

19 Hot Tapping and Freezing Operations

- General
- Hot Tapping Operations
- Freezing Operations

20 Hotwork, Welding, and Flame Cutting Operations

- General
  - Written safety work permit system
  - Avoid being a source of ignition
  - Certified welders for equipment whose primary function is to contain hydrocarbons
- Personal Protective Equipment (PPE)
- Fire Protection
- Equipment
- Welding Fumes and Ventilation