Message from Dominic Macklon

Colleagues,

It is my pleasure to provide you with the 2019 edition of the Lower 48 HSE Handbook. This year we’ve tried to focus on addressing the daily needs of those working in the field. There is important information provided for all Lower 48 employees and contractors, but we wanted to ensure it could be used as a quick reference for HSE topics faced by our field personnel on a daily basis. We are also providing the handbook in multiple formats, including a mobile app, for easy access. Our Life Saving Rules are prominently featured, and we are introducing new Process Safety Fundamentals guidance.

As you are all aware, our SPIRIT Values place Safety first and foremost. That is critical to ensure everyone returns home safely every day. To accomplish that, we should be “Always Professional, Always in Control.” Focusing on that mindset and utilizing the information provided in this handbook, will help position us for our 2020 goal of zero significant incidents and a continuous improvement in TRR.

As you prepare to start work each day, I ask that you and your co-workers consider these questions:

1. Have we planned the job properly, designed the equipment properly, and identified the remaining job-specific hazards and risk mitigations?
2. Are the people conducting the work adequately trained and competent to perform the work safely?
3. Do our work practices and procedures lead to safe execution and are they being followed?
4. Have we VERIFIED that we are honoring the identified hazard mitigations and controls?
5. Are we taking the time necessary to be safe, and are we ready to STOP the job if there’s ANY doubt?

I genuinely want each and every one of you to return home safely at the end of each day. As we continue our safety journey, I hope the information in this handbook will assist you in executing your work safely.

Dominic Macklon
President, Lower 48

At ConocoPhillips, our work is never so urgent or important that we cannot take the time to do it safely.
Lower 48 Safety Expectations

The following expectations apply to all personnel working on a ConocoPhillips Lower 48 location:

- Report all unplanned events and any injury, no matter how minor, to a ConocoPhillips supervisor as soon as possible.
- For injuries, call your asset’s medical case management service (typically, this is Axiom 1-877-502-9466).
- Attend an asset-specific safety briefing or orientation before going to work.
- Before working on one of our sites, attend a ConocoPhillips Safety Leadership Seminar (SLS) or Hazard Recognition & Management Workshop (HRMW) followed by SLS within 6 months.
- Complete all required HSE training for your position.
- If available, follow the safe work procedures and guidelines for the job you are doing.

**If safe work procedures or guidelines are not available, and you feel the job is unsafe to start, exercise your Stop Work Authority!**

- Use the Job Safety Analysis (JSA) process and GO card to identify hazards and take appropriate action:
  - A JSA should focus on a few job steps at a time, then refresh the JSA as job steps are completed.
  - When hazards are identified, steps must be taken to eliminate or mitigate those hazards.

  **Note:** “Be aware” or “Be careful” are not acceptable mitigations. Eliminate hazards or reduce their risk to an acceptable level with protective barriers (physical barriers, specialized equipment, procedures, etc.)

- Actively participate in a Behavioral Based Safety (BBS) program by observing, intervening and reporting.

  **STOP all unsafe acts that you see and have a meaningful discussion with the individual or crew such that they also understand the unsafe act and both of you agree on a safer alternative to complete the work!**

- Submit Hazard ID or similar reports for any potentially unsafe conditions you observe. These may include equipment, procedures or even lack of training or understanding.
HSE Management System
(HSE MS01)

The L48 HSE Management System is a detailed plan of:

- How to manage HSE risk and protect the health and safety of COP workers, contractors and nearby communities along with the environment.

- What the L48 organization will do to comply with the corporate HSE MS Standard.

- The processes, programs and procedures (methods) used to plan, do, assess and adjust our system to continually improve HSE performance in each of the 15 Elements of the Management System.

Note: More details on many of the subjects presented in this manual can be found by accessing the HSE Management System.
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Scan for L48 HSE Management System site.
Life Saving Rules
Life Saving Rules
Further detailed on following pages

Line of Fire
Keep yourself and others out of the line of fire.

Work Permit
Obtain a valid work permit when required.

Confined Space Entry
Obtain authorization before entering a confined space.

Working at Heights
Protect yourself against falls when working at heights.

Lifting Operations
Follow safe lifting operations and do not walk under a suspended load.

Energy Isolation
Verify isolation before work begins.

Ground Disturbance/Excavation
Obtain authorization before starting ground disturbance/excavation activities.

Bypassing Safety Devices
Obtain authorization before bypassing, inhibiting, or defeating a safety protection device or equipment.

Driving Safety
While driving wear your seat belt, do not use your mobile phone and do not exceed speed limits.
Line of Fire

Keep yourself and others out of the line of fire.
Establish and honor barriers and exclusion zones.

Position yourself and others to avoid:

- Pressure releases
- Vehicles and heavy equipment
- Dropped objects and suspended/swinging loads
- Moving objects
- Equipment under tension
- Pinch points

Secure loose and potential dropped objects.
Work Permit

Work with a valid work permit when required.
Work Permit

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- Where should a copy of the Work Permit be kept? 17
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- When should a Work Permit be canceled? 17
Working with a valid work permit is required, but a permit alone does not make the job safe. Before a work permit can be issued, the following minimum following minimum requirements must be met:

- All those who are involved in the work permitting process have been trained and proven competent in their roles and responsibilities.
- The scope of work has been well defined for the specific work location.
- Any change in the scope of work is accounted for by stopping the work, reassessing the risk, and reviewing/revising the permit, as appropriate.
- The permit issuer and responsible persons have identified any interactions with other work permits, work tasks, and/or simultaneous operations and these are cross-referenced on the permit.
- All hazards, including Line of Fire, have been identified and assessed; risks have been mitigated; and the necessary controls have been put in place.
- Changing hazards have been considered, and workers have been trained to recognize changes.
- Responsible persons have validated hazards mitigation and permit requirements at the work site prior to the start of work.
- All required signatures for the permit have been obtained from the designated responsible persons.
- Responsible persons have verified the integrity of any isolation required for the work to proceed.
- The scope of work, permit conditions and risk assessment have been communicated to all persons involved prior to the start of work as well as to those persons who come to the work site after work has started.
- Required atmospheric testing has been completed; results have been evaluated and documented; and repeat or continuous testing requirements are part of the permit conditions.
- For ongoing work, handover discussions are conducted between responsible persons of each shift, and the work permit is revalidated, as appropriate.
Work Permit

When is a Work Permit required?

• A general permit to work is required for the following non-routine work activities at Class A, B and PSM facilities:
  – General/Cold Work.
  – Class A & B Hot Work.
  – Confined Space Entry.
  – Excavation Work.
  – Lifting Operations.
  – Work requiring Energy Isolation.

• Activity-specific permits are required at ALL L48 facilities for the following routine and non-routine activities:
  – Confined Space Entry.
  – Excavation.
  – Lifting/Rigging.
  – Hot Work Class A & B (some Class B Hot Work is excluded from permit requirements; see Hot Work requirements for additional information).

When is a Work Permit not required?

• When “routine” work is being performed such as:
  – Identified as low risk per L48 Risk Matrix.
  – Systems with a voltage < 50 Volts.
  – Work not requiring an L48 work permit (LOTO, Hot Work, Confined Space Entry, etc.).

Who needs to approve a Work Permit?

• A COP Foreman, Supervisor or Superintendent (or designee).

What questions should be asked during the Work Permit approval process?

• Is the work required?
• Are the Work Permit and documentation complete?
• Does the work involve a Management of Change? Has it been approved to implement?
• Will this work involve SIMOPS (Simultaneous Operations) on the site?
• Is the Operations Manager’s written approval required for any work in a hazardous area?
• Are all the requirements understood by all parties?
• Are all HSE and Process Safety risks understood, and appropriate mitigations planned or in place?
• What is the impact on other activities in the area?
Where should a copy of the Work Permit be kept?
• At the work site.

When should a Work Permit be suspended?
• When work is interrupted. Examples of work interruption include:
  – Fire or gas alarms.
  – Hazard introduction from SIMOPS.
  – Conflicts with scope of work.

! Work cannot resume until the Work Permit is reauthorized by the Authorizing Representative!!

When should a Work Permit be canceled?
• When the job scope changes. Examples of job scope changes include:
  – LOTO is not completed.
  – Work cannot be performed as planned.
  – SIMOPS conflict that cannot be resolved.

! Work cannot resume until a new Work Permit is generated and approved for issue!
Confined Space Entry

Obtain authorization before entering a confined space.
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All confined space entry requires authorization. See local rules and regulations for specific requirements. Additionally, before authorization to enter a permit-required confined space is given, the following minimum requirements must be met:

- The permit has been issued and authorized with all responsible persons’ signatures and has been posted at the confined space entrance.

- Hazard analysis has been conducted to verify that all hazards associated with the entry have been recognized and mitigated.

- Only confined space trained personnel are allowed to enter and work in the confined space.

- Changing hazards have been considered, and workers have been trained to recognize changes.

- Permit conditions and risk assessment have been communicated to all affected personnel.

- Pre-entry preparation and inspection have been completed to verify that all appropriate controls and isolations are in place and verified.

- Required atmospheric testing has been completed; results have been evaluated and documented; and testing is repeated as described by the permit conditions.

- Emergency rescue procedures and resources have been put in place and tested.

- An attendant is present whose sole responsibility is to maintain communication with entrants and to raise an alarm in the event of an emergency. The attendant understands the assigned duties and knows not to enter the confined space for any reason.

- Controls to prevent unauthorized access are always in place.
Confined Space Entry

What is a Confined Space?

• A space that meets the following three requirements:
  – Is large enough and configured such that a person’s entire body can enter.
  – Has limited or restricted means of entry or exit.
  – Is not designed for continuous human occupancy.

What is entry?

• Entry occurs as soon as any part of the body breaks the plane of an opening into the space.

What are the different types of Confined Spaces?

• Permit-Required Confined Space.
• Re-Classified Confined Space.

What defines a Permit-Required Confined Space?

• Contains or has the potential to contain a hazardous atmosphere that exposes employees to a risk of death, incapacitation, injury or acute illness from one or more of the following causes:
  – Oxygen concentration below 19.5 percent or above 23.5 percent.
  – Flammable gas, vapor or mist more than 10% of its lower explosive limit (LEL).
  – Airborne combustible dust at a concentration that meets or exceeds its lower flammability limit (LFL). This condition may be approximated when dust obscures vision to 5 feet or less.
  – A concentration of any substance that could result in employee exposure in excess of the permissible exposure limit (PEL), e.g., H₂S-Hydrogen Sulfide.
  – Any condition recognized as immediately dangerous to life or health.
  – Contains a material that has the potential for engulfing an entrant.
  – Has an internal shape such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes down and tapers in.
  – Contains any other recognized serious safety or health hazard.

• Permit-Required Confined Space requires an approved permit, signed by a supervisor, before work may proceed.
What defines a Re-Classified Confined Space?

• The identified atmospheric, physical, and occupational health conditions are within nonhazardous limits.

  **Note:** This reclassification process must be documented on the CSE permit form.

How are Confined Spaces marked?

• Signs or other effective means of warning must be posted on confined spaces that can be entered easily (without the use of tools or keys).

CSE Key Steps

1. Isolate energy sources using LOTO. If positive isolation cannot be accomplished, the double block and bleed method can be used, but the bleed/vent must be locked open and monitored during CSE.

   - **A single closed block valve is never allowed as an isolation method for CSE!**

2. Clean, purge and ventilate the confined space.

3. Test the entire confined space using a direct-reading instrument and record results on the CSE permit form.

4. Complete a hot work permit if required.

5. Install barriers if needed.

6. Complete the CSE permit form and post near the entrance to the CSE.

   - **Note:** The CSE Supervisor is not required to remain onsite for a reclassified CSE, so these duties will belong to the Lead Worker. If reclassification is not possible, the CSE Supervisor will remain onsite.

7. Ensure the rescue team, equipment and attendant are ready (not required for Reclassified CSE).

8. Ensure continuous monitoring while entrants are in the confined space.

9. Document the atmospheric readings every 2 hours on the CSE permit form (not required for Reclassified CSE).
Confined Space Entry

10. Complete a new CSE Permit form if:
   • Permit duration exceeds 12 hours.
   • Entry spans a crew change.
   • A Stop Work Order is given.

11. **STOP** the work and remove entrants from the confined space if any unanticipated hazardous condition is detected during the entry.

12. Complete CSE by:
   • Removing all personnel and tools.
   • Installing a barrier at the entrance.
   • Conducting a debrief (**not** required for Reclassified CSE).
   • Closing the CSE permit.

Additional information on atmospheric testing

• Use a probe or extension on the testing equipment for confined spaces that are deep, have odd shapes or include remote areas.

• Individuals cannot physically enter a confined space to obtain a test reading without meeting the conditions of either a permit required or reclassified confined space entry.

*When conducting atmospheric testing, make sure to test at multiple elevations/areas of the space to account for vapors/gases that are lighter or heavier than air!*
Working at Heights

Protect yourself against a fall when working at height.
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Use fall protection when working outside a protective work environment. See local rules and regulations for specific height requirements. A protective work environment includes approved scaffolds, stairs and platforms with handrails, mid-rails and toe boards, and approved mobile work platforms. Before working at height proceeds, the following minimum requirements must be met:

• Options to eliminate the need to work at height have been assessed.

• Where practical, a fixed or mobile work platform with handrails, mid-rails, and toe boards is used. A competent person must approve these platforms.

• The fall arrest equipment and system includes these requirements:
  – A responsible person has identified and provided sufficiently rated anchor point(s) for continuous tie-off, preferably above the worker’s head.
  – A full body harness with a D-ring attachment point is used.
  – Synthetic lanyards with shock absorbers or fall limiter devices, all equipped with dual action self-locking snap hooks at each connection, are used.
  – Visual inspection of the fall arrest equipment and system is completed before each use, and any equipment that is found to be damaged or has been activated is taken out of service.

• A rescue plan and appropriate equipment are in place to minimize suspension trauma in the event of a fall.

• Personnel working at height are trained to recognize hazards and to use applicable fall protection equipment.

• Only trained personnel erect, modify, and dismantle scaffolding.

• Only competent person(s) inspect scaffolding.

• Work surfaces, including wall and deck openings on work platforms, are properly protected to prevent falls.

• Tools and equipment used while working at height are properly secured from falling.

• Where work at height could interact with persons working or passing below, suitable barriers are in place to prevent injury from falling objects and walking into potential Line of Fire hazards.

For further guidance, see local procedures related to Working at Height and Scaffolding.
Working at Heights (Fall Protection)

When are you required to use fall protection?

• When on a walking and working surface with an unprotected side or edge that is 4 feet or more above a lower level.

• When working where there is a fall hazard potential greater than 6 feet, but is not on a walking and working surface, such as climbing on equipment, portable ladders, fixed ladders without cages, etc.

You must maintain 100% continuous use of a correct fall protection system!

How do you know when to use fall protection and what type?

• A Fall Hazard Assessment must be completed when the potential falls are either:
  – From a height of 6 feet or more
  – Likely to cause serious harm falling from a lesser height

  Note: These requirements do not apply to trucks, trailers or railcars, unless at a loading/unloading rack.

What are the different types of Fall Protection?

Hazard Elimination

• Use alternate work methods to complete the task, eliminating the need to work at height.
Passive Fall Protection

- Place physical barriers such as guardrails at unprotected edges and cover all holes. Ideally, permanent guard rails are installed when work is expected to be done at heights above 4 feet.

Installation of temporary or permanent guard rails at heights above 4 feet will likely require the use of either a fall restraint or fall arrest system!

Fall Restraint System

- A system designed to prevent the user from reaching a fall hazard.

- Restraint systems typically include a full body harness or a body belt and a lanyard or restraint line. No vertical free fall is permitted.

- The most common types of fall restraint systems include work positioning systems and fall restraint lanyards.

  - A work positioning system:

  - Fall restraint lanyard:

  - This is designed to prevent you from falling, not absorb the shock after a fall. It could be adjustable length or fixed length.
Working at Heights (Fall Protection)

Fall Arrest System

• Used to make sure workers only fall a safe distance with an acceptable level of force.

These systems shall be rigged so workers can neither free fall more than 6 feet nor contact any lower level!

• Normally consists of an anchor point, connectors and a full body harness and must include a lanyard, lifeline, deceleration device, shock-absorbing device or a suitable combination of these items.

Body belts cannot be used with a fall arrest system!

A custom fall arrest device must be provided for any employee whose combined tool and body weight is more than 310 pounds!

• The most common types of fall arrest systems are either shock-absorbing lanyards or self-retracting lifelines (SRL).

- Retractable Fall Arrest System
  - A fully self-retracting lifeline that attaches directly to a full body harness on the back at the upper D-ring. The arrest system is a braking mechanism that limits the free-fall to 24 inches, has a maximum working load of 310 pounds and is at least 30 feet in length when fully extended.
• **Self-Retracting Lanyard**
  - A device containing a drum-wound line that slowly feeds from or retracts into the drum under slight tension while the user moves normally. It is attached to the fall arrest attachment on the body harness and automatically locks (i.e., prevents the line from feeding and thus stops a fall) if the individual wearing it falls.

• **Fall Arrest Shock-absorbing Lanyard**
  - A fall arrest shock-absorbing lanyard typically will include a “shock absorber” identified by either a bungee cord hooked to the lanyard or a bundle of material at one end of the lanyard. It is designed to both stop a fall and absorb the shock after a fall occurs.

![](image)

A typical 6-foot shock-absorbing lanyard requires an anchor point at least 18 feet high to be effective! These devices typically have limited use for ConocoPhillips!

**Do fall arrest systems have to be attached to an anchor point?**

- Personal fall arrest systems must be attached to an approved anchor point.

- The following Anchor Selection Worksheet may be used to determine the appropriate piping sizes and structural guidelines for anchor point selection in lieu of engineering design.
Working at Heights (Fall Protection)

Pipe, Angle, Beam Width and Channel Sizing Chart

<table>
<thead>
<tr>
<th>Connection Parameters</th>
<th>Required Beam Section Modulus must be</th>
<th>Required Pipe Diameter (in.)</th>
<th>Required Angle (in.)</th>
<th>Required Beam Width (in.)</th>
<th>Required Channel Size (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,000-lb load to the midpoint of bracing spanning less than 5 ft.</td>
<td>Greater than 3 in.</td>
<td>Greater than 6 in.</td>
<td>Greater than 6 in. x 6 in. x 3/8 in.</td>
<td>Greater than 4 in. x 13 in.</td>
<td>Greater than 6 in.</td>
</tr>
<tr>
<td>5,000-lb load to the midpoint of bracing spanning more than 5 ft., and less than 10 ft.</td>
<td>Greater than 6.5</td>
<td>Greater than 6 in.</td>
<td>No angles</td>
<td>Greater than 6 in.</td>
<td>Greater than 6 in.</td>
</tr>
<tr>
<td>1,000-lb load to the midpoint of bracing spanning less than 5 ft.</td>
<td>Greater than 2.375 in., Schedule 40</td>
<td>Greater than 3 in. x 3 in. x 3/8 in.</td>
<td>Greater than 4 in. x 4 in. x 1/2 in.</td>
<td>Greater than or equal to 4 in. x 13 in.</td>
<td>Greater than or equal to 3 in.</td>
</tr>
<tr>
<td>Connecting a 3,000-lb load at midpoint of bracing spanning less than 5 ft.</td>
<td>Greater than 3.500 in., Schedule 40</td>
<td>Greater than 4 in. x 4 in. x 3/8 in.</td>
<td>Greater than or equal to 4 in. x 13 in.</td>
<td>Greater than or equal to 4 in. x 13 in.</td>
<td>Greater than or equal to 4 in.</td>
</tr>
<tr>
<td>Connecting a 1,000-lb load at midpoint of bracing spanning more than 5 ft., but less than 10 ft.</td>
<td>Greater than 3.500 in., Schedule 40</td>
<td>Greater than 4 in. x 4 in. x 3/8 in.</td>
<td>Greater than or equal to 4 in. x 13 in.</td>
<td>Greater than or equal to 4 in. x 13 in.</td>
<td>Greater than or equal to 4 in.</td>
</tr>
<tr>
<td>Connecting a 3,000-lb load at midpoint of bracing spanning more than 5 ft., but less than 10 ft.</td>
<td>Greater than 4.500 in., Schedule 80, or 5.625 in., Schedule 40</td>
<td>No angles</td>
<td>Greater than or equal to 4 in. x 13 in.</td>
<td>Greater than or equal to 4 in. x 13 in.</td>
<td>Greater than or equal to 6 in.</td>
</tr>
</tbody>
</table>

- Anchor system strength criteria for various fall protection anchors are as follows:
  - **Fall Arrest**
    - Noncertified anchor: 5,000 lb. static strength
    - Certified anchor: designed, selected, installed and used under the supervision of a qualified person; static strength two times maximum arresting force
  - **Work Positioning**
    - Noncertified anchor: 3,000 lb. static strength
    - Certified anchor: static strength two times foreseeable force
  - **Restraint & Travel Restriction**
    - Noncertified anchor: 1,000 lb. static strength
    - Certified anchor: static strength two times foreseeable force
• All anchor points are to be designed to support 5,000 pounds for each personal fall arrest system attached or designed with a safety factor of at least two.

• Locate the attachment point for a body harness only in the center of the back near shoulder level.

• Ensure that D-rings on the sides of the body harness are used only for attaching positioning devices.

• Verify that anchor points used for attachment of personal fall arrest equipment are independent of any anchor point being used to support or suspend platforms.

• Locate the anchor point directly above the individual’s head to eliminate the hazards of “pendulum-type” swing falls and locate it above shoulder height whenever possible.

• Attach personal fall arrest systems to guardrail systems only if a registered professional engineer with experience in designing fall protection systems or a Qualified Person with appropriate education and experience approves the guardrail system as an anchor point.

• A crane or boom can be used as a tie-off point if it is appropriately rated, and deenergized (unless it is being used for a rescue situation)!

What are some other requirements for Fall Arrest Systems?

• Personal fall arrest devices must be used when fall hazards cannot be eliminated or prevented by other means.

• Personal fall arrest devices must be used when working in a crane suspended basket or platform.

• Personal fall arrest device or a fall restraint system must be used when working from an aerial lift as follows:
  – Body belt (or body harness) with a tether (i.e., lanyard without a shock absorber) anchored to the boom or basket that does not allow a worker to fall out of the basket.
  – Body harness with a tether (e.g., 3-feet lanyard with shock absorber, self-retracting lanyard) anchored to the boom or basket rigged such that an individual can neither free fall more than 6 feet nor contact any lower level.

• Only one personal fall arrest system can be attached to a single vertical lifeline.

• Lanyards must be free of knots and no longer than six feet including connectors and shock absorber.
Working at Heights (Fall Protection)

- A separate fall arrest system (e.g., harness, lanyard and anchor point) must be used that is independent from descent control equipment.

What are the rescue requirements when using a Fall Arrest System?
- Emergency rescue plan must ensure personnel are rescued within 20 minutes after a fall occurs using a personal fall arrest system.
- Availability and need for additional equipment, rescue personnel, ladders, etc., must be considered as part of the plan.
- COP and contractor rescue plans must be reviewed in the JSA discussion.
  **Note:** Fall arrest systems that allow for self-rescue can be purchased.

What do you look for when inspecting fall protection equipment?
- Personal fall protection equipment and components must be inspected before each use for signs of the following:
  - Distorted snap-hooks or faulty hook springs.
  - Mildew.
  - Wearing or internal deterioration in the lanyards.
  - Contact with fire, acids or other corrosives.
  - Damage due to deterioration.
  - Defects (cuts, tears, abrasions, undue stretching).
  **Note:** Equipment removed from service must not be used again until inspected by a competent person.
Lifting Operations

Follow safe lifting operations and do not walk under a suspended load.
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- What are some of the basic safety rules for gantry cranes and hoists? .................................................. 42
- What are some basic safety rules when using a gin pole truck? .............................................................. 42
Before Lifting Operations proceed, the following minimum requirements must be met:

- A competent person has assessed the lift method and equipment.
- Critical lifts have undergone a risk assessment, and a Lift Plan has been approved.
- Operators of powered lifting equipment and lifting devices are trained and certified for that equipment.
- Lifting devices and equipment have been certified for use within the last 12 months (at a minimum) or per local regulatory requirements, whichever is more strict.
- A competent person has conducted visual inspection of lifting devices and equipment, including rigging of the load.
- Load limits are clearly and legibly marked on all lifting devices and equipment.
- The load weight has been verified to not exceed dynamic and/or static capacities of the lifting equipment.
- Prior to lifting, the operator has confirmed that safety devices installed on lifting equipment are operational.
- Appropriately trained and qualified persons supervise rigging.
- Tag lines, poles, stiffy tools or other appropriate means are available as the primary methods to control lifted loads.
- The person(s) guiding the load into place understand Line of Fire hazards and have an identified means of escape, should the load move.
- Clear communication (including hand signals) is established and can be maintained by all involved parties during the lifting operations.
- For blind lifts, a competent spotter/signalman uses radio communication and direct visual contact with the lift operator.
- For Lifting Operations to commence, barriers have been put in place, including preventing anyone from walking under suspended loads or into the Line of Fire.
- Changing conditions (e.g., weather, winds) have been discussed and prepared for.
Lifting Operations

What are the basic rules for mechanical lifts?

• Load limits must be clearly marked on all lifting equipment.
• Visual inspection must be conducted for lifting devices, associated equipment and the load rigging.
• Only certified personnel or trainees supervised by qualified personnel can rig, operate, inspect or maintain mechanical lifting equipment:
• The Operator must remain at the controls when a lift is in progress.

Do not operate mechanical lifting equipment within 10’ of energized electric lines or travel under or near energized electric lines within 4’.

Do not leave a suspended load unattended!

Maintain a safe (3’ minimum) buffer zone when mechanical equipment is in operation except for operations where special precautions are taken, such as pipe tripping and other rig floor operations.

Maintain a buffer zone within 45-degree angle of the load, if practicable. Before lifting, verify tag lines or stiffy tools are long enough to maintain a 45-degree angle during the lift.

• The Operator must verify all personnel are clear of the buffer zone prior to actuating equipment.
• Personnel must never enter the buffer zone until the Operator has moved his hands away from the controls, established eye contact, and gives the go-ahead.

Never place any part of your body under a suspended load - not even for an instant!

• Do not carry loads over personnel.
• Never reach for a falling or swinging object to stop its movement.

Always use a tag line (without knots or loops on the end) or stiffy tool to guide, snub and control the load! Multiple lines/tools may be needed!

• Rope ends of taglines must be braided, taped or left frayed.

What are some of the signaling/communication requirements?

• A signal person must be assigned when:
  – The Operator does not have full view of the operation.
  – The Operator or person handling the load determines a signal person is needed.
  – Site-specific safety concerns are raised.
• When the Operator cannot see the primary signaler, a second signaler must be used to:
  – See both the primary signaler and operator.
  – Relay signals from the primary signaler to the operator.
• All hand signals from a designated signaler must be obeyed (see Appendix for hand signals).

A stop signal must always be obeyed regardless of who gives the signal!

• For blind lifts, the spotter/signalman must use both of the following:
  – Radio communication.
  – Multiple spotters and signalmen to maintain visual contact with the lift operator.
• Signalers should be identified by either an orange hard hat, orange gloves or orange vest.

What qualifications must a Crane Signaler have?

• Documented qualification from:
  – A third-party qualified evaluator.
  – The employer’s qualified evaluator.
• Documentation must be available at the worksite.
Lifting Operations

What are some of the Rigging requirements?

- Rigging of slings and other lifting equipment must be performed only by a qualified rigger, or trainees under the direct supervision of a qualified rigger.

Rigging must be inspected at the beginning of each work shift or prior to each use and removed from service after a failed inspection!

- Below are examples of damage to rigging equipment that would require its removal from service:

  - KINKING
  - DOG LEGS
  - BIRDCAGING
  - SEVERE WEAR
  - BROKEN WIRES
  - CORROSION
  - DAMAGED FITTINGS
  - ILLEGIBLE TAG/ID
  - CHEMICAL DAMAGE
  - HEAT DAMAGE
  - HOLES, CUTS, TEARS
  - BROKEN/WORN STITCHES
  - WEAR/ABRASION
  - KNOTS
  - UV DAMAGE
  - DAMAGED FITTINGS

What qualifications must a Rigger have?

- One of the following:
  - Recognized degree.
  - Recognized certificate.
  - Recognized professional standing.
  - Extensive knowledge, training and experience.

- A qualified Rigger must demonstrate the ability to solve problems related to rigging loads.
What is a Critical Lift?

• When any of the following occur:
  – More than one crane is supporting a load.
  – The load weight is greater than 75 percent of crane’s capacity.
  – Lifting over operating process equipment.
  – Lifting personnel without using an offshore personnel basket.
  – A blind lift.

A Critical Lift Plan is required!

When can mechanical lifting equipment be used for lifting personnel?

• Only when conventional means are more hazardous or not possible. Conventional means of lifting personnel include:
  – Personnel hoist.
  – Ladder.
  – Stairway.
  – Aerial lift (man lift).
  – Elevating the work platform.
  – Scaffold.

What training must a crane Operator have?

• Certified for the type and capacity of crane to be operated.
• Qualified by one of the following:
  – Certification from an accredited crane operator testing organization.
  – Qualification from their employer through an audited employer program.
  – License from a state or local government meeting the minimum requirements set forth.

When should cranes be inspected and documented?

• Prior to each new operation.
• Monthly inspection including the condition of its wire ropes.

Each crane must have an anti-two-blocking device to prevent contact between the load block and boom tip and between the Overhaul ball and the boom tip!

Anti-two-blocking device must never be bypassed!
Lifting Operations

What are the basic safety rules for operating a forklift?

- Forklifts must have an automatic device that signals when the vehicle is backing up, such as a horn whistle or gong.
- Forklifts must be inspected daily before use.
- A seat belt must be worn while operating a forklift.
- None of the following are allowed on a forklift:
  - Riding on any area of the forklift not specifically designated for human occupancy.
  - Standing under or passing under the elevated portion of a forklift regardless of the load.
  - Must not be operated near overhead installations.
- Never lift a load with one fork.
- Unattended forklifts must be left in the following condition:
  - Fully lowered.
  - Controls in neutral.
  - Power shut off.
  - Brakes set.

What are some of the basic safety rules for gantry cranes and hoists?

- Warnings and legends designed to alert the operator to the hoist, load block and controls are required.
- The rated load of the crane must be plainly marked on each side.
- A daily pre-use inspection must be conducted on all gantry cranes and hoists.
- Hoists must be installed in a way that allows the Operator to always remain clear of the load.
- Hand chain-operated hoists must be operated with hand power only and with no more than one operator per hand chain.

A lever extension (cheater) must not be used on manual lever-operated hoists!

What are some basic safety rules when using a gin pole truck?

- Trucks equipped with winches must have “headache” guards to protect the cab and driver.
- The operator must never leave the controls while the load is suspended.
• Personnel must not approach a suspended load until:
  – The operator’s hands are moved away from controls.
  – The signaler has given the go-ahead.

• Personnel must be clear of the load with no body parts:
  – Between the load and another object.
  – Under any part of a load suspended on the winch and gin poles.

• Do not touch a moving line and do not allow the line to slide through someone’s hands.

• The load must be secured before moving the truck.

• Operator must never leave the controls while load is suspended.

⚠️ Do not use Snap Boomers!

• The gin poles must be secured when in the raised position. The line hook must be secured, the line pulled snug and the brake set.
Energy Isolation

Verify isolation before work begins.
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Isolation and the use of specified additional personal protective equipment (PPE) provide barriers and protection from hazards such as electricity, stored energy and/or hazardous materials. Before work that is dependent on isolation from such hazards proceeds, the following minimum requirements must be met:

- A designated competent person has risk-assessed and authorized the isolation scheme, the method of removing stored energy and/or hazardous materials, and the reinstatement of the stored energy and/or hazardous materials.
- Personnel, who perform isolation work, remove stored energy and/or hazardous materials, and reinstate the stored energy and/or hazardous materials are competent and are authorized to do so.
- Any required authorized permits and documents showing isolation arrangements and/or locations have been made available at the work site and have been communicated to affected personnel.
- All isolation points are clearly identified with approved locks, disabling devices and tags as specified on the required authorized permits, Isolation Certificates and/or Lockout/Tagout (LOTO) documents.
- Isolation locks and keys have been logged in appropriate registers and remain strictly controlled.
- A designated competent person and the responsible person(s) for work execution have verified at the site that all physical isolations and controls are in place.
- Changes in conditions or work scope outside those specified in the authorized permits, Isolation Certificates, and/or LOTO documents require a revalidation and re-verification of the isolation/de-isolation scheme before continuing with the work.

For Process/Mechanical Isolations:

- Before start of work (e.g., first line break), a test has been conducted to confirm the absence of stored energy and/or hazardous material.
- **Note:** If this is not possible, do not start work. Always stay out of the Line of Fire.

For Electrical Isolation:

- A test to validate the absence of voltage is conducted before working on any electrical equipment.
- After a change in conditions or after any worker break, a retest to revalidate the absence of voltage is conducted.
- Working on ‘live’ systems is not permitted without written permission from Senior Line Management, as defined by local rules.
Energy Isolation (Lockout/Tagout & Try)

**Lockout**—a method of ensuring that an energy-isolating device and the machines or equipment being controlled cannot be operated until the lockout device is removed.

**Affected Personnel**—individuals whose jobs require them to operate or use machines or equipment on which service or maintenance is being performed under lockout or tagout, or whose jobs require them to work in the immediate vicinity of servicing or maintenance being performed.

**Authorized Personnel**—COP employees or contract personnel who have been designated by their supervisors and trained to be responsible for servicing or maintaining machines or equipment under lockout.

**Qualified Person**—Person who has received electrical training and is capable of working safely on energized circuits; is familiar with the proper use of special precautionary techniques, personal protective equipment (for shock hazards and Arc flash requirements), insulating and shielding materials, and insulated tools; and can recognize and avoid the electrical hazards that may be present with respect to that equipment or work practice.

What are the different types of LOTO & Try?
- Individual.
- Group.
- Group using the Permit Process.

What are the 7 main parts of LOTO & Try?
1. Preparation for Energy Isolation.
2. Equipment Shutdown.
3. Isolation of Energy.
5. Verification of Isolation and Try.
6. Inspection and Notification.
7. Release from Lockout.

When is LOTO & Try required?
- Anytime there could be an unexpected release of energy while performing maintenance or repairs (servicing) on a piece of equipment.

Who performs LOTO & Try?
- A trained, qualified and authorized person who has demonstrated the skills and knowledge to safely isolate equipment.

Who else is involved in LOTO & Try?
- All Authorized and Affected Personnel working on equipment under LOTO & Try must verify isolation and...
de-energization has been effectively accomplished before working on equipment.

**What locks and tags should be issued for LOTO & Try?**

- **Red** individually keyed or combination personal locks and tags issued only to personnel trained as COP Authorized Persons.
- **Yellow** locks, tags and lockboxes issued only to personnel trained and authorized in COP Group LOTO & Try procedures.
- **Blue** shift-change locks and tags issued only to personnel who are expected to be involved in the COP shift change process.

**When should you use LOTO & Try tags?**

- With red, yellow or blue locks when isolating energy under LOTO & Try to indicate equipment must not be operated.
- When equipment is not capable of being locked out, LOTO & Try tags alone can be used.

**Operational Tagging is not allowed as a substitute for LOTO & Try!**

**What do LOTO & Try tags look like?**

- LOTO & Try tags must have the following:
  - Name of authorized person who attached the tag.
  - Date the tag was attached.
  - Reason for LOTO & Try.
  - Specified colors of red, black and white per ANSI Z53.1-1967.
Energy Isolation (Lockout/Tagout & Try)

What is an Energy Isolation Procedure (EIP)?
• An EIP is a document (developed onsite or pre-built) that explains how to control hazardous energy effectively during LOTO & Try.

OSHA requires an EIP before each occurrence of LOTO & Try isolation!

When is single point isolation during LOTO & Try NOT allowed?
• During Confined Space Entry (requires positive isolation) (see Confined Space Entry section).
• During Class A Hot Work (see Hot Work section).

Positive isolation is required for Class A hot work on tanks, drums or vessels!

Push buttons and selector switches are never allowed for isolation!

What does it mean to “Try” during LOTO & Try?
• Verify the energy source has been isolated by trying to turn on switches, checking voltage, opening valves or opening bleed valves to ensure there is no pressure/energy in the system.

When should “Try” occur during LOTO & Try?
• Before starting work on machines or equipment that have been locked or tagged out.

When can a contractor perform LOTO & Try on COP property or equipment?
• If they have approval from COP Line Supervision and have been trained as a COP Authorized Person.

Note: Contractors must use COP LOTO & Try processes or their own OSHA compliant program.

LOTO & Try Key Steps:
1. Identify job scope and need for isolation.
2. Determine if an EIP will be created for the job or if a cataloged EIP will be used.
3. Determine if the equipment has a required SOP for shutdown.
4. Plan the isolation method that will be used for the EIP.
5. Request Permit-to-Work, if applicable.
6. Conduct a pre-job safety meeting.
7. Notify Affected Personnel at the site that LOTO & Try will occur.
8. Shut down equipment by following the Standard Operating Procedure (SOP) if it exists.
9. Perform LOTO & Try as per EIP (follow steps for Group LOTO – if applicable).
10. Verify equipment is de-energized.
11. Issue clearance for the work to begin.
12. Re-verify energy isolation prior to starting work or if conditions change.
13. Verify that work is complete.
14. Remove LOTO (follow steps for Group LOTO – if applicable).
15. Notify Affected Personnel at the site that LOTO has been removed.
16. Restore energy to the equipment.

**Shift Change LOTO & Try extra steps**
1. Remove personal red locks and tags from the lockbox.
2. Install a blue shift lock on the lockbox.
3. Ensure new shift authorized person (primary authorized person in the case of Group LOTO & Try) removes blue shift lock and replaces it with personal red lock and tag.
4. Ensure lead group workers coming on shift (in the case of a Group LOTO & Try) install personal red locks and tags to the lockbox.
5. Verify reapplication of personal locks and tags according to EIP.

**When can someone else’s lock be removed from LOTO?**
- With approval from supervisor and completing the Emergency / Non-Owner Lock Removal Form.
Energy Isolation (Lockout/Tagout & Try)

Standard Isolation Methods and Schemes
(Process Isolation Standard, Sec. 7.1)
Energy Isolation

Standard Isolation Methods and Schemes
(Process Isolation Standard, Sec. 7.1) cont.
Ground Disturbance/Excavation

Obtain authorization before starting ground disturbance or excavation activities.
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Before Ground Disturbance/Excavation work proceeds, the following minimum requirements must be met:

- Competent person(s) have conducted a worksite risk assessment and have communicated the assessment to all affected persons.
- Markings have been made visible and are maintained for use during work.
- Responsible persons have authorized the excavation to begin. See local rules and regulations for specific authorization requirements.
- All underground services have been identified, located, and if required, isolated before the start of work.
- Personnel entry into an excavation may only proceed provided that:
  - Excavation has been assessed to determine whether a confined space entry permit is required, and if applicable, a permit has been issued.
  - Ground movement has been controlled and potential collapse has been prevented by effective shoring, sloping, benching, soil placement or other appropriate means.
  - A competent person has inspected the excavation before entry of personnel.
  - Ground movement and environmental conditions have been and continue to be regularly monitored and inspected for change by a competent person.
  - Access to the work area remains controlled.
  - Where required, a rescue plan and emergency egress arrangements have been put in place and tested.
  - If required, an attendant is present at the excavation site for the sole purposes of maintaining communication with entrants and raising an alarm in the event of an emergency.

For further guidance, see local procedures related to Ground Disturbance or Excavation Safety.
Ground Disturbance/Excavation

Excavation—any man-made cut, cavity, trench or depression in the earth’s surface, formed by earth removal.

Competent Person—a person who:

- Has completed Excavation and Trenching Competent Person Certification Training.
- Can identify and predict hazards in the surroundings or working conditions.
- Is authorized to take prompt corrective measures to eliminate hazards.

Who is involved with Excavation?

- A Competent Person must be designated for all work in or around excavations.
- Excavations exceeding 20 feet in depth must be designed by a Registered Professional Engineer.

What must be done before beginning an Excavation?

- Follow state and local requirements pertaining to One-Call or Call-Before-Digging notification system (the number for One-Call is 811 – in most locations).

- Contact utility companies or owners within established or customary local response times when a One-Call system is not available.
- Use line finding equipment (e.g., line finders) before excavating to:
  - Locate and/or verify underground installations when the exact position of such installations cannot be determined through other means.
  - Confirm underground installations before the positions of underground installations are finalized.
- Provide ground “markings” to identify the location of utility installations.
- Investigate adjacent lines of the area being excavated and determine actions to be taken to ensure the area is safe for excavations.

Electrical lines within 2 feet of digging must be de-energized!

Hand-digging tools or hydro-excavation must be used when excavating within 2 feet of any pressurized line!
• Post warning signs where buried hazards and likelihood of public access to area warrant them.
• A Competent Person must give approval to onsite workers to begin the excavation.

**What must be done during Excavation?**

• A Competent Person must monitor the depth of digging using a probe or alternate means when excavating down to an underground installation such as a pipeline or electrical cable.
• The equipment operator must maintain visibility of uncovered line during the excavation.

**Personnel are prohibited from being in an excavation while digging is occurring!**

• Maintain all visible markers that show the location of underground installations during the job.
• Follow Confined Space Entry requirements when entering an excavation or trench that is:
  – More than 4 feet deep and
  – Has potential for a hazardous atmosphere.
• Control atmospheric hazards identified in excavations and trenches less than 4 feet deep before allowing personnel to enter.
• Personnel must be protected from cave-ins when excavations are deeper than 4 feet by sloping, benching, shoring or shielding. Type C soils must be sloped and be no steeper than 1.5:1 (1.5 horizontal to 1.0 vertical, or a 34-degree maximum slope). Type B soils (cohesive clays) allow for benching or sloping up to a maximum slope of 1:1.

![SIMPLE SLOPE](image1)

1. All simple slope excavations 20 feet or less in depth in Type C soil shall have a maximum allowable slope of 1½:1

![MULTIPLE BENCH](image2)

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows*

*NOTE: Benching allowed in Type B Cohesive (Clay) Soil Only.

Max. Depth 20’

Min. 8’ Wide

Max. 4’ High

Max. Depth 20’

1. All simple slope excavations 20 feet or less in depth in Type C soil shall have a maximum allowable slope of 1½:1

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows*

*NOTE: Benching allowed in Type B Cohesive (Clay) Soil Only.

Max. Depth 20’

Min. 8’ Wide

Max. 4’ High

Max. Depth 20’

1. All simple slope excavations 20 feet or less in depth in Type C soil shall have a maximum allowable slope of 1½:1

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows*

*NOTE: Benching allowed in Type B Cohesive (Clay) Soil Only.
Ground Disturbance/Excavation

- Excavations must not undermine sidewalks, pavements or other structures unless a support system is already in use to protect personnel from possible collapse of these structures.

- Excavated materials must not be placed closer than two feet from excavation edge.

- Provide a stable and safe means for entering and exiting excavations such as a ladder, stairway ramp, benched steps and/or additional sloping for personnel working at any depth.

- Personnel must be protected by guardrail systems, fences, or barricades at the edge of excavations that are:
  - More than 6 feet deep.
  - Not readily seen because of plant growth or other visual barriers.

- Inspect excavation work sites as the following:
  - Before work begins each day.
  - Before personnel enter the excavation.
  - When there is a potential for a cave-in.
  - At regular intervals throughout each shift and according to the permit.
  - After every rainstorm or other hazard-increasing occurrence.

What must be done when work is completed in Excavation?

- Backfill the excavation site after required work is complete.

- Tamp and level backfill to eliminate safety hazards such as:
  - Changes to the runoff pattern which may cause damage.
  - Excess dirt.
  - Future settling of backfill material.
Bypassing Safety Devices

Obtain authorization before bypassing, disabling or inhibiting a safety protection device or equipment.
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• What is a Safety System? ...................................................... 64

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• When can a safety system be bypassed? ......................... 64

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• What steps must be completed before removing a bypass? .................................................................. 65
Before authorization is given to bypass, disable or inhibit a safety protection device or equipment such as isolation devices, emergency shutdown valves, Lockout/Tagout (LOTO) devices, trip systems, relief valves, fire and gas alarm systems, process controls, alarms and crane computers, the following minimum requirements must be met:

- A competent person fully understands and has risk-assessed the implications of bypassing, disabling, or inhibiting safety protection devices or equipment.
- The appropriate level of supervision/management has provided written authorization based on the assessed risk level.
- Where appropriate, the responsible persons conducting the risk assessment have considered the total combined risk of other bypassed, inhibited or defeated safety protection devices or equipment.
- For each Facility (or group of smaller Facilities) a log/register of all bypassed, disabled, or inhibited safety protection devices or equipment has been created and is regularly updated.
- A routine management review process has been put in place for the log/register of all bypasses/inhibits.
- Routine communication channels have been put in place to identify which safety protection devices or equipment are bypassed, disabled or inhibited, including communication at each shift and crew handover.
- Operating personnel are trained to easily locate and identify the safety protection devices or equipment that are bypassed, disabled or inhibited.
- The Management of Change and authorization requirements have been met.
- Only designated competent person(s) with the appropriate written approval have the authorization to bypass, disable, or inhibit a safety protection device or piece of equipment via the Safety Instrumented System (computer/logic system).
Bypassing Safety Devices

What is a Safety System?
- A self-contained system of elements including a logic solver and sensors to shut down or bypass equipment such as those listed below:
  - Process Safety Control (e.g., a pump or compressor shutdown).
  - Emergency Shutdown Systems (ESD).
  - Safety Critical Element (SCE).
  - Fire and Gas Detection.
  - Fire Protection System.

  **Note:** All safety systems must have an established inspection schedule (calibration and function tests).

What is a Bypass?
- An electrical, mechanical, software or physical device that removes part of an ESD or safety system from service.

When can a safety system be bypassed?
- Following proper approval for testing, inspection and/or maintenance.

What must be done before a safety system can be bypassed?
- Complete a risk assessment.
- Generate a Bypass Permit and get approval.
- Follow established procedures for bypassing or disabling the safety system.
- Complete the Management of Change (MOC) process.
- Notify affected personnel.

  **Note:** A log or register of all bypassed, disabled or inhibited devices must be kept.

What is a Bypass Permit?
- An authorization to allow a bypass of an ESD or critical Safety System.

Who can approve and how is a Bypass Permit approved?
- A first level supervisor must provide written authorization for bypass.

  **Note:** Phone approval is acceptable when signature is impractical.
Who can perform the actual Bypass?

- An Authorized Person performs the Bypass

**Note:** An Authorized Person is one who is qualified to work on an ESD or Safety System. This individual must have a full understanding of the I&E Calibration Standards and meet the criteria for Instrument/Measurement Technical role.

How long can safety systems be bypassed?

- ESD/SCE may be bypassed up to 8 hours.
- Other safety systems may be bypassed up to 16 hours.

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Written approval from a second-level supervisor must be obtained if a safety system will be bypassed for more than a 16-hour period or an ESD/SCE will be bypassed for more than 8 hours.

---

What steps must be completed before removing a bypass?

- Follow established procedure for removing the bypass which should include the following:
  - Inspect the system’s condition.
  - Return block valves in the system to their normal operating conditions.
  - Notify all affected personnel and the facility supervisor of the date and time the system was returned to normal service.
Driving Safety

Wear your seat belt, obey speed limits and do not use any mobile device while driving.
Driving Safety ..........................................................................................69

• Company Vehicle ..................................................................................69
• Company-Assigned Vehicle ...............................................................69
• What do you need before driving a company vehicle?........................69
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• Can you use a cell phone while driving? ............................................70
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• Are there special requirements for long trips in a company vehicle (Journey Management)? ......................71
When driving on company business or property, these rules must always be followed:

- All occupants must wear and keep their seat belts properly fastened while in a moving vehicle.
- Drivers must not use any mobile device (e.g., phones, tablets, laptops or other digital devices) nor send or read text or other electronic messages while driving. See local rules and regulations and the Company Standard for further clarification.
- Drivers must observe speed limits at all times.
- Drivers must adjust their driving to accommodate prevailing weather, terrain and other environmental conditions.
- Personnel are not to drive when fatigued; they are encouraged to pull over and take a break when necessary.
- Vehicle occupant(s) should intervene if any of the Driving Safety rules are not being followed.
- Where required by local rules, a Journey Management Risk Assessment has been completed and the agreed journey plan communicated to the driver and to those who may need to react in the event of an incident.

**Company Vehicle**—any vehicle authorized for use on roads in the name of COP, including company-owned, leased, rented and van pool vehicles, as well as employees’ personal vehicles authorized for use on company business (i.e., the employee is eligible for mileage reimbursement).

Motorcycles are not authorized for use on company business!

**Company-Assigned Vehicle**—Any company-leased or -owned vehicle that is assigned to a driver as its exclusive user.

**What do you need before driving a company vehicle?**

- Proper driver’s license for the motor vehicle and cargo being transported.
- Complete all BU-assigned Training.
- Complete a vehicle walk-around and Driving JSA (Non- documented Driving JSAs are acceptable).
Driving Safety

- Verbal approval from a supervisor before using a personal vehicle to travel on COP company business.

**Note:** This is not needed for local travel such as airport, business lunch, same area office-to-office, etc.

**What does a company-assigned vehicle need to be equipped with?**

- First aid kit.
- Functioning In-Vehicle Monitoring System (IVMS).
- Motor Vehicle Accident Reporting Kit.
- Proof of insurance.
- Fire extinguisher (minimum requirement):
  - A-B-C rating.
  - 20 lbs. for trucks.
- Motor vehicles regulated by DOT must contain the following additional equipment:
  - Three bi-directional, emergency reflective triangles.
  - Spare fuses of each type and size used on the vehicle.
  - A copy of the DOT Emergency Response Guide.

**Who can ride in a company vehicle?**

- Company employees.
- Non-employees on company business.
- Non-employees during an emergency response.
- Family members being driven on official company business with prior approval from employee's supervisor.

**Can you use a cell phone while driving?**

- Use of a cell phone, two-way radio or other electronic device is **prohibited** while:
  - Operating a company vehicle.
  - Operating a personal vehicle on company business.
  - Operating any motor vehicle on company property.
  - Operating a personal vehicle on personal business when mobile device is company property.

**Use of a hands-free device does not override any of the restrictions on using mobile devices!**

**Setup or adjustment of navigational aid is allowed only while the vehicle is safely parked!**
What are some general safety rules for driving a company vehicle?

- Smoking in a company vehicle is prohibited (including E-cigarettes).
- Whenever possible, park so that:
  - Ground contact points of nearby equipment are seen from the driver’s seat.
  - You do not have to back your vehicle (except for angle parking) when leaving.
  - Your vehicle is outside of hazardous areas.
- When leaving a company vehicle unattended with the engine running, the transmission must be in “park” and the parking brake set or wheels chocked.
- Vehicles should not be driven inside electrically classified areas without a permit.

What happens if you have an incident in a company vehicle?

- Notify the following personnel immediately:
  - Law enforcement when incident occurs on a public road as required by law.
  - Immediate supervisor.
  - Health, Safety and Environment (HSE) representative.
- Complete an incident report promptly and participate in the alcohol/controlled substance screening/test per your supervisor’s direction.

Are there special requirements for long trips in a company vehicle (Journey Management)?

- Travel plans must be approved by a supervisor for driving trips that meet any of the following criteria:
  - Over 600 miles.
  - Driver will have been awake for more than 16 hours upon arrival and with less than 6 hours sleep.
  - Driver will have been awake for more than 18 hours upon arrival regardless of how much sleep they had previously.
- A driver who is tired should either pull over to a safe spot and take a nap or check into a hotel to sleep.
Process Safety Fundamentals
Process Safety Fundamentals

The Process Safety Fundamentals (PSFs) are simple, actionable and good operating practices meant to improve process safety awareness and create discussions in the field. In many instances, the PSFs can be satisfied completely, but, when they cannot, it’s time to stop and have a meaningful discussion between the team, supervisor and support staff to find an alternative safe course of action to complete the work.
Process Safety Fundamentals

Always use two barriers for hydrocarbon vents and drains.

Where are your 2 line barriers (a valve, plug or blind) on hydrocarbon vents and drains?

Never leave critical draining and transfer operations unattended.

What will you do so as not to leave an open drain or transfer valve unattended?

Know the condition of your safety devices. Risk-assess any impairments or deferrals.

What are your safety devices? Are they working properly and up-to-date on their inspections? If not, how will you mitigate?

Walk the line. Verify and validate any line-up change.

Have you walked the line to validate proper line-up and connections?
Always follow an approved change management process prior to altering process systems (even if temporary).

Who reviewed and approved the proposed change?

Verify for complete tightness after installation or maintenance work.

Have you checked to make sure all bolts and connections are tight following installation and maintenance work?

Ensure equipment is pressure-free, drained and properly isolated before starting work.

How did you verify there is no stored energy in the equipment and that it is properly isolated before starting work?

Ensure effective well isolation, with at least two barriers, when working downstream of a well.

What barriers will you maintain between you and the well while performing downstream work?
Other HSE Topics
Abrasive Blasting

Abrasive media is often used for paint removal and surface preparation for certain coating applications. Inhalation of toxic dusts, such as lead from the paint or silica from the blasting media, is a main health hazard associated with this activity.

The following are required to reduce this health hazard:

• Approval from site/area supervision for the specific type of blasting media.
• Assume coatings contain lead until proven otherwise.
• Designate a Competent Person (one who can identify existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate such hazards) before removing any lead or lead-containing materials.
• Wear proper personal protective equipment (PPE) including a breathing apparatus as determined by risk assessment.

Air Compressors and Receivers

• Air compressors in continuous service should be on a regular preventive maintenance schedule that includes draining the receivers weekly to prevent liquid accumulation.
• Infrequently used air compressors and receivers must be drained each time they are used and before they are put in service.
• Use only appropriate lubricants.

Non-approved lubricants may cause fire and/or explosion!

• Air compressors and air receivers must have a pressure relief device. It is also recommended that a block valve be installed between the compressor/receiver and the relief device, but the valve must be car-sealed open except when testing the relief device.
• Relief devices on air compressors must be tested per A&OI requirements.
• For vehicle-mounted compressors with air receivers, the pressure must be reduced to less than 25 psig before moving onto public roads.

Asbestos (Respirable Fibers)*

Asbestos is a material frequently used in the past for insulation and other purposes. When disturbed, the dust can become airborne and is hazardous to a person’s health if inhaled. Typically, asbestos removal requires the use of
specialty contractors with job-specific tools and training. The following precautions are to be employed when dealing with any facility or equipment that is suspected of containing asbestos:

- Leave any questionable material undisturbed and notify immediate supervision for proper identification.
- Consult supervisors regarding the job requirements prior to handling respirable fiber containing material (RCFM) in any manner.
- Consult the Environmental Representative prior to collecting, disposing of, selling or releasing asbestos-contaminated equipment or waste.
- Collect and dispose of any waste, scrap, debris, bags, containers, equipment or clothing contaminated with asbestos material in sealed, labeled, impermeable bags or containers.
- Ensure that labels have been affixed, where feasible, to all installed asbestos products.

**Asset & Operating Integrity (A&OI)**

A&OI programs ensure that minimum company and industry standards, codes, specifications and regulations are met and maintained during project design, construction and ongoing operations.

**Asset Integrity** is the capability of an asset to contain its contents. This is typically verified through testing and inspection.

**Operating Integrity** is the ability and competency of the workforce to safely operate and maintain an asset.

To accomplish the goals of the A&OI program, we must:

- Apply the Management of Change (MOC) process to all modifications and changes.
- Complete and issue Material Transfers when equipment is moved.
- Design out risk where possible.
- Ensure formal inspections and tests are completed and documented on schedule.
- Know the most likely loss of containment scenarios and the approved measures to prevent them.
- Report unplanned events (leaks, heavy corrosion, dents, gouges, cracks, etc.) to the supervisor.
- Validate that:
  - Upstream block valves affecting the operation of relief valves are sealed or locked in the open position.
  - Pressure vessels are protected with relief valves that
are set at or below the vessel’s maximum allowable working pressure (MAWP).
- Equipment is in good operating condition.
- There is no short bolting or missing bolts.
- Thief hatches are sealed and in good repair.
- Open-ended valves and piping are plugged.
- There are no single-sized reduction bushings or street ells in hydrocarbon service.
- There are no all-thread pipe nipples.
- There is no misaligned piping.
- Equipment tags or name plates are readable.
- Flanges and connectors are rated for MAWP.
- Tanks are properly grounded.
- Piping is properly supported.
- Equipment and piping touching soil are coated and protected.
- Protective devices and safety systems are not bypassed without an approved permit.
- All pressure gauges work.
- All level gauges work, have no broken glass and have guards covering the glass.
- Valves are operational.

ATV (All Terrain), UTV & Snow Vehicles

Prior to unloading and operating an ATV/UTV/snow vehicle, the driver must:

- Perform a JSA to determine the hazards associated with the task (terrain, weather, road conditions, loading/unloading, etc.).
- Wear and use appropriate PPE.
- Ensure the vehicle has a first aid kit.

All ATV/UTV/snow vehicles drivers must:

- Complete BU-specified ATV, UTV or snow vehicle safety training if required.
- Have a valid driver’s license.
- Follow the local Lone Worker procedures and carry a communication device capable of maintaining contact with co-workers.
- Exercise caution when unloading or loading.
- Never refuel while the engine is running.

No passengers can ride on an ATV, UTV or snow vehicle designed for “Driver Only”!
Axiom (Injury) Notification

Axiom contact number: (877)-502-9466

- Axiom is a medical case manager that facilitates proper medical care for COP employees and contractors.
- Coverage is available 24/7, 365 days a year.
- After reporting an injury to their supervisor, the employee and/or supervisor must call Axiom for a recommendation on appropriate medical attention.

**Note:** For injured contractor employees, Axiom or a similar medical support group can fulfill this requirement.

- Axiom will:
  - Discuss the injury with the employee or contractor and provide an initial diagnosis and treatment recommendation.
  - If needed, direct the injured person to an appropriate medical facility and provide preliminary information to the receiving physician.
  - Speak with examining physician before the injured person leaves the medical facility to understand any ongoing treatment and recovery recommendations.
  - Follow up with the injured person until they return to regular work duties.
  - Provide updates to company leadership during the entire process.

Some injuries will be an emergency and warrant immediate treatment such as calling 911, an ambulance or taking the injured directly to a hospital!

Barricades

There are 2 types of barricades:

- Warning Barricades.
- Protective Barricades.

**Note:** When practical, a protective barricade is always preferred.

**Warning Barricades:**

- Call attention to the hazard but offer no physical protection.
- Are set up when it is not practical to eliminate the hazard completely.
- Draw attention to specific hazards or to restrict entry.
- Warning barricades include:
  - Red and black danger tape.
  - Black and yellow caution tape.
  - Orange fluorescent tape.
Protective Barricades:

- Provide a physical barrier to keep personnel outside the hazardous area.
- Are provided where there are elevation differences of more than 4 feet.
- Examples include:
  - Guardrails, handrails.
  - Interlocking railing system.
  - Fencing material.
- When it isn’t feasible to install a protective barricade, other protections should be used (example: use a personal harness and/or fall arrest system when working at heights.

Personnel should not enter a barricaded area unless they understand the hazards, mitigate those hazards and have an immediate need to be within the barricade!

Benzene*

- Benzene can be found in all areas of oil and gas production operations and is recognized as a carcinogen (may cause cancer).
- Prolonged exposure to benzene above OSHA permissible exposure limit (PEL) can cause adverse health effects.
- Every effort should be made to avoid breathing hydrocarbon vapors:
  - Use respiratory protection for work tasks where hydrocarbons may be present including maintenance, repair, vessel cleaning, remediation of hydrocarbon-contaminated soil and during emergencies.
- Label containers of benzene or mixtures containing more than a 0.1% liquid concentration of benzene (excluding piping systems) as follows:
  
  **DANGER CONTAINS BENZENE CANCER HAZARD**

- Establish and post regulated areas if workplace permissible exposures are above the COP OEL (8-hour time weighted average [TWA] of 0.5 ppm, or the short-term exposure limit of 2.5 ppm for 15 minutes).
- Ensure employees exposed above the OEL receive initial training and annual refresher training thereafter.
- Train employees (initial and annual refresher training) with the potential to be exposed above the Operating Exposure Limit (OEL).
- Ensure the employees participate in annual medical surveillance examinations.
Bloodborne Pathogens (BBP)

Bloodborne pathogens may be present in human blood and can cause diseases in humans including the Hepatitis B virus (HBV) and the human immunodeficiency virus (HIV).

- Use proper PPE (including gloves, face shield and long sleeves) when responding to medical emergencies that pose a potential exposure to BBP.
- Blood clean-up should only be performed by properly trained and equipped personnel.
- Following any exposure or potential exposure to blood or potentially infectious bodily fluid, the hepatitis B virus vaccine and vaccination series as well as HIV/AIDS testing is available at no charge to COP employees.

Boomers, Binders and Come-Along

- Lever-style load binders (e.g., snap boomers) and non-ratcheting chain come-alongs must not be used on COP L48 locations.

Note: If a third-party delivery company comes to location with snap boomers, they can perform a JSA and use that equipment.

- Handle extensions (i.e., cheaters) must never be used on binding, tensioning or lifting devices.

- Cheaters must not be used to release the boomer handle. If necessary, stand to the side of the handle and use a steel pry bar under the handle.

Always stay out of the line of fire as the handle releases!

Burn Ban Conditions

Burn bans are issued and enforced by government agencies when dry weather conditions increase the risk of wildfires.

During a burn ban, the following are typically prohibited:

- Outdoor fires, including recreational fires.
- Driving vehicles through tall vegetation (i.e., height above top of tire rims).

Note: A fire watch for each activity that may cause a spark (e.g., welding, torch cutting and grinding) and wetting of the area should be required.

- Open flames or ignition sources (including vehicles) within 35 feet of combustion sources particularly when winds are greater than 15 miles per hour.
**Note:** If unable to clear the perimeter of vegetation for 35 feet:
- Vegetation should be soaked with water.
- A loaded water truck (minimum 350 gallons) should also be on-site.
- Fireproof tarps/blankets should also be considered.

**Note:** When winds are greater than 15 miles per hour:
- Additional buffer (e.g., 100 feet) should be considered.
- Other alternatives (including delaying hot work or allowing hot work only in designated areas) should also be considered and used whenever possible.

### Camlock Connections

When using camlock connections:

- Conduct a pre-use inspection before each connection is made and replace any damaged, missing or broken parts of fittings.

  **Do not use fittings with missing cam ears!**

- Ensure connection points are clean and free of debris.
- Position trucks and hoses to ensure the camlock fitting is not placed in a bind during installation.
- If abnormal force is required to disconnect a camlock fitting, stop the job and evaluate the problem before continuing.

  **Avoid the Line of Fire—position your body to avoid being struck by the hose end if the connection suddenly releases!**

### Carbon Dioxide (CO₂) and Nitrogen (N₂)

The following apply to CO₂ or N₂ activities:

- Be trained on the hazards of CO₂ and N₂ and the proper safe handling procedures, including PPE.
- Do not enter closed structures containing CO₂ and/or N₂ without adequate ventilation.

  **Check for oxygen concentration before entering.**

- Use only supplied air respirators or self-contained breathing apparatus in CO₂ or N₂ environments.
• Do not go into low-lying areas or areas without adequate ventilation if CO$_2$ or N$_2$ is being vented or leaked.

• Valves used to control the flow of CO$_2$ or N$_2$ must be the throttling type to avoid sudden erratic flow.

• Securing methods (e.g., anchors, stakes and cement blocks) for energized fluid lines should be designed by Engineering.

• Do not extend vent lines more than 2 feet beyond the edge of a pit or point vent line down.

• Stand clear of the vent line during circulating or venting operations.

• Secure kill truck (pump truck) lines used with the vent line in the same manner as the vent line.

Compressed Gas Cylinders

• Compressed gas cylinders containing commercial gases, including “empty” cylinders, must always be secured.

Never secure a cylinder with sharp clamps or screws!

• When not in use, cylinder valves must be closed and covered with a cap.

• Store cylinders in the vertical position.

• Stored oxygen cylinders must be separated from fuel gas cylinders by at least 20 feet or by a noncombustible barrier at least 5 feet high.

Note: This does not apply to welding trucks or two-wheeled carts.

• Never connect oxygen to anything that contains, or has contained, hydrocarbons.

• Never apply oil or grease to oxygen cylinders, regulators, gauges or hoses.

All oxygen gauges shall be marked “Use No Oil.”

• Never wear oily gloves when handling oxygen equipment.

Contractor HSE Management*

Contractor HSE Management is based on the principle that contractor and COP employee HSE performance are equally important.

The following apply when using contractors:

• Use only approved contractors (from approved list).

• Follow procurement guidelines when adding contractors to the approved list.
• Critical Activities may require:
  – An HSE plan, pre-mobilization meeting, pre-job walkthrough, on-site hazard analysis, demobilization plan and final evaluation.

• Determine whether to use COP or contractor HSE procedures for each job following a review of the contractor’s procedures and programs.

• Contractors must provide regulatory training, HSE orientations and specific job skill training and certification for their employees before arriving on the COP property.

• All contractors must attend a COP Safety Leadership Seminar (SLS) or Hazard Recognition & Management Workshop (HRMW) followed by SLS within 6 months of going to work.

• During an area-specific briefing, pre-job safety meeting or JSA, provide an overview of COP’s HSE procedures to be used by the contractor.

• A JSA/Go Card discussion is required before performing any work on a COP site.

• Contractors with Significant or High-Risk rankings must be evaluated using the Contractor HSE Management Manual (HSE MS Level 1).

Control of Work (including PIC and Critical Activities)

Company-operated work sites are always supervised by an on-site, authorized leader who is accountable for the safety of everyone on the work site and the efficient execution of all planned work.

ConocoPhillips has also identified some work tasks that involve an added level of complexity and/or risk that requires additional controls. These are referred to as Critical Activities or Essential Tasks and can only be performed or supervised by individuals authorized to do so by COP.

Person In Charge (PIC)

The Person In Charge program ensures that company work sites always have adequate supervision. Prior to leaving an active work site, the assigned site leader delegates their on-site authority to another ConocoPhillips employee, contract designee or third-party contractor (typically a crew lead) who has been authorized by local field management and trained in the responsibilities of being a PIC.

Before leaving the location, the assigned site leader should review the planned work with the PIC to ensure that person can oversee the work and is comfortable with the assignment. Everyone on site should be told that the assigned site leader is leaving the location and who will be the PIC in their absence.
The PIC has authority over all on-site workers and activities and final authority to decide whether multiple tasks taking place on site are compatible (Simultaneous Operations—SimOps), or if one or more of the activities need to shut down until other activities are completed.

**Critical Activities and Essential Tasks**

Onsite leadership over certain activities, sometimes referred to as Critical Activities or Essential Tasks, may not be delegated to a third-party PIC. These vary by organization and function, so it is the responsibility of each Lead and PIC to know what is allowed and not allowed in their organization.

In addition, authorization to perform or supervise some work (Essential Tasks) may be limited by experience level, training or title. Examples include:

- Only qualified Electricians are authorized to work on energized systems or inside panel boxes.
- Only Operations personnel who have been authorized to remove hydrates or launch and retrieve a pipeline pig may perform this work.

**All employees must know the limitations of work allowed in their area!**

**Drilling and Well Servicing**

The following apply to drilling and well servicing operations:

- Signs posted at the location entrance should indicate:
  - Only Authorized Personnel are allowed.
  - Special hazards such as H₂S, smoking rules, etc.
  - Where to report for HSE orientation.
  - Minimum personal protective equipment (PPE) required.
- The derrick and supporting guy lines must not come within 10 feet of energized power lines (add 4 in. for each additional 10 kV over 50 kV) during rig up, rig down or while operating.
- Power lines within the fall distance of the derrick must be de-energized while rigging up or down.
- Guy lines should be flagged to increase visibility and guard against vehicle traffic.
- Use a spotter to help locate equipment near guy lines and power poles.
- Hold periodic drills to ensure personnel are familiar with the site Emergency Response Plan. The following is a recommended schedule:
  - Hold pit and trip drills weekly.
  - Hold H₂S response drills weekly while working on wells with the potential to produce H₂S.
  - Hold Well Control drills per COP’s Well Control Manual.
Swabbing:
The following apply to swabbing operations:
• Swabbing at night is discouraged but allowed with appropriate lighting.
• No one is allowed in the derrick or within 6 feet of the wellhead when the swab line is being run in or out of the hole.
• Swab with a lubricator long enough to contain the entire swab assembly and which can be isolated from the tree (with a swab valve), bled down and removed while the well continues to flow.

Wireline Operations:
The following apply to wireline operations:
• Do not weld or burn within 75 feet of the wellhead or wireline unit while the unit is operating and then only in an approved hot work area with continuous wind direction and gas LEL monitoring.
• Pressure control equipment must be used where the potential for surface pressure exists.
• Lubricators must be long enough for the entire tool string to be raised above the surface-controlled shut-in device (wellhead valve, BOP, or lubricator valve) on wells that can flow.
  
  Note: For fishing operations, the fishing string and fish should both fit inside the lubricator.
• A wireline lubricator is not required:
  – While open-hole logging during the drilling phase in overweight mud conditions.
  – When logging inside unperforated casing/liner with kill weight fluid in the well and BOPs installed.
    
    Note: Continuously monitor the well to ensure it does not begin to flow.
• Include a pump-in sub or other suitable access for connecting pumping lines to the lubricator in case a well kill is necessary.
• Secure portable or skid-mounted wireline units to prevent any unwanted movement. If chocked, a minimum of two chocks should be used: one behind each rear wheel on the wellhead side.
• Secure the loose end of a wireline that could recoil when released prior to handling.
• Rope falls (block and tackle), gin poles (telescoping and single post), attachments and attachment devices must be rated to handle the anticipated load.

No one is allowed in the derrick or near the wellhead while running wireline in or out of the hole!
• Logging devices containing radioactive material may only be handled by qualified personnel.
Drug, Alcohol and Other Contraband Policy

The following contraband items are not permitted on COP property at any time.

- Firearms—unless such a ban is prohibited by state law or with prior permission for a special event, e.g., approved hunting, raffle, gift, etc.  
  **Note:** On-duty law enforcement personnel exempted.
- Ammunition.
- Incendiary devices, accelerants, gunpowder or hoax bombs.
- Machetes—unless approved by local BU management and applicable to work scope.
- Illegal knives (per applicable state law).
- Unauthorized alcoholic beverages.  
  **Note:** Authorized alcoholic beverages must be pre-approved by a senior manager responsible for the site.
- Illegal drugs or controlled dangerous substances.
- Drug paraphernalia which in the judgment of the company, is used exclusively for illegal drug ingestion, inhalation or consumption.
- Prescription medications without proper prescription.
- Pornographic, obscene, defamatory, abusive or inflammatory material or literature.
- Smoking or vaping (E-cigarettes) may only be done in dedicated smoking areas. Do not carry smoking paraphernalia, including: lighters, matches, E-cigarettes or their batteries in work areas. These should be stored at the dedicated smoking area.

COP will conduct drug and alcohol screening for all employees including:

- Pre-employment (drug).
- Random (drug and alcohol).
- Reasonable suspicion (drug and alcohol).
- Post-accident (drug and alcohol).
- Post-rehabilitation (drug and alcohol).
- Aftercare (drug and alcohol).

Electrical Safety*

**Qualified Person**—a COP or contractor employee who:

- Has received training on COP procedures.
- Has also received electrical training.
- Can safely work on energized circuits.
- Is familiar with the use of electrical-specific precautionary techniques, PPE, insulating and shielding materials and insulated tools.
Can recognize and avoid the electrical hazards that may be present with respect to that equipment or work task.

The following rules pertain to Electrical Safety:

**Only a qualified person can work on electrical/electronic equipment and installations.**

- Make sure all electrical/electronic tools are rated for potentially flammable or combustible atmospheres (hazardous classification Division 1 or 2).

**If tools are not rated for flammable or combustible atmospheres, refer to Hot Work requirements for use of electrical and electronic tools in classified areas.**

- Inspect these tools routinely and remove them from service when they are in disrepair and can no longer meet approved standards.
- JSAs should include:
  - An assessment of electrical hazards and methods to eliminate, minimize or control those hazards.
  - Required PPE to mitigate electric shock and arc flash hazards.
- Control the generation and accumulation of static electricity buildup to eliminate spark hazards.

*Note:* Hydrocarbon liquids can accumulate a static charge during any kind of movement such as pumping, pouring, moving through pipes, filtering and mixing.

- Portable containers used to collect hydrocarbon liquid must be metallic.
- Absence of voltage must be verified before initiating any activity.
- Test instruments must be suitable for the expected voltage level and CAT IV rated for overvoltage protection.
- Electrical work (especially outdoor work) must be postponed when an electrical storm is near enough to be seen or heard.
- Metal ladders must not be used by workers doing electrical work.
- Do not work alone (away from immediate assistance) when working on energized circuits above 600 V.
- Personnel must use LOTO when working on or near de-energized parts or equipment that may suddenly re-energize or restart.

**Emergency Response**

- Emergency Response Plans are maintained at each BU/Asset or field office to identify potential emergency situations and provide a plan for appropriate mitigation and control.
• Personnel should understand their roles and responsibilities (if any) in their local emergency response plan, especially the limitations on actions they may take in response to an incident and the level of HAZWOPER Training they are required to have:
  – Awareness Level—personnel who might discover a hazardous material spill or release. Their actions are limited to calling for help.
  – Operations Level—personnel who may respond to a hazardous spill or release in a defensive manner only, such as containing the spill and/or protecting people and the environment.
  – Technician Level—personnel trained to respond to a hazardous spill or release in an offensive manner and take steps to stop the release and clean it up.
• While on-site, all personnel should continuously monitor conditions such as the location of hazards, wind direction, exit and muster points and the location of the nearest medical facility.

Environmental Topics*

Spill Response and Reporting*
Follow these steps when a spill is discovered:
• Attempt to determine the source of the spill and stop it if it can be done safely and falls within your level of Hazwoper training.
• Immediately notify the responsible COP Supervisor of the spill.
• Secure and preserve all incident evidence.
• Participate in the Corrective Action Plan.

Spill Prevention Control and Countermeasure (SPCC)*
Some facilities are required to have an SPCC Plan to prevent an accidental discharge of oil into navigable waters or adjoining shorelines. Regulations vary from state to state. Operations personnel should:
• Contact BU Environmental Staff for SPCC applicability determinations.
• Know which sites have SPCC plans.
• Understand and implement SPCC plans.

Air Compliance*
Notify BU Environmental staff:
• In the early stages of planning and prior to initiating construction of new facilities or modification or removal of existing facilities.
• Prior to modifying emissions sources.
• When operating conditions change at a facility.
• Prior to new construction or modifying facilities:
  – Hold an Environmental review as part of the Management of Change (MOC) process.
    **Note:** Modifications include increases in throughput.
  – Start facility construction only after receiving all required state/federal/local authorization or permits applicable to the work.
• Operations personnel are responsible for:
  – Understanding permit limits, monitoring, documentation, emission testing, reporting and record-keeping per permit conditions or other regulatory requirements.
  – Maintaining pollution control equipment (vapor recovery units, combustors, flares, thief hatches and catalytic systems).
  – Maintaining mechanical equipment (seals on packing glands, flanges and connections) to minimize emissions.
  – Knowing which facilities have air permits and registrations and their requirements.
  – Managing and tracking compliance actions to comply with permit conditions or other applicable requirements.
  – Accurately recording monitoring data in accordance with required schedules.
• Open burning, including fire training, generally requires regulatory authorization.
  **Note:** Open burning should be used as an option only after discussion with your HSE representative and after required authorizations are secured.
• Flaring and venting should be minimized and according to regulatory requirements.
• Emergency flaring, venting and accidental releases must be reported to an HSE representative immediately, be closely monitored and quantified to the best extent possible.

**National Pollution Discharge Elimination System (NPDES)**

Facilities that discharge pollutants to waters of the U.S. have permits that meet the requirements of the federal Clean Water Act. The Environmental Protection Agency (EPA) is authorized to implement NPDES, however, they may authorize states, territories or tribes to implement all or parts of the program.
• Notify HSE in the planning stages of construction to allow adequate time for a compliance evaluation and to acquire the proper authorization to construct.
• Operations personnel should understand permit monitoring, documentation, reporting and record-keeping conditions and other regulatory requirements for their facilities.
• Notify HSE of any planned changes to a facility that could redefine the facility as a new source or result in changes to discharge.
• Operations personnel should immediately notify the appropriate supervisor in the event of a nonconformance or a potential enforcement action.

Superfund Amendments and Reauthorization Act (SARA) Title III*

Laws enacted under SARA Title III are designed to provide state and local governments and citizens with information to plan for emergencies. It requires employers to provide information on chemical hazards to local and state government authorities.

• Use the process described in the Hazard Communication Manual to control and report chemicals that are brought to a facility or location.

Storm Water*

• A storm water release from a site may trigger a permit requirement (Industrial Storm Water Permit [ISWP] or Construction General Permit [CGP]).
• The ISWP and CGP are both triggered when a storm water discharge includes a reportable quantity (oil sheen) for which notification is required.
• Storm water contained in a diked area must be free of contamination prior to draining.
• Contact an HSE representative for guidance if storm water permitting is likely.
• Be aware that certain facilities with Storm Water Permits may require specific mitigations and reclamation. Contact BU Regulatory staff for guidance.

Waste Management*

All waste must be properly classified, stored, labeled and disposed of per COP policies and government regulations.

• Consult with your supervisor and BU Environmental resource for approved waste management practices or before starting a new one. BU Environmental must approve any new waste disposal practice.
• Personnel handling hazardous waste must be properly trained.
• Consult with an HSE representative regarding storage hold times, testing, labeling, transportation and disposal.
• Wastes must be disposed at approved disposal sites.

Minimize waste generation by managing activities, recycling and using non-hazardous alternatives where possible.
• Do not mix waste streams. Even small amounts of hazardous waste mixed with other wastes can result in the whole waste stream being classified as hazardous, thus making disposal more expensive.
• Eliminate or reduce the quantity of waste at the source.
• Reuse, reclaim or recycle as much of the waste as possible.
• Use an approved contractor/facility to reprocess, recover and use waste as fuel.

Waste is only disposed of in COP Commercial Waste Management Program approved hazardous, industrial, and recycler waste sites or approved exempt waste disposal sites.

Ergonomics*

Ergonomics is the study of how people use their bodies to do work and designing the workplace environment to prevent injuries and illnesses while improving worker effectiveness and comfort.

Controllable risk factors in the workplace include:
• Repetitive motions.
• Forceful exertions.
• Awkward or uncomfortable posture.
• Static posture.
• Mechanical stress.
• Environmental factors (temperatures, vibration, lighting and noise).

Early reporting of ergonomic issues is extremely important to ensure an employee’s supervisor is informed and can promptly respond to an employee’s need.

Those who frequently work at a computer or other repetitive-motion workstations should complete an ergonomic self-assessment form when beginning their assignments.

Extracting Stuck Vehicles

Consider the following when using tow ropes to extract a stuck vehicle:
• Vehicle Attachment:
  – The rope or strap should be connected to a device directly attached to the frame and positioned so the rope or strap won’t be cut by sharp edges.
  – Tow hooks should be rated for at least 10,000 pounds.
  – Hook vehicles back-to-back when possible.

⚠️ No chains are to be used!

• Tow Ropes or Straps:
  – Must have a minimum breaking strength of 20,000 pounds.
– Should have a 6 to 8-inch diameter loop braided on each end.
– Overall length of at least 25 feet.
– Should be properly stored away from direct sun and weather and inspected before each use.
– Should be attached by loop or 3/4-inch shackle (rated for 20,000 pounds) through a totally enclosed hole.
– Ropes should only be lengthened by “looping” ropes through one another.
– Take the slack out of the rope or strap before the first pull.

Fatigue Management*

The following pertains to Fatigue Management:

• Personnel should not work more than 18 consecutive hours except in emergencies.
• Working long hours on consecutive days and callouts should also be minimized.
• Working beyond normal or scheduled hours requires approval by your immediate supervisor.
• It is the worker’s responsibility to talk to their supervisor when they are feeling fatigued or anticipate exceeding the Hours of Service limits.
## Fire Protection

**Prevention** is our first line of defense:

- Good housekeeping prevents combustibles from contributing to a fire.
  - Areas within 15 feet of production equipment must be free of weeds, grass and other combustibles.
- Smoking is restricted to areas at least 75 feet from any vessel that contains flammable or combustible material.
- All electrical installations must conform to:
  - Area classifications (e.g., Class 1, Div.1 or Div. 2).
  - National Fire Protection Association (NFPA) 70.
  - American Petroleum Institute (API) RP 500.
- Use only UL-approved metal safety cans to store and transport flammable liquids and oily rags. Oily rags should be properly disposed of as soon as practicable.

### Operational Situation

<table>
<thead>
<tr>
<th>Maximum Consecutive Shifts (Day or Night) in a Work set</th>
<th>12-Hour Shift*</th>
<th>10-Hour Shift*</th>
<th>8-Hour Shift*</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Normal Ops – onshore commuters</td>
<td>7 shifts</td>
<td>10 shifts</td>
<td>10 shifts</td>
</tr>
<tr>
<td>b) Outages – onshore commuters</td>
<td>14 shifts</td>
<td>14 shifts</td>
<td>19 shifts</td>
</tr>
<tr>
<td>c) Normal Ops/Outages – onshore remote and offshore</td>
<td>28 shifts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimum time off after a Work set</th>
<th>12-Hour Shift*</th>
<th>10-Hour Shift*</th>
<th>8-Hour Shift*</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Normal Operations</td>
<td>36 hours</td>
<td>36 hours</td>
<td>36 hours</td>
</tr>
<tr>
<td>Work set of 4 or more night shifts</td>
<td>48 hours</td>
<td>48 hours</td>
<td>48 hours</td>
</tr>
<tr>
<td>After 84 hour or more regardless of day or night*</td>
<td>48 hours</td>
<td>48 hours</td>
<td>48 hours</td>
</tr>
<tr>
<td>b) Outages</td>
<td>36 hours</td>
<td>36 hours</td>
<td>36 hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extended Shifts</th>
<th>12-Hour Shift*</th>
<th>10-Hour Shift*</th>
<th>8-Hour Shift*</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Unscheduled maximum shift</td>
<td>18 hours</td>
<td>16 hours</td>
<td>16 hours</td>
</tr>
<tr>
<td>b) Time off after shift</td>
<td>10 to 16-hour shift</td>
<td>8 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 to 16-hour shift</td>
<td>8 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 to 16-hour shift</td>
<td>8 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;16 to 18-hour shift</td>
<td>10 hours</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum Number of Extended Shifts per Work set</th>
<th>12-Hour Shift*</th>
<th>10-Hour Shift*</th>
<th>8-Hour Shift*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1; no limit for less than 14-hour shift; 1 for more than 14-hour shift</td>
<td>1 for 14-hour shift or 2 for 12-hour shifts or for 3 or more 12-hour shifts, follow 12-hour normal operations guidelines above</td>
<td>2 if greater than 12 hours in duration; extended shifts must be non-consecutive. If &gt;2, follow 12-hour normal operations above</td>
<td></td>
</tr>
</tbody>
</table>
• Fire detection devices must be installed in control rooms, offices and personnel quarters.

• Each building or hazardous area must have at least two means of egress, with the following exceptions:
  – Space does not exceed 200 square feet.
  – Space is occupied by a maximum of two people.
  – Distance to the exit is less than 25 feet.

• A written emergency evacuation plan must be developed for office buildings with 10 or more people.

Fire Extinguishing

In case of fire:
• Sound the alarm and evacuate the site.
• If possible, shut off the fuel source (remotely).
• Call out a professional firefighting organization.
• Only attempt to extinguish a fire when all the following conditions are met:
  – The fire is small and just beginning (incipient stage).
  – You have been trained in the use and limitations of available fire extinguishers.
  – No one will be exposed to additional hazards.

Fire Safety Equipment

• Fire safety equipment, other than for fire brigades, is provided to employees ONLY as personal protection.

COP employees and contractors may fight incipient stage fires if they are willing and trained to do so, but they are NOT expected to fight fires except when they are part of an official fire brigade that is equipped and trained!

• Company-assigned vehicles should be equipped with 20-pound minimum, multipurpose, dry-chemical fire extinguisher.

  Note: This does not include pool vehicles provided only for office personnel use.

• Fire extinguishers should be mounted to avoid external corrosion of the extinguisher.

• If firefighting equipment is provided to personnel, annual training is required.

• Fire extinguishers must be inspected monthly to verify:
  – The extinguisher is charged.
  – There is no evidence of damage or tampering.
  – A monthly inspection tag is present.

  Note: Inspections must be documented on a tag attached to the extinguisher.

• Annual maintenance is to be performed by a trained person with a UL-approved apparatus.
First Aid Kits

Office, company vehicles and personal first aid kits must:

- Include contents and other emergency first aid equipment based on the job site hazards.
- Meet the current requirements of ISEA Z308.1/ANSI Z308.1 for Type III kits.
- Be readily accessible where provided with the contents inspected regularly and kept up-to-date.
- Be in all company vehicles.

Flagging and Tagging

**Flagging** is used in conjunction with tags to increase attention where the tags are not easily visible. Flagging should be one of the following:
- Highly visible neon-colored marking or surveying tape.
- Orange or yellow **DANGER** or **CAUTION** tape.

**Tagging** is a visual communication tool to:
- Provide messages or instructions prior to starting equipment.
- Make people aware of temporary operational hazards.
- Tell people not to use the equipment.
- Highlight operational hazards not requiring Lockout/Tagout.
- Identify equipment that is in a non-normal position (valves, switches, etc.) during Non-Energy Isolation (Non-LOTO & Try) situations.

Flagging & Tagging is never allowed as a substitute for Lockout/Tagout!
Tagging looks like:

- Tagging is normally orange (Operational/Warning) or yellow (Caution) tags with black letters:

- These tags may be used interchangeably, however, orange tags are typically used to mark out-of-service equipment and yellow tags are used to mark hazards.
- Operational Tags should provide the following information:
  - Equipment that has been altered or placed in a non-normal position.
  - Date the tag was attached.
  - Why the tag was attached.
  - Who attached the tag.
  - Contact information for person attaching the tag.

Other Tagging Considerations:

- Tags should be able to withstand the environmental conditions in which they are placed.
- Tags left in place for an extended amount of time should be checked periodically to make sure the information written on the tag is still easy to read and the flagging is still visible.
- Tags should be secured to devices in such a way they cannot be detached or removed by wind or other weather elements. Zip ties or tie wire are good connectors.
- When the equipment is placed back in service, all flags and tags should be removed.

Removing an Operational Tag:

- Verify equipment is ready to be put back into service.
- Report any areas of concern before operating it.
- Remove tags prior to placing the equipment back in service.
- A supervisor must consent for tag removal if the person who installed the tag is unavailable.

Using a Lock with an Operational Tag:

- Operational locks are not required but may be used with operational tags if the locks are non-colored.

⚠️ Red, yellow and blue locks are used strictly for Lockout/Tagout & Try!
The following rules apply to bench, stand grinders and portable grinders and wire wheels:

- The grinder operator must wear a face shield and safety glasses with side shields or goggles.
- Other people in the vicinity of grinding work must wear safety glasses with side shields or goggles.
- Disconnect the energy sources before removing or replacing the grinding wheel.
- Guard the grinder and brush wheels as follows:
  - Wheels over 2 inches in diameter must be guarded.
  - At least half of the wheel should be guarded.
  - Guard the side of the wheel facing the operator.
  - The guard should be adjustable so that the grinder can be used in any position.
- Adjust the guard so that:
  - The opening between the tongue guard and chip wheel does not exceed 1/4 inch.
  - An opening of no more than 1/8 inch exists between the work rest (tool rest) and the wheel.
- With the tool unplugged, turn the wheel by hand and inspect it for defects, gouges and cracks. Ensure it is tightly secured on the shaft.
- Do not operate a grinder or wire wheel if the guard is missing or defective or the wheel is loose (vibration).
- Verify the rated wheel speed is greater or equal to the tool’s speed and the correct wheel size is used.
- Never use a grinding wheel to grind soft metals such as aluminum or brass.
- Inspect all guards, electrical connections and cords before every use.
- Ensure loose clothing is tucked in or taped. Never allow a rotating wheel to contact the body or clothing.
- Hold the grinder firmly with the wheel against a solid object until the wheel stops when you finish grinding.
- Pneumatic grinders may only be powered by an air source.

**Natural gas must not be used to drive any pneumatic tool!**

**Using a portable grinder in a restricted area is prohibited without an approved Hot Work Permit!**
Grounding and Bonding

- Grounding (or bonding) is required to properly ground electrical equipment and associated production facilities and provides protection against lightning and static electricity build-up.
- Prior to transferring liquid (oil, water or chemicals) from one container to another or to/from a truck transport, attach a bonding cable between the two containers to prevent static electricity build-up.
- A qualified Engineer will be utilized to design and a qualified Electrician to install and/or verify the proper installation of electrical grounding on all permanent and temporary facilities.

Hammer Unions

Follow these hammer union practices to prevent serious injury, death and/or property damage:

Never strike, tighten, or loosen pressurized unions, lines or connections!

- Always follow the manufacturer’s recommended installation, usage, maintenance and inspection requirements.
- Ensure all hammer union components are of the same pressure rating (i.e., 1502 with 1502).

Hammer union components that cannot be positively identified as to their manufacturer, size, figure number, pressure rating or approved type of service must never be used!

- Never exceed the rated working pressure of the unions and their attachments.
- Never use severely worn, eroded or corroded pipe or unions.
- Secure unions from falling when using them in overhead applications.
- Secure unions and attachments from undue movement especially when used with pressure control equipment.
- Always inspect, clean and lubricate unions before using.
- Never use hammer unions with sharp edges, burrs, flared wing nut lugs, chips, cuts, cracks or other blemishes.
  - Acceptable Use or GO – A minimum of $\frac{1}{4}”$ of flat surface remaining on top of the striking lug after grinding off flared areas.
  - Unacceptable Use or NO-GO – Less than $\frac{1}{4}”$ of flat surface remaining on top of the striking lug after grinding off flared areas.
Handle Extensions

**Note:** Protrusion or flaring of the lug past the shoulder of the wing nut and other deformities must be ground off flush with shoulder.

- Replace both halves of the union to ensure compatibility of the union when a replacement is required.
- If unions are designed to be used with seals, always use clean undamaged seals and o-rings. Grooves and seal pockets must be clean, rust free and unblemished.
- Always wear suitable eye protection with side shields when hammering union nuts to tighten.
- Use a 6 lb. hammer on 3” connections or larger and a 4 lb. hammer on 2” connections or smaller.

The use of excessive hammer forces or overtightening can damage hammer unions and must be avoided!

Handle Extensions (cheaters)

The use of handle extensions is restricted to limited applications and requires certain precautions be taken such as:

- Must never be used on binding, tensioning or lifting devices.
- May be used on forged steel wrenches only where other options are not practical and the potential hazards have been identified and thoroughly discussed including precautions taken to eliminate unnecessary personnel exposure.

If a handle extension is to be used, discuss it in the JSA, and apply the following guidelines:

- The maximum length of the extension must be no more than 2 times the length of the tool handle.
- The handle extension must be made of steel or heavy-wall aluminum pipe.
- The handle extension must fit snugly on the tool handle and cover the full length of the tool handle.
- The force exerted on the handle extension must not exceed the force that can be exerted by one person with both feet firmly on the ground.
Do not put full weight on the handle extension and “bounce” or jerk; do not allow two people on the handle extension!

- Equipment or tasks requiring repeated use of handle extensions should be evaluated for replacement or re-engineering.

Hand Tools

- Use a JSA to determine the proper tool for the job, identify the line of fire and verify no one is in the strike zone (e.g., pinch points or knuckle busters).
  - Heavy-duty pneumatic hammer wrenches or hydraulic bolt torquing units may be the best option for bolt tightening or loosening.
  - A special-purpose compound leverage wrench (or multiple workers, each with their own wrench) may be the best option for breaking out threaded piping unions.
- Position and brace yourself when applying force to avoid injury if the tool slips or a connection breaks.
- Do not yank stuck pieces of equipment towards you; use pry bars or mechanical tuggers.
- Do not stand on or put full body weight on a tool and bounce or jerk.
- Do not use defective or improper tools.
- Check frequently to ensure hand tools are maintained in good condition to avoid tool slippage.
- Avoid repetitive or sustained exertions, particularly if they are accompanied by deviations from straight wrist and/or by forceful exertions. The force exerted should not exceed the force that can be exerted by one person with both feet firmly on the ground.

  Do not use too much force on a tool. Use a bigger wrench or handle extension to reduce the force required!

- Secure the work piece when tightening fittings or breaking connections:
  - Do not hold the work piece with one hand and the tool with the other.
  - If relying on the work piece’s weight to prevent it from moving, carefully test whether the work piece is heavy enough to stay put with the wrenching force.
- When using an adjustable wrench (e.g., Crescent) or pipe wrench, apply the wrench so the force is against the fixed portion of the tool, not the adjustable part.
- Equipment or tasks requiring repeated use of excessive force should be evaluated for replacement or re-engineering.
• Train workers on safe hand tool working practices:
  – Inspect tools prior to use.
  – Do not modify the design of a tool.
  – Wear the proper PPE for the job. The JSA should help identify the proper glove for the job.
  – Secure tools when working at heights.
  – Clean and store tools at the end of the job.
  – Do not carry a tool by the cord or hose.

Never yank the electrical cord or hose to disconnect!

  – Do not hold fingers on the switch button while carrying a plugged-in tool.
  – Keep good footing and maintain your balance when operating tools.
  – Pneumatic power tools should be used in electrically classified areas.

The use of natural gas or other flammable substance to power any pneumatic tool is strictly forbidden!

• The driving faces of hammers, chisels, drift pins, bars or similar tools should be free of mushroom heads, breaks and other defects.

Do not use a hammer with a hardened face on a tempered tool such as a drill, file, die or jib!

• Wooden handles must be sound and securely wedged or fastened to the tool.
• Metal handles on digging tools should be avoided when working near electrical hazards.

Holding a Backup Against Powered Torqueing

Shut down the job and hold a dedicated JSA to identify and mitigate the hazards associated with powered torqueing and holding a backup. Consider the selection of tools and determine if a reasonable safer alternative exists. If so, that alternative must be used, even if the job must be suspended while the right tools are obtained.

Backup tools must be restrained by mechanical means to prevent them from spinning during powered torqueing. Restrain the work piece such that the backup force cannot move the work piece laterally.

Note: Backup requirements do not refer to approved operations where connections are being made using two sets of tongs or a top drive and a set of tongs. However, before tripping pipe, making connections at the stump or making connections at the mouse hole, a JSA/Go Card discussion should be performed to identify hazards and manage risk to an acceptable level.
Hazardous Communication (HazCom)*

The purpose of HazCom is to ensure the hazards and precautions of all chemicals produced at or brought to the work site are evaluated and communicated to employers and employees by way of container labeling, signs, safety data sheets (SDS) and employee training.

- A Chemical Approval and Inventory Control Form must be completed and approved prior to bringing any new chemicals (except consumer product chemicals) to the workplace.
- An inventory of hazardous chemicals used or stored at each facility will be maintained.
- An SDS for each chemical identified on the chemical inventory list will be readily accessible to all personnel during each work shift.

HAZCOM Labeling

Portable Containers

- Ensure that suppliers’ portable containers have the original label as applied by the manufacturer.
- Portable containers used only for temporary and immediate use of the individual who filled it are not required to have warning labels, however they must be marked with the name of the product.
- Label any temporary portable containers with remaining product at the end of a work shift with the quantity (other than a residue) of the material and the same information as the original container’s label.

Stationary Storage Tanks

- Ensure Global Harmonized System (GHS) labels are on stationary storage tanks that are capable of being loaded and unloaded by personnel.

Employee/Contractor Communication.

- Ensure hazard communication training is presented to employees or contractors who may encounter hazardous chemicals while working on a COP location.

Hearing Conservation*

Workers must be protected from exposure to occupational noise levels that might cause hearing loss. Appropriate hearing protection should be worn in all posted areas and in unposted areas where the potential for temporary high noise levels exists.

HSE will conduct a sound level study (survey):

- At all facilities where excessive noise levels may be present.
• Within 90 days of startup of all machines and facilities.
• When there is a change in the process or equipment.

HSE will designate a site as “noise hazard area” where noise levels typically equal or exceed 82 dBA:
• Warning signs will be posted in noise hazard areas.
• Personnel must wear hearing protection devices (HPDs) when working in noise hazard areas regardless of the amount of time in the area.
• Personnel are to be provided a variety of HPDs and be trained in their use and care.
• HSE will ensure annual audiometric testing is conducted for all employees when full shift noise exposure equals or exceeds 82 dBA.

Areas where noise levels are equal to or exceed 105 dBA must be designated and posted as “double hearing protection areas” (e.g., earplugs plus earmuffs).

The preferred methods for controlling noise levels are as follows (in priority order):
• Engineering controls (walls, barriers and insulation).
• Administrative controls (procedures).
• PPE.

Helicopters

Before boarding a helicopter, all employees and contractors must attend a pre-flight safety orientation.

Precautions for boarding and leaving a helicopter:
• Hearing protection must be worn when approaching a helicopter and during flight.
• While the helicopter is landing, stay in one group.
• Do not approach the aircraft until the pilot motions you to do so.
• Approach and leave the helicopter from the side or front, never from the rear. Maintain eye contact with the pilot.

⚠️ Stay away from the tail rotor blades!

⚠️ Disembarking passengers should immediately exit the heliport!

⚠️ Passengers waiting to board should not block the stairway and should remain below the heliport deck until the helicopter has landed!

• Hold your hat in your hand unless you are using a chinstrap. Securely hold any small or loose articles.
• Never carry loads over your shoulder.
• Do not walk uphill when leaving the helicopter or downhill when approaching the helicopter.
• Open and close the helicopter doors gently. Never let the doors swing freely. Hold on to the door handle anytime the door is open.

• Signal the pilot when all passengers are buckled in and all doors are closed properly.

When the helicopter is enroute, follow these safety rules:
• Smoking is not allowed.
• Seat belts must always remain fastened and passengers must not change seats.
• Do not throw objects from the windows.

Loading equipment onto a helicopter must be directed by the pilot according to the following rules:
• Shut down the helicopter when loading large or bulky objects when possible.
• Carry poles or tall objects horizontally, with all maneuvering of the object done parallel to the ground and main rotor.
• Secure equipment loaded into the cargo compartment so that it will not move around in flight.

When working around the cargo compartments, be very careful of engine exhaust and your proximity to the tail rotor!

• Tie down any equipment carried in the cabin or, if small enough, passengers can hold them.

**Heliports**
• Must have adequate recessed tie-down facilities.
• Must be kept clear of unneeded items. Material that can be moved by rotor turbulence or interfere with landing or take off should be removed from heliports.
• Helicopters should not land during extended crane operations, wireline operations, well testing, or while bleeding gas.
• Exit stairways must be kept clear.

**Hot Oiling/Watering**

**Hot oiling/watering** is done to remove paraffin build-up and involves pumping heated oil or water under pressure down a well or through process piping. The following precautions for hot oiling/watering should be followed:
• Perform a JSA/Go Card discussion before work begins.
• Verify that communications equipment is available and working.
• Ensure that:
  – A wind indicator (sock) is visible so the wind direction is known throughout the job.
  – The hot oil unit is not parked under power lines or over the flow line being treated.
— The wheels on at least one axle of the unit are blocked with chocks both front and rear.
— The unit is placed upwind at least 75 feet from tanks, wellheads and other production equipment.
— All on-site personnel are informed of the lines to be treated.
— Fire extinguishers are readily accessible.
— The unit is grounded to the wellhead or ground rod.
— Hoses are not used when hot oiling, unless it is used for circulating a tank.
— Chicksan are used to bring the lines down to ground level to alleviate stress on wellhead connections.
— An appropriately sized and rated check valve is installed close to the wellhead.
— The area is free of hazards (e.g., H₂S, gas leaks and spills).

• A pre-job meeting must identify the maximum allowable working pressure (MAWP) and temperature of treating lines and equipment.
• Lines and equipment must be tested to 1½ times the maximum planned treating pressure.
• The operator must always remain at or near the unit’s controls while the job is being pump.

**Hot Work** (including Hot Tapping, Hot Tie-In and In-Service Welding)

**Hot Work**—using tools or equipment that may create an arc, spark or open flame (e.g., electric or gas welding, cutting, brazing, burning, grinding, use of an oxyacetylene torch or similar operations).

**Authorized Permit Writer**—an individual who is trained and approved to authorize/complete Hot Work Permits.

**Fire watch**—one or more individuals who are specifically stationed where hot work is being performed and whose only job is to monitor for the presence of accidental fire or other hazardous conditions.

*A Fire Watch can perform other safety related tasks such as atmospheric monitoring or CSE standby person provided their Fire Watch duties are not compromised!*

**Designated safe work areas**—unclassified areas that are more than 75 feet from any wellhead, production piping, vessels or related hydrocarbon-containing equipment and upwind of vents or other sources of hydrocarbon vapors.
Types of Hot Work:

• **Class A** – High Energy Hot Work
  – Welding, cutting, grinding, brazing (open flame) within 75 feet of recognized or potential hydrocarbon sources.

• **Class B** – Low Energy Hot Work
  – The use of spark generating tools or equipment (drills, portable generators, lap-tops, etc.) within a classified area.
  – Where motorized equipment operates within a classified area or within 10 feet of a wellhead.

**Note:** Well servicing equipment is not exempt from this requirement. However, a permit is only required when a component of the equipment contains an ignition source (i.e., engine compartment) within a classified area or within 10 feet of a wellhead.

A Hot Work Permit required when:

• Performing either Class A or Class B Hot Work.
• Working on energized circuits including the opening of explosion-proof junction boxes within a classified area.
• Using Thermite (CADWELL) within 75 feet of a hydrocarbon source or within 35 feet of combustible materials.
• Performing welding, cutting, grinding or brazing on any part of a building (partition, walls, floors, ceilings).
• Hot Work is being performed on portable containers or equipment that contain or have contained flammable or combustible material.

Hot Work can be performed without a permit

• In a designated safe work area.
• When using intrinsically safe tools.
• When using non-intrinsically safe tools (such as mobile phones, tablets, cameras, radios, calibration & testing equipment) inside a classified area after you:
  – Conduct a JSA.
  – Continuously monitor atmospheric conditions with a four-gas monitor.

A Hot Work Permit is completed by:

• An Authorized Permit Writer.

Hot Work is approved by:

• A Field Supervisor.

A Hot Work permit is good for:

• 12 hours maximum or one complete work shift.
• Permits can be revalidated up to 6 times or 7 shifts provided the following are true:
  – The scope of work has not changed.
  – Each revalidation is authorized on the permit.
Atmospheric conditions and health hazards to be documented on the permit include (safe range):

- Oxygen (19.5% - 23.5%).
- $\text{H}_2\text{S}$ (less than 5 ppm).
- Carbon Monoxide (less than 25 ppm).
- NORM (less than 50 uR/hr).
- Flammability (0%).

If unable to reach 0% flammability, an Operations/Projects/D&C Manager must approve before proceeding (OSHA Limit is <10% LEL)!

Atmospheric testing should be performed:

- Before work begins.
- After any break.
- After the area has been left unattended.
- During the work when conditions change.
- No less than every 2 hours.

A Fire Watch is required:

- When performing Class A (High Energy) Hot Work.

Hot Work Key Steps

1. Determine if Hot Work permit is required.
2. Obtain initial approval for hot work from a supervisor.
3. Use the permit checklist to review/address hazards.
4. Ensure welding/cutting/brazing equipment meets requirements.
5. Perform isolation and LOTO & Try if needed.

Class A Hot Work on tanks, drums or vessels requires positive isolation!

Single point isolation is not allowed for Hot Work!

6. Prepare equipment for hot work by cleaning and purging if needed.
7. Test the atmosphere and document readings on the permit.
8. Complete CSE permit if needed.
9. Assign and post a trained fire watch when performing Class A Hot Work.
10. Get final authorization.
11. Complete and post permit.
12. Perform hot work.
13. Re-test the atmosphere as required.
14. Re-issue/Re-validate permit as required.
15. Leave the fire watch in place for at least 30 minutes after the hot work is complete.
16. Close out and remove permit.
Hot Tapping

Hot Tapping is defined as:
• Attaching a branch connection by welding a tapping fixture and mechanically drilling (i.e., tapping) into pressure vessels, tanks, pipelines or service piping while the equipment is under pressure and in service.

The Hot Tapping approval process includes:
• A written justification with risk assessment must be submitted to the Operations Manager for approval.
• A Hot Tap work scope, written plan, justification and Operations Manager approval must be attached to the Hot Work Permit.

The actual Hot Tap can be performed by:
• Only a specialty contractor with appropriate equipment and experience shall perform hot tapping.

Hot Tie-In

A Hot Tie-In is defined as:
• The process of making welded pipe connections while residual vapors may be present or could burn in a controlled manner at the weld area.

A Hot Tie-In is approved by:
• The appropriate level of management as determined in your respective Business Unit must approve a Hot Tie-In prior to conducting the work.

Hot Tie-Ins are performed by:
• Follow the guidelines in Appendix B, Installation and Maintenance—Pipe Replacement Procedure, L48 MPR 4215.

Hot tie-in is restricted to pipeline repair and replacement!

In-Service Welding

In-Service Welding is defined as:
• Any welding performed on equipment, pipelines and/or other facilities which have been in hydrocarbon service and are to remain in service, pressurized or not, unless they have been blinded, depressurized and purged such that they cannot be within the flammable range.

The In-Service Welding approval process includes:
• A written justification with a risk assessment must be submitted to the Operations Manager for approval. In-Service Welding work scope, written plan package, justification and Operations Manager Approval must be attached to the Hot Work Permit.
In-Service Welding can only be performed by:
• A welder qualified to API 1104 Appendix B.

Hydrates

A hydrate plug is comprised of water and hydrocarbon and typically forms between a temperature of 35°F and 65°F at pressures greater than 100 psig. Hydrates typically form in flow areas with a pressure drop and high fluid turbulence such as near a control valve or an orifice plate. Indications of hydrate formation include:
• Decreased or lack of gas flow.
• Increased upstream pressure, decreased downstream pressure and increased differential pressure.
• Decreased temperature.

A hydrate plug can resist significant differential pressure. The release of a hydrate plug may act as a piston and compress the downstream gas to a pressure above the maximum allowable working pressure (MAWP) of the piping, or the plug may act as a projectile and approach a speed in excess of 1,000 feet per second. The goal is to thaw the plug without moving it; extreme caution is required.

The release of a hydrate plug may cause significant injuries and damage to equipment! Always stay out of the line of fire to minimize the risk of personal injury!

When dealing with a hydrate plug:
• Determine the location of the hydrate plug.
• Monitor pressure on both sides of the plug.

Do not attempt to push a hydrate plug with an expansive energy source such as a compressor or a gas pipeline!

• Always isolate potential sources of fluid energy from both sides of a hydrate plug.

Do not attempt to remove a hydrate plug without first equalizing the pressure upstream and downstream of the plug!

• Equalized pressure should be reduced below the hydrate formation pressure.

Do not attempt to de-pressure downstream of a hydrate plug to dislodge or to move the plug with gas pressure!

Do not use a hammer or similar tool to hit the piping to release a hydrate plug!
• Allow ambient heat to thaw the hydrate plug. If ambient heat is not high enough, apply heat from an external source to thaw the hydrate plug. External sources may include:
  – Heated air.
  – Vehicle exhaust (this technique may not be used in a partially or fully enclosed building). Only use if there is adequate ventilation to prevent carbon monoxide gas poisoning.

  Do not use an open flame such as an acetylene torch or other similar technique to apply significant heat input to a very localized area of the piping. This may weaken the steel and result in a pipe failure and personal injury.

  If heat from an external source is not available, methanol can be introduced into the process stream.
  • Once the plug thaws, verify there is an open path for gas flow and restore gas flow.

  Stay out of the line of fire of a potential hydrate plug release when gas is re-introduced into the piping system!

Hydrogen Sulfide ($\text{H}_2\text{S}$) *

Characteristics of $\text{H}_2\text{S}$:
• Toxic, colorless, flammable and corrosive gas.

  Can be fatal even in very low concentrations!

• Can have an offensive odor (like rotten eggs) at low concentrations.

  Do not rely on your sense of smell as a warning device. $\text{H}_2\text{S}$ can block sense of smell!

• Heavier than air. When released, it is likely to travel along the ground to low-lying areas.

• Highly flammable explosive mixture form with air in concentrations of 4.0 - 44%.

• The byproduct of burning $\text{H}_2\text{S}$ is sulfur dioxide (SO$_2$) which is also an extremely toxic gas.

• Extremely corrosive to most metals.
Physical effects of H$_2$S exposure at different concentrations are detailed in the table below:

<table>
<thead>
<tr>
<th>Concentration (ppm)</th>
<th>Physical Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.13 ppm</td>
<td>Minimal perceptible odor.</td>
</tr>
<tr>
<td>10 ppm</td>
<td>Obvious and unpleasant odor. OSHA permissible exposure limit (8-hour exposure).</td>
</tr>
<tr>
<td>15 ppm</td>
<td>OSHA short-term exposure limit (15-minute exposure).</td>
</tr>
<tr>
<td>100 ppm</td>
<td>Immediately dangerous to life and health. Impairs the sense of smell in 3 to 15 minutes. May irritate eyes and throat.</td>
</tr>
<tr>
<td>500 ppm</td>
<td>Dizziness, breathing stops in a few minutes. Needs prompt artificial respiration.</td>
</tr>
<tr>
<td>700 ppm</td>
<td>Unconscious quickly. Death will result if not rescued promptly.</td>
</tr>
<tr>
<td>1000 ppm</td>
<td>Unconscious immediately followed by death within minutes.</td>
</tr>
</tbody>
</table>

**Safety Requirements/Training**

- All personnel required to work near equipment containing H$_2$S in excess of 10 ppm must be trained in H$_2$S safety.  
  **Note:** Training must be refreshed annually.

- Personal H$_2$S monitors must always be worn in areas where:
  - Fixed detection devices are not provided; and
  - H$_2$S is expected to be present in airborne concentrations greater than 10 ppm.

- Personal H$_2$S monitors must be worn:
  - On the front side of your body in the breathing zone (within 18 inches of your nose).
  - With the sensor exposed, not covered by clothing or located inside a pocket.

- Wind-direction indicators must be installed at the following locations:
  - Plant sites where the calculated 100 ppm Radius of Exposure (ROE) is 50 feet or greater.
  - Facilities where H$_2$S concentrations exceed 100 ppm in the gas stream or vapor space above produced fluids.
• Wind-direction indicators must be:
  – Visible.
  – Sufficient in number.
  – Installed in prominent locations.
  – Placed in illuminated areas if possible.
• Caution signs must be posted within 50 feet of any facility where the H₂S concentration is 100 ppm or higher in the gas stream or vapor space above produced fluids.
• Danger signs must be posted at the entrance of areas where employees must wear respiratory protection.

• Pipelines must be marked by posting markers (signs).
• Security fencing must be installed when the H₂S concentration at a production well site or facility exceeds 100 ppm and the site is within:
  – A quarter mile of a public area.
  – City or incorporated limits of a town.
  – An area where the public could be expected to frequent.
• Airborne concentrations of H₂S >100 ppm require you to wear either:
  – Full Face Positive Pressure SCBA, fully charged.
  – Full Face Positive Pressure Supplied Air Respirator (SAR), equipped with a minimum 5-minute escape bottle.

  **Note:** At least one trained and equipped Standby Person must be located outside a work area with an IDLH atmosphere (≥100 ppm).

### H₂S Rescue

• Time is critical when rescuing a person overcome by H₂S.

  **Take all precautions first! Do not become another victim!**

• Call for emergency assistance.
• Put on a self-contained breathing apparatus (SCBA) before entering the danger area if you are trained and equipped for rescue.
• Move the victim to fresh air at once.
• Begin artificial respiration if the victim is not breathing.
• Begin cardiopulmonary resuscitation (CPR) if the victim has no pulse.

Hydrotesting

Equipment Installation and Verification
Confirm the following for onsite equipment:
• The rated pressure of the hydrotest pump is appropriate for the equipment being tested.
• The pump’s pressure-relief valve (PRV) is set to relieve at 115% of the specified hydrotest pressure and is sized to relieve 100% of the pump capacity at set pressure.
• The high-pressure trip is set at 110% of test pressure.
• All flexible hoses are secured with whip checks.
• All steel lines are secured using proper Engineering design.
• The equipment is spotted to avoid areas where gases or vapors may be present and hot work areas.
• The bleed-off system is operable.
• The equipment to be tested is isolated from the rest of the system.

Isolation should be achieved by using blinds, skillets or plugs – never by closed valves!

Startup and Hydro-test
• Instruct all personnel to move to a safe location prior to starting the pump.
• Test the pump and lines to the MAWP of the test equipment or to the maximum test pressure of the equipment to be tested.
• Purge the equipment to be tested with test medium to eliminate any trapped air.
• Test for a minimum of 3 minutes unless other instructions are provided.
• Check for leaks using pressure monitoring equipment.

No one should stand or walk near equipment being tested until the pressure has been released!

• Have the test unit operator give an “ALL CLEAR” signal once all trapped pressure is released.

Identify any potential trapped pressure in the system and release it before breaking connections!

Drain points must not be used to verify pressure; they are prone to plugging!
Incident Response, Reporting and Investigation*

Unplanned Event—an event that is neither planned nor expected to occur.

Incident—an unplanned event resulting in a loss (e.g., injury, damage, public complaint, product release, environmental impact, nonconformance and enforcement actions), including failure of processes and procedures.

Near Miss—an unplanned event with no consequence, but the circumstances could have resulted in injury, property or environmental damage, process upset or other disruption.

Initial Response

- The incident site must be secured, preserved and contained to prevent:
  - Further injuries.
  - Continuation of a release event.
  - Equipment damage.
  - Loss of investigation evidence.
- Activate the Emergency Response Plan if required.
- Provide initial first aid if required.
- Contact Axiom (877-502-9466) for any injury so a licensed healthcare provider can provide first aid guidance and further injury care recommendations.
  **Note:** For injured service company employees, Axiom or a similar medical support group can fulfill this requirement.
- Dispatch emergency medical services if required.
- Accompany any injured COP employees and contractors taken to medical facilities.
- Unplanned events must be reported to the COP supervisor immediately.

Investigation

- An investigation should be initiated in accordance to the Incident Reporting and Investigation Procedure.
  **Note:** An investigation may involve a large team or only one or two individuals depending on the risk potential and complexity.
- BU/Asset leadership, with guidance from HSE, will choose the most appropriate investigation method to best understand the incident cause and identify needed improvements.
Knives/Razors

Before a knife or razor is used (including safety knives and razors), a JSA must be performed to discuss the selected tools and their condition to determine if a safer alternative can be used (e.g., wire strippers, scissors or cutters).

- If there is a safer alternative, use it even if the job must be suspended while the right tool is obtained.
- Once the proper tool is determined, safe operating procedures should be reviewed (i.e., body positioning, footing and PPE).
- If it is determined that a knife or razor is the proper tool (e.g., a safety knife or razor with a locking guard), cutting procedures should be reviewed before starting work (e.g., cutting motion should be away from and not toward the body).

Note: Kitchen knives used for food preparation are exempted from this policy.

Ladder Safety*

Fixed ladder—is permanently attached to a structure, building or other equipment.

Fixed ladders installed after November 2018 that are 24’ or taller must be equipped with a fall arrest or ladder safety system.

Portable ladder—is built to be moved from one job to another such as stepladders and extension ladders.

- Portable ladders must be certified as Type 1-A Industrial Heavy Duty with a 300-pound duty rating.
- Equip all straight and extension ladders with non-slip bases (i.e., ladder feet).
- Inspect all portable ladders before each use.
- Inspect all fixed and portable ladders annually for cracks, fading or other damage that might weaken the ladder.
- Remove defective ladders from service.
- Wear fall protection on fixed and portable ladders when working above 6 feet.
- Maintain 10 feet of clearance when working around overhead power lines.
- Never use ladders as braces, skids or gangways.
- When ascending or descending a ladder, take the following precautions:
  - Face the ladder and keep the body near the center of the ladder.
  - Do not extend your body beyond the sides of the ladder at any time.
- Hold ladders at the base until they are secured.
- Always hold the ladder with at least one hand while climbing or descending the ladder (3-point contact).
- Carry tools or other work materials in a tool belt or hoist them to the work level.
- Do not store tools or other materials on ladders.

- Straight ladders must not exceed 30 feet in length.
- 2-section ladders must not exceed 60 feet in length when fully extended.
- Ladder feet should be placed 1 foot back from vertical for every 4 feet of ladder height.
- Use fiberglass rail ladders when working on electrical equipment.
- Fixed ladders exceeding 20 feet in length must be caged or provided with fall protection devices.
- Only one person on a ladder at a time unless the ladder is specifically designed for multiple people.

Lighting Burners on Fired Vessels

A Hot Work Permit is required before lighting a fired vessel in a classified area unless done by an auto-igniter.

Manual Lighting Procedure:

- Open the pilot burner access port and verify that the system is purged to an LEL reading <10%.
- Prepare a manual lighting torch by completing the following tasks:
  - The torch handle should be nonflammable, flexible and long enough to extend the lit end to the pilot burner without placing hands inside or in front of the port.
  - Insert the unlit torch into the port until the end is to the pilot burner. Mark a reference point on the torch handle at the entrance of the access port.
  - Bend the torch handle so your hands are not placed in front of the port when lighting the pilot.
- Ensure extinguishing material is in the immediate area.
- Light the pilot burner as follows:
  - Ignite the torch.

  **Hands and face should never enter or be in front of the access port! Also, never look directly into—or stand in front of—the end of the access port when lighting the burner!**

- Insert the torch into access port to the pre-marked reference point.
- Open the pilot light fuel valve and listen for ignition.
- After ignition, remove and extinguish the torch.
Replace the pilot burner access port cap and check the flame through the viewing window.

**Automatic Lighting Procedure:**
- Open the pilot burner access port and verify the system is purged to an LEL reading <10%.
- Open the pilot light fuel supply valve.
- To light the pilot burner, actuate the pilot igniter control and push the igniter until you hear a snap.
  
  **Note:** You may need to repeatedly push the igniter before it lights.
- Listen for ignition before releasing the igniter.
- Visually check the flame through the viewing window.
  
  **Note:** Pilot flame should be a steady, long, rolling and yellow-tipped.

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**Lone Worker**

Field personnel frequently work alone and in potentially hazardous situations. Each BU or asset is expected to develop and communicate a Lone Worker program that is appropriate to safeguard the workers in their operation.

Contractors working for COP are also expected to have a Lone Worker program for their personnel.

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**Long-Term Isolation**

**Long-Term Isolation or Equipment Out-Of-Service:**

- Physically disconnect the equipment (preferred) or lock the isolating valves closed so the equipment cannot be unintentionally put back in service.
- Attach an orange DO NOT OPERATE tag with an explanation why the equipment is not being used, a contact name and the date the equipment was removed from service.
- Complete an MOC prior to changing the operation of any facility including permanently taking equipment out of service at an active facility.

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**Machinery and Equipment Guarding**

Effective machine and equipment guards prevent the operator and other workers from placing parts of their bodies near hazardous moving parts.

- Guards must be provided to protect personnel from hazards such as sharp edges or blades, rotating parts, flying chips and sparks.
• Guards must prevent hands, arms and any other part of a worker’s body from contacting dangerous moving parts.

• Guards should be inspected each time a piece of equipment is used and repaired or replaced if it no longer provides the intended protection.

**PPE is never a substitute for proper machine or equipment guarding!**

**Removal of covers and/or guards from machinery while in operation is prohibited!**

**Management of Change**

The Management of Change (MOC) process is used to manage any “change” to process chemicals, technology, equipment and procedures, or other changes to facilities.

**Note:** A “Like Kind” exchange (i.e., equipment is replaced with another of the same model, size and pressure rating) does **not** require an MOC.

• Ensure changes that have the potential to impact health, safety, the environment, and compliance with federal and state regulations are identified, formally reviewed, assessed for risk, communicated, documented and approved prior to implementation.

**Manual Lifting/Carrying Loads**

Proper lifting techniques when manually lifting and carrying objects are:

• Test the load to see if you can lift it safely.

**Max single person lift—100 pounds!**

• Choose hand placement to avoid pinch points.

• Use material handling aids (stiffy tool, rope sling, hook) for heavy items without safe handholds.

• Slide the load toward you before picking it up.

• Objects in trailers or pickup beds should be slid to the edge before being picked up.

**NEVER reach into the back or over the sides of a pickup and try to lift a load over the sides of the bed!**

• Stand close to the load with your feet spread apart (about shoulder width with one foot slightly in front of the other for balance).

• Keep your back straight, bend your knees (not your waist), but not past 90 degrees.
• Get a firm grasp of the object with both hands before beginning the lift. Make sure the load is balanced in your hands.
• Look up to the horizon and begin slowly lifting with your legs by straightening them.
• Keep the load close to your body to prevent straining the lower back.
• Move your feet so that they point in the direction of the lift as you turn.

![Never twist your body during lifting or carrying!](image)

• Make sure that your travel path is clear of obstructions and that there are no slip hazards.
• If you must turn while carrying the load, turn using your feet, not your torso.
• Handle a load when it is too heavy to safely lift by:
  – Getting another person to help you or use mechanical assistance (hand trucks, carts) to avoid lifting.
  – Using mechanical equipment for lifting or dragging loads over 100 pounds.

Naturally Occurring Radioactive Material (NORM)*

A NORM survey should be conducted before cleaning or working on gas-processing or production equipment and piping where airborne particulates have the potential to be generated.

• Precautions must be taken when:
  – Workers may be exposed to NORM in excess of 50 microrems per hour.
  – During maintenance, equipment handling or repair, and vessel entry where workers may have direct physical contact with NORM-contaminated solids.
• Surplus and junk equipment, scale and sludge with NORM levels at or above 50 microrems per hour must be labeled and stored on-site until proper disposal options are given or the NORM-contaminated equipment is transferred to another COP storage location.
• Additional precautions must be taken whenever extensive removal of NORM-contaminated material is required or where work requires grinding, drilling, polishing, welding, brazing or metalizing.
Painting

Ensure appropriate PPE and safety precautions recommended by the coating manufacturer are used.

Precautions for safe paint removal, surface preparation and paint applications include:

- Respiratory protection may be required depending on exposure levels:
  - Abrasive media is often required for paint removal and/or surface preparation. The inhalation of toxic dusts from the paint or the blasting media is a hazard.
  - Inhalation of toxic vapors, dusts or spray mist from the paint is also a primary hazard.

- A Competent Person must be designated before removing any lead or lead-containing materials.

**Assume coatings being removed contain lead until proven otherwise!**

- Solvents in the paint can be a fire hazard.
- Stay alert to wind directions.
- Eliminate or mitigate ignition sources in the work area.
- Use adequate ventilation (mechanical or natural) to keep the work atmosphere at less than 10% of the lower explosive limit (LEL) and oxygen (O\(_2\)) content greater than 19.5 percent.
- Ventilation equipment must be rated for the work area’s electrical classification.
- Paint wastes may be considered hazardous waste. Follow BU/Asset procedures for disposal.

Personal Protective Equipment (PPE)*

**Basic PPE Requirements for Field Locations:**

- PPE is worn when engineering and administrative controls cannot provide adequate protection.
- Wear the right PPE for the job, the specific task being performed and the hazards that may be encountered.

  **Note:** Workplace task hazard assessments are performed to determine required PPE in the workplace.

- Minimum PPE to be worn at all times in the field:
  - Safety glasses with side shields.
  - Head protection (hard hat).
  - Foot protection (safety-toed shoes/boots).
  - Fire Retardant Clothing (FRC).
  - Gas Monitor (unless protected by a fixed monitor).
Note: Refer to local asset requirements for approved monitor types.

- Use only company-approved or company-issued PPE.
- The minimum requirements for basic PPE are outlined in the following table:

<table>
<thead>
<tr>
<th>Item</th>
<th>Performance and specification requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye protection and side shields</td>
<td>OSHA 1910.133 and ANSI Z87.1-1989</td>
</tr>
<tr>
<td>Head protection - Helmets and hard hats</td>
<td>OSHA 1910.135 and ANSI Z89.1-1997 Type I Class E (formerly Class B) for working at a field location.</td>
</tr>
<tr>
<td>Rainwear</td>
<td>ASTM D6413 or NFPA 2112</td>
</tr>
<tr>
<td>Hand protection - Electrical/insulating gloves</td>
<td>American Society for Testing and Materials (ASTM) D120-09</td>
</tr>
<tr>
<td>Foot protection</td>
<td>Occupational Safety and Health Association (OSHA) Standard 1910.136 and ASTM F 2412 / 2413 • Class 75 toe protection rating • Class 75 toe protection rating • Class 75 toe protection rating</td>
</tr>
<tr>
<td>Head protection - Helmets and hard hats</td>
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<td>Foot protection</td>
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</tr>
<tr>
<td>Foot protection</td>
<td>ASTM D6413 or NFPA 2112</td>
</tr>
</tbody>
</table>

Foot Protection

- Wear safety-toed footwear that meets the OSHA and ASTM/ANSI requirements.
  
  Note: Visitors who are only observing field operations and do not have safety-toe footwear must be escorted by an employee.

- Wear leather footwear or metatarsal (instep) protection when your work involves the handling of heavy objects, especially those with sharp edges and corners that could strike your foot behind the toe cap.

- Electrical hazard footwear must be worn for extra protection when:
  - Working on equipment that generates, transmits or distributes electricity.
  - Accidental contact with high-voltage, electrically energized equipment is possible.

- Ice gripper footwear must be readily available and worn when weather conditions include snow, ice or slippery walking surfaces.

Eye Protection

- Wear, as a minimum, safety glasses with side shields.
  
  Note: Non-prescription safety glasses are available at the field office for COP employees.

- The use of prescription safety glasses with side shields must be approved by a supervisor.

- Advise your supervisor if you wear contact lenses and place a sticker noting that on your hard hat.
Note: Personnel needing to wear hard contacts must get approval from their supervisor and the COP Medical department.

- Wear goggles when safety glasses are not enough (e.g., working with overhead equipment, in excessively windy conditions, or using an abrasive grinding wheel).
- Wear indirect goggles with a full-face shield when the potential exists for exposure to chemical spray.
- An adapter is needed to wear prescription lenses inside the face piece of a full-face respirators.

**Face Protection**

- Wear face shields as needed to protect the face and neck from flying particles and sprays of hazardous liquids.
- Always wear safety glasses or goggles under the face shield.

**Head Protection**

- Wear a Type I Class E hard hat.

**Metal hard hats and bump caps are NOT allowed!**

- Wear a hard hat with dielectric protection when working in an area where contact with electrical current is possible.
- Inspect your hard hat every 6 months for cracks, signs of impact or rough treatment and prolonged exposure to UV light. Discard if you see signs of chalking or cracking.

**Hard hats may not be altered in any way such as drilling holes, painting, cutting or carving!**

- Hard hat liners must be made from 100% cotton, 100% wool, cotton-wool blend or fire-retardant material.

**Clothing**

- Wear clothing adequate to provide bodily protection and to protect against hot lines, hot liquids, skin irritants, flash fires and other hazards.
- Fire-resistant clothing (FRC) should be worn as the outermost layer. FRC should be worn with the shirt tucked in, sleeves rolled down, and all buttons or zippers fastened.
- Clothing worn underneath FRC must be made from 100% cotton, 100% wool or cotton/wool blend.

<table>
<thead>
<tr>
<th>Prohibited garments</th>
<th>Prohibited items</th>
</tr>
</thead>
<tbody>
<tr>
<td>tank tops/sleeveless shirts</td>
<td>finger rings</td>
</tr>
<tr>
<td>fishnet shirts</td>
<td>earrings</td>
</tr>
<tr>
<td>shorts</td>
<td>necklaces</td>
</tr>
<tr>
<td>loose/baggy clothing</td>
<td>items that may get caught in equipment or tools</td>
</tr>
<tr>
<td>neckties/scarves</td>
<td>watches and bracelets (other than medical identification)</td>
</tr>
<tr>
<td>tie belts</td>
<td>any other exposed jewelry</td>
</tr>
</tbody>
</table>
• Exposed jewelry (rings, watches, necklaces, etc.) other than for medical identification may not be worn on work sites. Medical-identification jewelry must be worn in a way that does not pose an entanglement hazard.
• Long hair must be confined in a manner that does not pose an entanglement hazard.

! Ensure that long hair is tucked inside of the hard hat and it does not interfere with the hat’s suspension!

Chemical Protective Clothing
• Chemical protective clothing (e.g., slicker suits, Tyvek®, aprons) must be worn when exposed to chemicals that present a skin contact hazard.
• Chemical clothing selected during the workplace task hazard assessment must be resistant to penetration, degradation or permeation.

Note: FRC must be worn in addition to chemical protective clothing when a fire hazard also exists.

Hand Protection
• Wear the gloves that provide the best protection from the hazards of the job (e.g., impact, chemicals, cuts, flames or contact with bloodborne pathogens).

<table>
<thead>
<tr>
<th>Glove Types</th>
<th>Proper Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Purpose Fabric or Leather</td>
<td>Gloves can protect your hands from minor scrapes and cuts while handling rough or burred materials; when working around moderately sharp</td>
</tr>
<tr>
<td>Gloves</td>
<td>edges; when working with moderate heat; or for tasks that may generate sparks or fragments.</td>
</tr>
<tr>
<td>Precision Gloves</td>
<td>Gloves are high-dexterity gloves that can protect your hands from minor scrapes and cuts. They should be worn while working with small parts</td>
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<tr>
<td></td>
<td>or tight spaces, such as when working on engines.</td>
</tr>
<tr>
<td>Impact/Crush Resistant Gloves</td>
<td>Gloves were developed to reduce lacerations, bruises, and fractures from blows and crushing forces. Designed with high cut resistance for</td>
</tr>
<tr>
<td></td>
<td>puncture protection, and impact protection on back of hand and fingers for contusion and crush protection, they may be worn to mitigate “struck</td>
</tr>
<tr>
<td></td>
<td>by” and pinch point injuries. These gloves may be appropriate for tasks that involve handling heavy objects or tools, but don’t require manual</td>
</tr>
<tr>
<td></td>
<td>dexterity.</td>
</tr>
<tr>
<td>Glove Types</td>
<td>Proper Use</td>
</tr>
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<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Chemical Impervious Gloves, such as neoprene, polyvinyl chloride (PVC) or polyvinyl alcohol (PVA), should be used to protect the hands from contact with corrosives such as organic acids and petroleum products. Use of these gloves may also prevent other glove types from being ruined. Be sure to review the MSDS for the material being handled to ensure that the gloves are correct for the application.</td>
<td></td>
</tr>
<tr>
<td>Cut Resistant Gloves, such as metal mesh or Kevlar, should be worn when handling sharp material, cutting materials or using tools with sharp edges. These types of gloves are cut resistant, but not puncture proof.</td>
<td></td>
</tr>
<tr>
<td>Insulated Electricians Rubber Gloves should be worn when working on or near electrical equipment (ANSI/ASTM D120-1984).</td>
<td></td>
</tr>
<tr>
<td>Leather Welder’s Gauntlets/Gloves should be worn to protect from hot slag and metal due to welding.</td>
<td></td>
</tr>
<tr>
<td>Sandblasting Gloves should be worn to protect against damage while sand blasting.</td>
<td></td>
</tr>
<tr>
<td>Cold/Wet Weather Gloves should be worn when working in cold/wet environments to maintain dexterity.</td>
<td></td>
</tr>
</tbody>
</table>
Pigging Operations

- Pig launchers and receivers are considered confined spaces.
- Liquid collected from pig launchers and receivers should be drained and properly disposed of. **Note:** Corrosion control chemicals and other hazards may be present in these liquids.
- Ensure the following for pigging operations:
  - Isolate connected piping not being pigged.
  - Ensure venting locations have adequate venting and spill prevention capability.
  - All equipment is ready for service and non-essential items are removed from the area.
  - Drain and vent valves are not plugged by debris prior to commencing pigging.
  - All corrosion coupons are removed from the system components being pigged. At a minimum, raise the coupon into its riser pipe and lock it in the retracted position.
  - Do not open launchers and receivers with leaking valves. Report these immediately and ensure they are repaired or replaced.
  - Do NOT open the enclosure until you are certain there is NO trapped pressure in the pig launcher or receiver.

Never stand in front of a closure door when opening to remove a pig! Stand to one side of the closure on the opposite side of the door hinge!

Never look into the barrel of a receiver or launcher! Use a mechanic’s mirror and an intrinsically safe flashlight to look from the side!

Pipe Handling and Storage

- All pipe in transit must be properly secured (e.g., with nylon straps and ratchet boomer).
- Pipe trailers should be equipped with a minimum of 4 posts secured to the trailer’s side rails that are sufficiently tall and strong to keep the pipe from rolling off the trailer while in transit.
- All pipe in storage must be properly secured (e.g., on pipe racks secured from accidental movement by nylon straps, chocks, pins and ratchet boomer or other suitable means).

Do not put fingers or hands into ends of pipe when handling pipe manually!
• When moving pipe using a mechanical lifting device, use tag lines attached to the end of the load, and not to the lift sling, to help guide and position the load.

• Pipe loaded or unloaded on pipe racks must have the bottom layer pinned or blocked securely on all four corners. Each successive layer must then be effectively chocked or blocked.

Do not walk or stand under a suspended load and do not stand between joints of pipe being rolled!

Pressure—Working with (Trapped, Systems, Venting/Bleeding)

Pressure Systems
Pressure systems can contain significant potential energy. Opening the pressure system can release solid, liquid or gaseous toxic materials and can generate heat or cold that may be harmful to people or to the environment.

• Pressure piping and facilities must be designed, constructed, maintained and modified in accordance with COP or appropriate industry standards.

• Open and close valves slowly when the valves are under pressure.

Stay to the side of the valve stem when opening or closing a valve!

• Count and post the number of turns necessary to open and close the wellhead master valve.

Use only tapped bull plugs in pressurized systems!

Trapped Pressure

• Identify hazards associated with trapped pressure (e.g., chemical spray) during the JSA and ensure that proper PPE is available and worn.

STOP the job and determine the best way to proceed when hazards identified during the JSA cannot be mitigated!

• Always check for trapped pressure by opening bleed ports before opening any piping or equipment.
  – Trace lines carefully from the line opening point to the bleed point and isolation devices.
  – Isolation procedures should incorporate a high point bleed within the isolated section of piping and equipment.
  – Pressure may be bled from a system using either the low-point drain or high-point bleed as long as a
final verification is made by opening the high-point bleed due to potential plugging of the low-point drain. **Note:** Drain points should generally be used to drain fluid.

Use only a high point bleed to verify all pressure has been relieved!

- Keep body and hands out of Line of Fire when removing plugs or caps.

Use tools, not your hands, to remove plugs or caps that may have pressure behind them!

- After equipment is shut down, locked and tagged out with gauges reading zero, ensure there is no trapped pressure.

Always “Try” by opening bleed ports to ensure pressure is relieved before working on equipment!

### Venting/Bleeding

- Bleed or vent pressure to the atmosphere as follows:
  - Into a closed system when possible.
  - At a controlled rate.
  - At a location free from nearby sources of ignition.
  - In a direction that is not potentially dangerous to personnel.

- Provide containment for any liquids bled or vented.

- Anchor pressure relief lines and any above-ground pressurized line that could move during operations per Engineering specifications.

- Stand to one side when bleeding down pressure even if you think all pressure has been bled down.

- Stay alert for the presence of trapped pressure due to plugging or hydrate formation.

- During venting, personnel must **NOT**:
  - Use backpressure valves for isolation.
  - Use a valve as a choke unless the valve is designed to do so.
  - Assume a pressure reading is accurate or valve or tubing is unobstructed.

Do not rely solely on pressure gauges!

- Assume low pressures are not hazardous.
- Bleed through elbow connections.
- Vent hydrocarbons in confined spaces.
- Rely solely on a check valve for isolation.
Opening Piping, Tanks and Vessels

Opening equipment for repair or inspection requires special precautions including:

- Tools, lighting and instruments used in atmospheres containing flammable vapors must be rated for the area’s classification (see the Electrical Safety section).
- Vessels or tank entry must comply with COP Confined Space Entry requirements.
- Cutting, welding, burning and grinding must comply with COP Hot Work requirements.
- Isolate potential energy sources prior to opening the process using the approved isolation procedure and according to the COP Lockout/Tagout & Try requirements.
- Ensure all sources of ignition are extinguished or eliminated.
- Ensure adequate venting to avoid collapsing the vessel when draining it.
- Check for radiation hazards such as Naturally Occurring Radiation Material (NORM).
- Assure adequate containment and spill prevention has been provided prior to opening tanks.

Pressure Washer Requirements

Portable pressure washers may be one of the following:

- Type 1 washer—capable of 100 psig or less of fluid pressure as measured at the discharge nozzle.
- Type 2 washer—has 8 hydraulic horsepower (HP) or less and 100 – 3200 psig fluid pressure at the discharge nozzle.
- Type 3—washer with 8–23 HP and 3200–5000 psig fluid pressure at the discharge nozzle.

Pressure washer operations should comply with the following:

- Operators are trained on the hazards of portable power washing equipment.
- Warning labels on potential risks are installed on the washer.
- Type 1 washer:
  - May be a continuous flow design or incorporate provision for manual shutoff of the fluid flow.
- Type 2 washer:
  - Manually-actuated “deadman” controls are provided on the wand. The trigger is guarded and will go to the “off” position when released.
  - Triggers are at least 29.5 inches from the discharge nozzle.
Note: If the wand can be detached from the trigger, ensure that cleaning fluid cannot be discharged with the wand removed or when the discharge pressure is greater than 100 psig.

- Type 3 washer:
  - Complies with all requirements for a Type 2 washer.
  - The trigger is located at least 4 feet from the discharge nozzle.
  - Non-metallic hoses used to connect the wand to the washer are shrouded with a protective device for at least 2 feet from the nearest grasping area of the wand.

Note: The shroud must interrupt and disperse the fluid flow in the event of hose rupture to prevent operator injury.

Pre-Startup Safety Review (PSSR)*

A PSSR is the final Operations review of a new facility or modified facility to ensure all equipment is installed and functioning properly prior to startup. A PSSR should ensure:

- Construction has been completed per design specifications.
- Operating procedures, including the safe operating limits, are written and reviewed.
- Assigned operating personnel are trained how to safely and efficiently run the facility.
- Safety equipment is in working order.
- Regulatory compliance has been met.
- All documentation necessary to close the MOC (when required) is complete.

Note: There is a PSSR form for the Class A, B and C2 facilities and another form for the C1 facilities.

Pumping Units

The following guidelines apply to pumping units:

- Pumping units must be guarded and color coded in accordance with the latest edition of API RP 11ER.
- The pumping unit must be properly isolated (LOTO & Try) following approved procedures prior to performing any work on or near the unit.
- No one is allowed in the guarded area (i.e., protected with guardrails or machine guards) of a pumping unit or other piece of equipment until the unit is shut down and locked out.

Note: An exception to this occurs when the equipment is designed where an individual must enter the guarded area to shut down the pumping unit or to perform LOTO.
• If it is necessary for the unit to be started while a well servicing unit is in place, the individual in charge must be certain that all personnel and equipment are clear of the moving parts of the unit.
• Throat bolts or equivalent must be installed and kept in place during normal operations.

Pumps

The following guidelines apply to the operation of pumps:
• Discharge piping on every positive displacement pump must include a pressure relief valve capable of protecting downstream equipment from overpressure.
• Plunger cages should be covered to prevent fluids from spraying and broken plunger pieces from flying in the event of a plunger failure.
• Never operate a positive displacement pump against a closed discharge valve.
• Bleed pressure off the pulsation dampener before working on the dampener.
• Rotating or reciprocating part on pumps (e.g., plunger shafts) should be guarded to protect against unintentional human contact.

Purging Operations*

Purging is the act of removing a hazardous gas or liquid from a pipe or vessel and replacing it with a non-hazardous gas or liquid prior to performing other work. The main danger in purging is the potential to form flammable mixtures.

All purging operations must follow approved Purging SOPs or SOGs (standard operating procedures or guidelines)!

Quality Management System (QMS)*

A Quality Management System (QMS) coordinates and directs an organization’s activities to meet regulatory, industry code of construction and COP engineering specification requirements. A QMS provides direction to accomplish Quality Assurance (QA), Quality Control (QC) and inspection functions related to the design, fabrication, construction, installation, repair and maintenance of COP-operated equipment and facilities. A QMS includes provisions for quality monitoring, measurement, non-conformance identification, reporting and resolution, goals, metrics and internal auditing.
Radiation Safety

Radiation sources that may be found in L48 COP operations include:

- **Non-ionizing radiation** can be found in welding and cutting operations, microwave ovens and around communications equipment.

- **Ionizing radiation** includes contract radiography, radioactive tracer surveys and the use of density meters and survey meters containing radioactive cesium.

- **Radiographic inspection** is normally performed in a restricted area.
  - Warning notices must be displayed at the controlled area boundary at suitable positions. The notices should bear the international radiation trefoil symbol, warnings and appropriate instructions in the local language.
  - Before the start of radiographic work, the area is to be cleared of all people except for authorized personnel. The boundary should be clearly visible and well-lit and continuously patrolled to ensure that unauthorized people do not enter the controlled area. If the boundary is large, or if it cannot be seen from one position or not secured by physical means, more than one person will need to patrol the area.

  All signs and boundaries must be observed, and entry into the restricted area is prohibited without prior permission from the lead Radiographer!

- **Radioactive (RA) tracer-containing wastes** must be managed per state and federal land RA tracer waste management requirements.
  - In most cases, the vendor providing the RA tracer material must survey and sample the material for concentration levels to ensure worker safety and appropriate disposal.

Relief Devices*

All pressure vessels must be protected by a safety relief device (PSV or PRV) set at or below the maximum allowable working pressure (MAWP) of the vessel.

Relief devices must be tested on a risk assessment-based frequency as determined by each BU/Asset and with consideration for any local, state or federal rules.

Before inspecting, testing or repairing any safety relief device, general precautions must be taken to maintain the safety of the equipment protected by the devices—especially if the equipment is in operation!
When an inspection, testing or repairs on a vessel are required, operating conditions must be normal and the proper authority and permits (including a Bypass Permit) for the work must be obtained!

Refer to the following for more information:

- Section 3 – L48 Engineering Guidelines, Recommendations, and Specifications (GRS) for design and installation of relief devices.
- A&OI Procedures:
  - Inspection, Testing and Repair (ITR) Relief Devices Procedure.
  - Pressure Relief Valve In-Line or On-site Bench Testing Procedure.
  - Inspection, Testing and Repair (ITR) Relief Devices Procedure for relief devices on air compressors/air receivers.

Respiratory Protection*

COP employees who may need to wear respiratory protection to perform work in a hazardous atmosphere or to serve as part of a COP emergency response team must meet the following:

- Be enrolled in the COP respiratory medical surveillance program.
- Be trained on the use, proper fit and maintenance of their respiratory protection equipment.
- Participate in quantitative fit-testing.
- Have no facial hair in the face-piece seal area (refer to OSHA grooming standard for wearing a face shield).
- Wear no eyeglasses with temple bars that interfere with the face-piece seal area.

Escape-only respirators

A medical evaluation is not required for personnel who wear escape-only respirators (or dust masks).

No work can be performed while using an escape-only respirator; it is for escape purposes only!
Rotating & Reciprocating Equipment

- Startup procedures should be posted on control panels.
- Repair, adjustment or maintenance of unguarded moving parts while in operation is unsafe and should be avoided unless absolutely necessary to accomplish a Supervisor-approved task, such as to observe moving parts.

**Note:** This requires specific job safety procedures approved by the site/area supervisor and should follow a task-specific JSA to identify and mitigate associated hazards.

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Long hair and loose clothing must be secured prior to working on rotating and reciprocating equipment to prevent entanglement and serious injury!

Signs must be posted on rotating equipment that starts automatically, stating that fact!

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Scaffolding*

**Competent Person**—a person who can identify existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous or dangerous to employees and who has authorization to take prompt corrective measures to eliminate the hazards.

**Qualified Person**—a person with a recognized degree, certificate or professional standing, or with extensive knowledge, training and experience, who has successfully demonstrated their ability to solve or resolve problems related to the engineering, design, construction, and use of scaffolding.

The following guidelines apply to scaffolding operations:

- Must be designed by a Qualified Person.
- Must be constructed and loaded in accordance with the design.
- May only be erected, moved, dismantled or altered under the direct supervision of a Competent Person.
- The Competent Person must affix a tag to the scaffold stating it has been erected correctly and inspected.
- Alterations may only be made with the approval and re-tagging by a Competent Person.

**No work may be performed from a scaffold until it has been inspected and approved by a Competent Person!**
A Short Service Employee (SSE) is a COP employee, contract
designee or contractor with less than six months of
continuous experience in the oil and gas industry.

**Note:** Individual assets may define others as SSE such as those with less than 6 months in a new position or in the asset.

The following should be completed before moving from the SSE program:

- Attend a COP asset-specific HSE Orientation.
- Complete Hazard Management & Recognition Workshop or Safety Leadership Seminar.
- May need training in the following procedures and processes:
  - Personal Protective Equipment (PPE).
  - Driving Safety.
  - LockOut/TagOut & Try.
  - Confined Space Entry (CSE).
  - Working at Heights.
  - Lifting Operations.
  - Excavation.
  - Work Permit.
  - Bypassing Safety Systems.
  - Hot Work.
  - Hazard Communication.
  - Lone Worker Requirements.
- Complete the MOC for Personnel process.

Other SSE expectations include:

- Wear a green hard hat, or alternative identifier, for a minimum of 6 months.
  **Note:** Alternatives include brightly colored tape or stickers on the hard hat.
- A mentor should be assigned to each SSE. One mentor may support multiple SSE.

Contractor SSE expectations include:

- Be identified during every JSA and PIC discussion.
- Identify all high hazard areas (H2S, overhead loads, SimOps, etc.) where SSE are not allowed to work.
- No more than 30% of a crew should be SSE without approval from the COP onsite lead.
- Contractors should ensure SSE compliance from all subcontractors.
- Contractors are responsible for maintaining their own SSE records.
Signs

There may be 4 types of signs on many L48 COP locations: Danger, Caution, Safety Instruction or Warning Tags.

• Danger signs are usually red and indicate an immediate danger.

• Caution signs are usually yellow and warn against potential hazards.

• Safety instruction signs vary in design, but always contain instruction for managing hazards in the workplace, e.g., “Do not enter when lights are flashing.”

• Warning tags vary in design and are temporary. They alert, warn and convey safety information.

All personnel are expected to obey all signs and tags displayed at their work sites!

Simultaneous Operations (SimOps)

Simultaneous operations (SimOps) are two or more operations (drilling, completion, workover, maintenance or construction) occurring at the same time and very near each other.

• Without a specific SimOps procedure or SimOps dedicated discussion that permits exceptions and addresses how to mitigate potential hazards, the following production operations require a drilling or workover rig shutdown:
  – Wireline work.
  – Well testing and other procedures where well flow does not pass directly from the header into a pipeline.
  – Any work that requires removal of any component of the wellhead (unless the removal is being done by the rig crew using rig equipment).
  – Manual sampling at the wellhead, positive choke changes or opening production equipment such that hydrocarbons are released.
  – Stripping a well, removing a sand bridge or any type of obstruction that could release trapped pressure (unless the work is being done by the rig crew using rig equipment).
  – Welding or burning except in designated safe welding areas.

• Without a specific SimOps procedure or SimOps dedicated discussion that permits exceptions and addresses how to mitigate potential hazards, the following drilling and workover operations require a production shutdown:
  – Driving conductors.
  – Running casing.
  – Nippling up a wellhead or blowout preventers.
– Swabbing.
– A well kick, or while circulating gas-cut drilling fluid.
– Rigging up, tearing down or skidding the rig.
– Drill Stem Tests.
– Welding or burning of any nature except in designated safe welding areas.
– Picking up or laying down drill pipe when production equipment is within the fall path.
– Wireline operations unless the well contains noncombustible fluids exerting a positive hydrostatic overbalance on the formation.

• Close subsurface safety valves, or run isolation plugs in wells capable of flowing prior to major construction lifts (exceeding 5 tons) over the wells.
• All other wells, piping or process equipment that could be endangered by a falling load must be shut in and bled down.

Slips, Trips & Falls

• Use your JSA to identify slip, trip and fall hazards. Refresh the JSA whenever the weather or other conditions change (accumulation of debris, cords, hoses or piping).
• Eliminate or mitigate tripping hazards if possible; otherwise, ensure they are clearly identified.
• Improve site walking and working surfaces by housekeeping, grading or traction treatment:
  – Keep all steps, walkways (including nonslip surfaces) and stairs free of obstruction, tools, grease and oils.
  – Cover or barricade holes in the ground, open trenches, grating or walking surfaces that present a fall hazard.
  – Provide a temporary work platform.
  – Clear pathways of ice, snow and mud or cover them with sand.
• Choose another route with better footing.
• Delay the work if necessary.
• Keep your eyes on the path and choose good footholds.
• Move slowly, and test footholds for balance and traction.
• Avoid carrying or dragging loads on surfaces with poor footing.
• After coming down a ladder or stepping down from equipment, maintain a handhold until you’ve turned around and examined your walking path.

Never jump! You may land on an uneven surface or off balance!

• Provide and use handrails when stairs include four or more steps.
Keep one hand free to hold onto the handrail when going up or down stairs!

- Wear footwear with good slip resistance soles. If available, use ice grippers or use other precautionary measures in freezing weather when surfaces could be coated with ice.

Static Electricity

Static electricity can be generated any time liquid or solid substances are flowed, splashed, sprayed or agitated.

The discharge of static electricity (arching) occurs when another object comes close enough for the charge to "arc" across. The result of the discharge varies from an insignificant physical shock to possible ignition of a flammable gas-air mixture. Static charges need to be controlled to avoid unintended ignition.

Note: Refer to the Grounding section for additional information.

The following practices reduce the hazards of static electricity:

- Use NFPA metal containers when transferring flammable liquids.

Using plastic buckets and containers after their original contents are gone is not allowed!

- When a nonconductive hose is used for transferring fluid, all conductive couplings (end fittings) and components should be bonded and grounded.
- Metal storage tanks must be grounded to an earthen ground.
- Ensure the metal gauge line is touching the thief hatch before lowering the line into the tank while gauging.
- Bond tank trucks to the storage tank before the transfer line is connected. Disconnect the transfer line before disconnecting the bond.
- Synthetic Pipe (plastic, PVC, composites, etc.)
  - When opening synthetic pipe that may contain hydrocarbons, protect against static discharge by applying a film of water or a wet cloth to the work surface. This prevents buildup of static electricity.

A ground wire on the synthetic pipe will not protect against static discharge!

- Static electricity builds on synthetic pipe by friction, particularly during pipe handling, shipping, installation or when cut by sawing or pipe cutters. The flow of air or gas containing dust or scale through the pipe may also build up significant static charges. This is a potential safety hazard in areas with an explosive atmosphere.
**T-Post Drivers**

Identify the best tool for driving posts or ground rods using the JSA process.

- The most common tool for driving posts is the simple one-piece manual driver.

  **Note:** It is recommended you use a device that prevents the tool from coming completely off the post while pounding, such as a bolt, integral insert, chain or external clamp.

- Avoid lifting the driver off the top of the T-post before thrusting the driver down to strike the post top.

  **Note:** New T-posts typically have a paint color change near the top of the post which helps the operator see how close to the top they are when lifting the driver.

- Pneumatic and hydraulic drivers are alternatives that don’t have the risks of manual drivers. These drivers may have a portable, wheeled power pack or self-contained, propane or gasoline combustion power.

  **Note:** Hydraulic drivers are also available as accessories for loaders and skid-steers.

---

**Temporary Equipment**

Any temporary equipment or piping to be installed in a facility’s pressure loop (as part of the production process) will be subject to the same MOC and PSSR processes as permanent facility additions or modifications.

- This includes temporary flowback equipment, choke tees, sand cans, separators, tanks, flares, compressors, meters, regulators, inter-connecting piping and any other component of the temporary facility.

- This does not apply to temporary equipment not installed in the pressure loop (rigs, wireline units, hot oilers, etc.).

Prior to introducing temporary equipment into one of our facilities, that equipment will undergo the same engineering design, inspection, certification and pre-startup steps as our permanent facilities following the approved L48 MOC and PSSR procedures (found under the A&OI tab of the HSE Management System).

In addition, a qualified Engineer will be utilized to design and a qualified Electrician to install and/or verify the proper installation of electrical grounding on all temporary facilities.
Unsecured Object Drops/Shifts/Rolls

• Prior to starting a job, inspect for unsecured objects that can drop, shift, roll, tilt or swing. Pay special attention to unsecured overhead items.

• Never leave an object or tool unsecured if it can drop or shift unexpectedly when a connection breaks, a load moves, a bind is removed or the object or tool is bumped.

• Treat an unsecured object as you would a suspended load by maintaining 3’ buffer zone around the sides and a 45-degree angle below the object.
  
  Note: Pipe tripping and other rig floor operations are exceptions to the buffer zone rule.

• Never try to catch a falling or swinging object. Let it come to a complete stop before reaching for it.

• Stay outside of the line of fire in case an object unexpectedly drops or swings.

Vac Truck Operation

• Vac trucks must **NOT** be connected to a pressurized system (wellhead, pressure vessel, pipeline, etc.) unless barriers or procedures are in place to ensure the system’s pressure cannot overpressure the truck or hoses.

• When parked or working, the vac truck’s wheels should be chocked to prevent movement.

• Bond vac trucks to the storage tank before the transfer line is connected. Disconnect the transfer line before disconnecting the bond.
Weather (Precautions and Related Illnesses)

Heat-Related Illness

Use preventative measures to reduce heat-related illnesses when the temperature is above 80°F and refer to the following heat index chart to better understand what workers may be exposed to.

Possible Heat Disorders
- Heat stroke or sunstroke highly likely with continued exposure
- Sunstroke, muscle cramps, and/or heat exhaustion likely
- Heatstroke possible with prolonged exposure and/or physical activity
- Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity
- Fatigue possible with prolonged exposure and/or physical activity

Controls
- Consult IH
- PIC/FLM Determination
- Buddy System & Direct Observation
- Heightened Awareness

Heat Index

- 130°F or higher: Extreme Danger
- 105–129°F: Danger
- 90–105°F: Extreme Caution
- 80–90°F: Caution

NATIONAL WEATHER SERVICE - HEAT INDEX (°F)

<table>
<thead>
<tr>
<th>Temp (°F)</th>
<th>80</th>
<th>81</th>
<th>82</th>
<th>83</th>
<th>84</th>
<th>85</th>
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<tbody>
<tr>
<td>Relative Humidity (%)</td>
<td>136</td>
<td>137</td>
<td>138</td>
<td>139</td>
<td>140</td>
<td>141</td>
<td>142</td>
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<td>151</td>
<td>152</td>
<td>153</td>
<td>154</td>
<td>155</td>
<td></td>
</tr>
</tbody>
</table>

Possible Heat Disorders
- Heat stroke or sunstroke highly likely with continued exposure
- Sunstroke, muscle cramps, and/or heat exhaustion likely
- Heatstroke possible with prolonged exposure and/or physical activity
- Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity
- Fatigue possible with prolonged exposure and/or physical activity

Controls
- Consult IH
- PIC/FLM Determination
- Buddy System & Direct Observation
- Heightened Awareness
To prevent heat-related illnesses:

- Increase your water intake to replace body fluid lost through perspiration and follow the Work Controls outlined in the following table:

<table>
<thead>
<tr>
<th>Category</th>
<th>Required Cool Water Intake</th>
<th>Required Work Controls</th>
</tr>
</thead>
</table>
| I Caution 80-89°F | 16 oz/Hour (8oz/30 min)     | 1. Address Heat Hazards in JSA.  
2. 10-minute breaks recommended every 2 hours (10-2-40).                               |
| II Extreme Caution 90-105°F | 32 oz/Hour (8oz/16min)     | 1. Review Heat Hazards (appendix A, C, D, E) in JSA  
2. Drink required amount of water each hour during the work day for conditions.  
3. Cooling Area Provided  
4. Periodic Supervisor Contact (Face-to-Face preferred).  
5. Use Buddy System.                                        |
| III Danger 106-129°F | 48 oz/Hour (8oz/10min)     | 1. Review Heat Hazards (appendix A, C, D, E) in JSA  
2. Drink required amount of water for conditions Appendix (A&B)  
3. Cooling Area Provided  
4. Periodic Face-to-Face Supervisor Contact  
5. Re-Evaluate Current work Activates  
6. Use Buddy System  
7. Consult with Immediate Supervisors to Evaluate.  |
| IV Extreme Danger Above 130°F | STP all Heavy Work Activities Consult with Immediate Supervisor and/or HSE to Evaluate Worksite Heat Exposure Limits |

Other considerations for working in hotter temperatures:

- Eat lighter meals and in smaller quantities.
- Avoid alcohol and caffeine drinks. These increase dehydration.
- Take frequent breaks to allow your body to cool off.
- Do outside work during cooler times of the day.
- Slow down your work pace.
- Wear appropriate clothing (light-colored cloths).

Note: Ice vests can help workers combat heat stress as well.

- Apply sunblock and wear long sleeves and a hat to protect your skin from sunburn.

Cold Injury Prevention

Cold injury prevention should be considered when you expect the temperature to be below 40°F. Assess work controls in the planning phase and during the JSA. Refer to the following wind chill chart to determine the risk category and implement the recommended work controls.
To prevent injuries due to extreme cold:

- Prioritize and limit outside work during extreme temperature and wind chill days.
- Use the appropriate PPE for any outside work.
  - Pay special attention to your face, head, hands, wrists, and feet. 40% of your body heat can be lost when your head is exposed.
  - Use gloves with gauntlets to prevent exposed skin areas between your jacket and gloves.
  - Recommended PPE includes: a heavy coat or jacket with a hood or a hat that covers the ears, warm gloves, and insulated footwear.
  - Ice Gripper cleats are required for walking on icy or otherwise slippery surfaces.
  - Additional winter gear, warming trailers and additional breaks may be needed based on job duties and risk assessment.

To prevent injuries due to extreme cold:

- Use the appropriate PPE for any outside work.
  - Pay special attention to your face, head, hands, wrists, and feet. 40% of your body heat can be lost when your head is exposed.
  - Use gloves with gauntlets to prevent exposed skin areas between your jacket and gloves.
  - Recommended PPE includes: a heavy coat or jacket with a hood or a hat that covers the ears, warm gloves, and insulated footwear.
  - Ice Gripper cleats are required for walking on icy or otherwise slippery surfaces.
  - Additional winter gear, warming trailers and additional breaks may be needed based on job duties and risk assessment.

Wind Chill Chart

Temperature (°F) Wind (mph) Wind Chill (°F) = 35.74 + 0.621T - 35.75(V^0.16) + 0.4275T(V^0.16)

Where, T = Air Temperature (°F) V = Wind Speed (mph)

Effective 11/01/01
Snow and Ice Storms
Personnel are responsible for determining if road conditions are unsafe to travel. A discussion with your supervisor should occur when road conditions are questionable or deemed unsafe.

Lightning
All onsite supervisors should carry a lightning detection device. In the event the device reaches the “danger” category, suspend work for a minimum of 30 minutes after the last lightning flash.

Note: If no device is available, use the 30-30 rule. If the time between seeing a lightning strike and hearing the thunder is less than 30 seconds, suspend activities for a minimum of 30 minutes after the last lightning flash.

Tornado
In the event of a tornado at a field location, seek shelter immediately. If shelter is unavailable, lie flat on the ground, preferably in a low spot, and cover your head and neck. Once the storm passes, contact your supervisor immediately.

Flooding
Avoid walking and driving through floodwaters. If moving swiftly, even water 6 inches deep can sweep you off your feet.

If you come to a flooded area in a vehicle, turn around and go another way. If your vehicle stalls, abandon it immediately and climb to higher ground.

High Winds
Work should be suspended when wind speeds exceed:
• 35 MPH*—for workover and completion rigs.
• 25 MPH*—for mechanical or aerial lifts.

*or equipment manufacturer recommendations, whichever is less.

Consider suspending work at heights (tanks and platforms) when high wind conditions are present.

Welding and Cutting

Welding, torch cutting or soldering in a non-designated hot work area or where oil or gas vapors may be present requires a Hot Work Permit!

Take necessary precautions to ensure an uncontrolled fire will not occur!
Eye protection required for welding and cutting are tinted lenses shaded to at least 5 or the current OSHA standard to protect your eyes from injury while still providing good visibility of the work!

A face shield with eye protection worn underneath is required for chipping, grinding and wire brushing!

**Arc Welding**

- Use an adequately rated and insulated electrode holder.
- Protect cables on the floor or ground from becoming damaged or entangled.
- Keep welding cables away from power supply cables and high-tension wires.
- Welding leads should be kept as short as possible. Check for damage prior to each use.
- Repair or replace cables and electrode holders immediately when the insulation is broken.
- Welders should keep their bodies insulated from the work. Avoid changing electrodes with bare hands or wet gloves when standing on wet floors.
- Grounding attachments:
  - Should be as close as possible to the work.
  - Must be within the area covered by the Hot Work Permit.
- Do not refuel welding machines with the engine running.
- Engine-driven welding machines should be equipped with spark-arrestor mufflers.
- Means for immediate shutdown of welding machines should be readily accessible and clearly marked.
- Proper eye protection must be worn by all personnel welding or working near a welding operation.

**Oxygen/Acetylene Cutting**

- Keep pressure gauges on cylinders in good working condition.
- When opening cylinder valves, stand to one side of the gauge and open the valve slowly to reduce the possibility of injury if the regulator fails.
- Never use a pipe wrench to open or close a valve; use the special key or wrench attached to the cylinder.
- Close cylinder valves when not in use or left unattended.
- Do not leave a torch unattended in a pipe, vessel or tank. A leaky hose or valve may cause a flammable atmosphere to develop inside the container.
- Protect the valves on compressed gas cylinders with the shipping caps when the regulators are not connected and when transporting the cylinders.
• Tie or chain cylinders in a secure upright position when being hauled, stored or used.

**Note:** This does not apply to welding trucks.

• Oxygen and acetylene cylinders should be stored at least 20 feet apart or separated by a 5-foot high firewall with a 1-hour rating.

**Note:** This does not apply to welding trucks or two-wheeled carts.

• Never use cylinders as rollers.

• Dented cylinders should be taken out of service.

• Never strike an arc on a cylinder.

• Never expose cylinders to excessive heat.

• Keep the space between the cylinders and the job clear so the valves can be reached quickly in an emergency.

• If the hoses catch fire, turn off the supply valves then extinguish the fire.

• Never allow the pressure on the oxygen cylinder to fall below the set (low) pressure on the acetylene cylinder.

• Oxygen cylinders should be removed from service when their pressure drops below 50 psig.

• Acetylene and propane cylinders should be removed from service when their low pressure begins fluctuating. Pressure in the cylinders should not be drawn down less than 5 psig on the high-pressure gauge.

• Do not completely empty a cylinder.

• Never transfer gas from one cylinder to another or mix gases in a cylinder.

• Acetylene reacts with copper and may produce an explosive compound. Do not use copper fittings on acetylene cylinders.

**Note:** Bronze, brass and steel fittings are acceptable.

**Oxygen regulator valves, gauges and fittings must not be lubricated with oil or grease, nor should they be handled with greasy hands or gloves as these may cause a spontaneous combustion!**

• Never use oxygen for starting engines, equalizing pressure on equipment, blowing dirt from clothing, as a fresh air supply or a substitute for compressed air.

• Use oxygen or acetylene only after verifying that:
  – The bottles are secured in a safe place and the acetylene is in an upright position.
  – Their regulators are equipped with properly operating gauges.
  – A flash-back arrestor is installed on the torch inlet connections.
  – Hoses are leak-free.
– Hoses are not hanging on or piled close to cylinders when in use.
– Hoses are turned off at the cylinder valve any time the equipment is not in use.
– Only friction spark devices are used to ignite cutting torches.
– Friction spark devices are not carried through a hot work area.
– When lighting a cutting torch, open the fuel gas valve first, then open the oxygen valve.
– Keep acetylene pressure downstream of the regulator at or below 15 psi.

Wildlife and Plants

Be aware of potential and actual impacts to wildlife near COP operations. Wildlife impacts (including injury, death, and nest or habitat disturbance) may trigger notification and response requirements per applicable regulations, tribal agreements or landowner agreements.

• Avoid interaction and interference with wildlife.

  **Do not touch or try to capture any wildlife (alive or dead)!**

  • Use appropriate mitigation methods to prevent on-site or offsite impacts by COP operations.
  • Immediately notify a COP supervisor if wildlife is impacted by our operations or if impacted wildlife is found on location.
  • The supervisor will contact a COP Regulatory or Environmental representative who will determine required reporting requirements, ensure necessary protocol is followed, file reports and provide further guidance to Operations.

Plants

Some plant species are also protected. Prior to performing any surface disturbance (mowing, weed spraying, dirt work, etc.) outside of a developed pad, contact the COP Regulatory or Environmental representative for further direction.
Appendices
### Anchor Selection Worksheet

<table>
<thead>
<tr>
<th><strong>Anchor Selection Worksheet</strong></th>
<th><strong>Required Channel Size (in.)</strong></th>
<th><strong>Required Beam Width (in.)</strong></th>
<th><strong>Required Angle (in.)</strong></th>
<th><strong>Required Pipe Diameter (in.)</strong></th>
<th><strong>Required Beam Section Modulus Must Be</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Beam Width</td>
<td>Greater than 6 in.</td>
<td>Greater than 4 in. x 13 in.</td>
<td>Greater than 4 in. x 4 in. x 3/8 in.</td>
<td>Greater than 6 in. x 13 in.</td>
<td>Greater than 6 in. x 13 in. x 1/2 in.</td>
</tr>
<tr>
<td>Required Angle</td>
<td>Greater than 4 in. x 6 in. x 3/8 in.</td>
<td>Greater than 6 in. x 4 in. x 1/2 in.</td>
<td>Greater than 4 in. x 4 in. x 3/8 in.</td>
<td>Greater than 6 in. x 13 in.</td>
<td>Greater than 6 in. x 13 in.</td>
</tr>
<tr>
<td><strong>Connection Parameters</strong></td>
<td>5,000-lb load to the midpoint of bracing spanning less than 5 ft</td>
<td>5,000-lb load to the midpoint of bracing spanning more than 5 ft and less than 10 ft</td>
<td>1,000-lb load to the midpoint of bracing spanning less than 5 ft</td>
<td>Connecting a 3,000-lb load at midpoint of bracing spanning less than 5 ft</td>
<td>Connecting a 1,000-lb load at midpoint of bracing spanning more than 5 ft but less than 10 ft</td>
</tr>
<tr>
<td></td>
<td>5,000-lb load to the midpoint of bracing spanning more than 5 ft and less than 10 ft</td>
<td>1,000-lb load to the midpoint of bracing spanning less than 5 ft</td>
<td>Connecting a 3,000-lb load at midpoint of bracing spanning less than 5 ft</td>
<td>Connecting a 1,000-lb load at midpoint of bracing spanning more than 5 ft but less than 10 ft</td>
<td>Connecting a 1,000-lb load at midpoint of bracing spanning more than 5 ft but less than 10 ft</td>
</tr>
</tbody>
</table>
### Table 1

**Carbon Steel Flanges – Pressure / Temperature Ratings (Post 1974)**

<table>
<thead>
<tr>
<th>Material Group</th>
<th>128# Class</th>
<th>304# Class</th>
<th>900# Class</th>
<th>1500# Class</th>
<th>2500# Class</th>
<th>4000# Class</th>
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<tbody>
<tr>
<td></td>
<td>1.1</td>
<td>1.2</td>
<td>1.4</td>
<td>1.1</td>
<td>1.2</td>
<td>1.4</td>
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<tr>
<td></td>
<td>Low</td>
<td>High</td>
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<table>
<thead>
<tr>
<th>Temp Range F</th>
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<tbody>
<tr>
<td>30 to 400</td>
<td>760</td>
<td>750</td>
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<td>400 to 750</td>
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<td>1150 to 1500</td>
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<td>1500 to 2000</td>
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<td>2000 to 2500</td>
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<td>3000 to 4000</td>
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<td>4000 to 5000</td>
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</tr>
</tbody>
</table>

**Notes:**
- Pressure and temperature ratings are for carbon steel flanges.
- Ratings are post 1974, with updated values for pressure and temperature.
- Materials and constructions vary by application and end use.
# Carbon Steel Flanges – Pressure/Temperature Ratings (Post 1974)

## Table 2

<table>
<thead>
<tr>
<th>Material Group</th>
<th>Materials (Spec-Grade)</th>
<th>See Notes</th>
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<tr>
<td>1.1</td>
<td>A105(1), A216-WCB(1), A515-70(1)</td>
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<tr>
<td></td>
<td>A516-70(1)(4), A350-LF6CL1(5)</td>
<td>(1)(4)(5)</td>
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<tr>
<td></td>
<td>A350-LF2(1), A537-CL.1(5), A350-LF3</td>
<td>(1)(5)</td>
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<tr>
<td>1.2</td>
<td>A203-B(1), A203-E(1), A216-WCC1(1),A352-LCC(2)</td>
<td>(1)(2)</td>
</tr>
<tr>
<td></td>
<td>A350-LF6CL2(5), A352-LC2, A352-LC3</td>
<td>(5)</td>
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<td>1.3</td>
<td>A352-LBC(2), A217-WC1(6)(7)</td>
<td>(2)(6)(7)</td>
</tr>
<tr>
<td></td>
<td>A351-LC1(2), A515-65(1)</td>
<td>(2)(1)</td>
</tr>
<tr>
<td></td>
<td>A516-65(1)(4)</td>
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<td>A203-A(1), A203-D(1)</td>
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<td>1.4</td>
<td>A515-60(1)</td>
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<tr>
<td></td>
<td>A516-60(1)(4)</td>
<td>(1)(4)</td>
</tr>
<tr>
<td></td>
<td>A350-LF1(1)</td>
<td>(1)</td>
</tr>
</tbody>
</table>

### Notes:

1. permissible but not recommended for prolonged use above 800 °F
2. not to be used over 650 °F
3. not to be used over 1000 °F
4. not to be used over 850 °F
5. not to be used over 500 °F
6. permissible but not recommended for prolonged use above 875 °F
7. use normalized and tempered material only

Chart indicates Material Group 1.1-1.4 – Carbon Steel Flanges.
Refer to ANSI B16.5-1981 for complete listing of flange materials and ratings.
## Conversion Factors

### Temperature

<table>
<thead>
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<th>MULTIPLY BY</th>
<th>TO OBTAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>°Fahrenheit (F) + 459.72</td>
<td>°F Absolute, or Rankine</td>
</tr>
<tr>
<td>°Fahrenheit (F) - 32</td>
<td>5/9 °Celsius (C)</td>
</tr>
<tr>
<td>°Celsius (C) + 273.16</td>
<td>1 °C Absolute, or Kelvin (K)</td>
</tr>
<tr>
<td>°Celsius (C) + 17.78</td>
<td>1.8 °Fahrenheit (F)</td>
</tr>
<tr>
<td>°Rankine (R) - 459.72</td>
<td>1 °Fahrenheit (F)</td>
</tr>
<tr>
<td>°Kelvin (K) - 273.16</td>
<td>1 °Celsius (C)</td>
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### Density

<table>
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<tr>
<th>Grams per cubic centimeter</th>
<th>Pounds per cubic feet</th>
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<tr>
<td>62.428</td>
<td>0.03613</td>
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<td>8.345</td>
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<table>
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<tr>
<th>Gram-moles of ideal gas @ OOC. and 760 mm Hg</th>
<th>Liters</th>
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<table>
<thead>
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<th>Pounds per cubic inch</th>
<th>Pounds per cubic foot</th>
<th>Grams per cubic centimeter</th>
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<td>1728</td>
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<td>27.68</td>
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<table>
<thead>
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<th>Pound-moles of ideal gas @ OOC. and 760 mm Hg</th>
<th>Cubic feet</th>
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<td>359.05</td>
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### Volume

<table>
<thead>
<tr>
<th>Barrels</th>
<th>Gallons (oil)</th>
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<tr>
<td>42</td>
<td>31.5</td>
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## Conversion Factors

### Cubic inches
- Multiply by: 16.387
- To obtain: Cubic centimeters
- Multiply by: 0.01639
- To obtain: Liters
- Multiply by: $4.329 \times 10^{-3}$
- To obtain: Gallons
- Multiply by: 0.01732
- To obtain: Quarts (liquid)

### Gallons, Imperial
- Multiply by: 277.4
- To obtain: Cubic inches
- Multiply by: 1.201
- To obtain: U.S. gallons
- Multiply by: 4.546
- To obtain: Liters

### Gallons, U.S. (liquid)
- Multiply by: 231
- To obtain: Cubic inches
- Multiply by: 0.1337
- To obtain: Cubic feet
- Multiply by: 3.785
- To obtain: Liters
- Multiply by: 0.8327
- To obtain: Imperial gallons
- Multiply by: 128
- To obtain: Fluid ounces

### Ounces, fluid
- Multiply by: 29.57
- To obtain: Cubic centimeters
- Multiply by: 1.805
- To obtain: Cubic inches

### Liters
- Multiply by: 0.2642
- To obtain: Gallons
- Multiply by: 0.0353
- To obtain: Cubic feet
- Multiply by: 1.0567
- To obtain: Quarts
- Multiply by: 61.025
- To obtain: Cubic inches

### Quarts, U.S. (liquid)
- Multiply by: 0.0334
- To obtain: Cubic feet
- Multiply by: 57.749
- To obtain: Cubic inches
- Multiply by: 0.9463
- To obtain: Liters

### Weight
#### Milligrams
- Multiply by: $2.2046 \times 10^{-6}$
- To obtain: Pounds (avoirdupois)
- Multiply by: $3.5274 \times 10^{-6}$
- To obtain: Ounces (avoirdupois)
- Multiply by: 0.01543
- To obtain: Grains
- Multiply by: $1 \times 10^{-5}$
- To obtain: Kilograms

#### Micrograms
- Multiply by: $1 \times 10^{-6}$
- To obtain: Grams

#### Grams
- Multiply by: 0.00220
- To obtain: Pounds (avoirdupois)
- Multiply by: 0.03527
- To obtain: Ounces (avoirdupois)
- Multiply by: 15.432
- To obtain: Grains
- Multiply by: $1 \times 10^{-5}$
- To obtain: Micrograms
## Conversion Factors

### Table of Conversion Factors

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## Conversion Factors

### CONVERSION FACTORS

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## Conversion Factors

### Conversion Factors

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## Conversion Factors

**Page 6**

### CONVERSION FACTORS

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## Conversion Factors

### Page 7

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#### Pressure

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#### Flow

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### CONVERSION FACTORS

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### CONVERSION FACTORS

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<td>0.001%</td>
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<tr>
<td>1 ppm</td>
<td>0.0001%</td>
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Appendix B: Crane Signals

Also Refer to ASME B30.4 and B30.5

- **HOIST**: With forearm vertical, forefinger pointing up, move hand in small horizontal circles.
- **LOWER**: With arm extended downward, forefinger pointing down, move hand in small horizontal circles.
- **USE MAIN HOIST**: Tap fist on head, then use regular signals.
- **USE WHIPLINE (Auxiliary Hoist)**: Tap elbow with one hand, then use regular signals.
- **RAISE BOOM**: Extend arm, fingers closed, thumb pointing upward.
- **LOWER BOOM**: Extend arm, fingers closed, thumb pointing downward.
Crane Signals
Page 2

RAISE THE BOOM AND LOWER THE LOAD, with arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.

LOWER THE BOOM AND RAISE THE LOAD, with arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless above hand giving the motion signal. (Host slowly shown as example.)

SWING. Extend arm, point with finger in direction of swing of boom.

STOP. Extend arm, palm down; move arm back and forth horizontally.

EMERGENCY STOP. Extend both arms, palms down, and move arms back and forth horizontally.

TRAVEL. Extend arm forward, hand open and slightly raised, make pushing motion in direction of travel.

DOG EVERYTHING. Clasp hands in front of body.
Crane Signals
Page 3

TRAVEL (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward (for land cranes only).

TRAVEL (One Side Track). Lock the track on side indicated by raised fist. Travel opposite track indicated by circular motion of other fist, rotated vertically in front of body (for land cranes only).

EXTEND BOOM (Telescoping Booms). Hold both fists in front of body, thumbs pointing outward.

RETRACT BOOM (Telescoping Booms). Hold both fists in front of body, thumbs pointing toward each other.

EXTEND BOOM (Telescoping Booms). One-hand signal. One fist in front of chest with thumb tapping chest.

RETRACT BOOM (Telescoping Booms). One-hand signal. One fist in front of chest with thumb pointing outward and heel of fist tapping chest.
## Dimensions of ANSI B16.5 2003 Class 150

### Flanges and Flange Bolt Dimensions

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<tr>
<th>Nominal Pipe Size</th>
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<th>Length of Bolts</th>
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<td></td>
<td></td>
<td>Stud Bolts (1)</td>
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<tr>
<td></td>
<td></td>
<td>0.06-in. Raised Face</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(in.)</td>
</tr>
<tr>
<td>1/2</td>
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<td>3/4</td>
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<td>18</td>
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Note(1) Length of stud bolt DOES NOT include height of the points
# Dimensions of ANSI B16.5 2003 Class 300

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<th>Stud Bolts (1)</th>
<th>Ring Joint</th>
<th>Machine Bolts</th>
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<td>0.06-in. Raised Face (in.)</td>
<td>0.06-in. Raised Face (in.)</td>
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<tr>
<td>1/2</td>
<td>4 - 1/2&quot;</td>
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<td>3.00</td>
<td>2.25</td>
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<tr>
<td>3/4</td>
<td>4 - 5/8&quot;</td>
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<td>2.50</td>
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<tr>
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<td>3.50</td>
<td>2.50</td>
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<tr>
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<td>4 - 5/8&quot;</td>
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<td>3.75</td>
<td>2.75</td>
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<tr>
<td>1 1/2</td>
<td>4 - 3/4&quot;</td>
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Note(1) Length of stud bolt DOES NOT include height of the points
### Dimensions of ANSI B16.5 2003 Class 600

#### Flanges and Flange Bolts

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<td></td>
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<td>(in.)</td>
<td>(in.)</td>
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Note(1) Length of stud bolt DOES NOT include height of the points
## Appendix D: Fantail Blind Plates

### Dimensions of ANSI B16.5 2003 Class 150

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<td>3/16&quot;</td>
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<td>7/8&quot;</td>
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<tr>
<td>Blank OD Diameter (in)</td>
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<td>2-1/2&quot;</td>
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<td>4&quot;</td>
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<td>1-1/16&quot;</td>
<td>1-1/16&quot;</td>
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<tr>
<td>Blank OD Diameter (in)</td>
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<td>1&quot;</td>
<td>1-1/4&quot;</td>
<td>1-1/4&quot;</td>
<td>1-1/4&quot;</td>
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</tbody>
</table>

| Blank OD Thickness (in) | 1-7/8" | 1-1/2" | 1-1/4" | 1-1/16" | 1" | 1/2" |
| Blank OD Diameter (in) | 14" | 19-1/8" | 24-1/8" | 29-1/8" | 1-1/16" | 1" |

| Blank OD Thickness (in) | 1-13/16" | 1-15/16" | 1" | 1-1/4" | 1-1/4" | 1-1/4" |
| Blank OD Diameter (in) | 16" | 24-1/8" | 29-1/8" | 34-1/8" | 1-1/16" | 1-1/4" |

| Blank OD Thickness (in) | 1-5/8" | 1-1/2" | 1-1/4" | 1-1/16" | 1" | 1/2" |
| Blank OD Diameter (in) | 18" | 25-1/2" | 30-1/8" | 35-1/8" | 1-1/16" | 1-1/4" |

| Blank OD Thickness (in) | 1-7/8" | 1-1/2" | 1-1/4" | 1-1/16" | 1" | 1/2" |
| Blank OD Diameter (in) | 20" | 26-1/8" | 31-1/8" | 36-1/8" | 1-1/16" | 1-1/4" |

| Blank OD Thickness (in) | 2-1/8" | 2-1/4" | 2-1/4" | 2-1/4" | 2-1/4" | 2-1/4" |
| Blank OD Diameter (in) | 22-1/2" | 25" | 28" | 31-1/8" | 35-1/8" | 1-1/4" |
Fantail Blind Plate Assumptions

Fantail Blank Thickness- Based upon ASME B31.3, For Spectacle Blind Thickness, Use ASME B16.48 (cont’d)

Assumptions

1. Calculations taken from B.31.3 — Section 304.5.3 for Blanks:

   \[ T_m = \frac{d_g \sqrt{3 \times P}}{16 \times S \times E \times W} + c \]

   \( T_m \) = Minimum Wall Thickness (calculated and rounded up to nearest 1/16" increment)

   \( c \) = Sum of mechanical allowances (thread/groove depth + corrosion and erosion allowances) - assumed 0" in calculations

   \( d_g \) = Inside diameter of gasket (from ASME B16.20 - Table I-4: Dimensions for Spiral-Wound Gaskets Used With ASME B16.5 Flanges)

   \( E \) = Quality Factor (B31.3 Table A-1A or A-1B) - assumed 1 in calculations

   \( P \) = Design Gage Pressure (B.16.5 Table II-2-1.1: Pressure-Temperature Ratings for Group 1.1 Materials)

   \( S \) = Stress value for material (B 31.3 Table A-1) - see note 2

   \( W \) = weld joint strength reduction factor (B31.3 Para. 302.3.5(e)) - assumed 1 in calculations

2. Stress Value—Table calculations based on A516-70 material (23.3 ksi).

3. Blank OD matches gasket outer diameter of centering ring from B16.20 Table I-4 (rounded DOWN to nearest 1/8" increment).
# Appendix E: Geometric Formulas

## Rectangular Box

![Rectangular Box Diagram]

Volume = \( l \times w \times h \)

## Roof Space

![Roof Space Diagram]

Volume = \( \frac{1}{2} \times h \times c \times b \)

## Sphere

![Sphere Diagram]

Surface Area = \( \pi \times d^2 \)

Volume = \( \frac{1}{6} \pi \times d^3 \)

## Triangle

![Triangle Diagram]

Area = \( \frac{1}{2} \times b \times h \)

## Circle

![Circle Diagram]

Circumference = \( \pi \times d \)

Area = \( \frac{1}{4} \pi \times d^2 \)

## Cone

![Cone Diagram]

Curved Surface Area = \( \pi \times d \times \sqrt{d^2 + 4h^2} \)

## Rectangle

![Rectangle Diagram]

Area = \( a \times b \)

## Parallelogram

![Parallelogram Diagram]

Area = \( b \times h \)

## Cylinder (Right)

![Cylinder (Right) Diagram]

Area of Curved Surface = \( \pi \times d \times h \)

## Right Triangle

Length of Sides

- \( a = \sqrt{c^2 - b^2} \)
- \( b = \sqrt{c^2 - a^2} \)
- \( c = \sqrt{a^2 + b^2} \)

## Trapezoid

![Trapezoid Diagram]

Area = \( \frac{1}{2} (a + b) \times h \)
### HazCom Globally Harmonized System (GHS) Pictograms and Hazards

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<thead>
<tr>
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<td>Self-Heating</td>
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<td>Emits Flammable Gas</td>
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<tbody>
<tr>
<td>Irritant (skin and eye)</td>
<td>Acute Toxicity (fatal or toxic)</td>
</tr>
<tr>
<td>Skin Sensitizer</td>
<td></td>
</tr>
<tr>
<td>Acute Toxicity</td>
<td></td>
</tr>
<tr>
<td>Narcotic Effects</td>
<td></td>
</tr>
<tr>
<td>Respiratory Tract Irritant</td>
<td></td>
</tr>
<tr>
<td>Hazardous to Ozone Layer (Non-Mandatory)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exploding Bomb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosives</td>
</tr>
<tr>
<td>Self-Reactives</td>
</tr>
<tr>
<td>Organic Peroxides</td>
</tr>
</tbody>
</table>
## Appendix G: Loads on Blocks

<table>
<thead>
<tr>
<th>Angle in Degrees</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.00</td>
</tr>
<tr>
<td>10</td>
<td>1.99</td>
</tr>
<tr>
<td>20</td>
<td>1.97</td>
</tr>
<tr>
<td>30</td>
<td>1.93</td>
</tr>
<tr>
<td>40</td>
<td>1.87</td>
</tr>
<tr>
<td>45</td>
<td>1.84</td>
</tr>
<tr>
<td>50</td>
<td>1.81</td>
</tr>
<tr>
<td>60</td>
<td>1.73</td>
</tr>
<tr>
<td>70</td>
<td>1.64</td>
</tr>
<tr>
<td>80</td>
<td>1.53</td>
</tr>
<tr>
<td>90</td>
<td>1.41</td>
</tr>
<tr>
<td>100</td>
<td>1.29</td>
</tr>
<tr>
<td>110</td>
<td>1.15</td>
</tr>
<tr>
<td>120</td>
<td>1.00</td>
</tr>
<tr>
<td>130</td>
<td>.84</td>
</tr>
<tr>
<td>135</td>
<td>.76</td>
</tr>
<tr>
<td>140</td>
<td>.68</td>
</tr>
<tr>
<td>150</td>
<td>.52</td>
</tr>
<tr>
<td>160</td>
<td>.35</td>
</tr>
<tr>
<td>170</td>
<td>.17</td>
</tr>
<tr>
<td>180</td>
<td>.00</td>
</tr>
</tbody>
</table>

### Example:
A gin pole truck lifting 1,000 pounds. There is no mechanical advantage to a single part load line system, so winch line pull is equal to 1,000 pounds or the weight being lifted.

To determine total load on snatch block A:

\[
A = \frac{1,000 \times 1.81}{\text{line pull}} = 1,810 \text{ lb}
\]

To determine total load on toggle block B:

\[
B = \frac{1,000 \times 0.76}{\text{line pull}} = 760 \text{ lb}
\]
## Appendix H: Pipe Schedules

### OD | Schedule 40 Thickness | Schedule 80 Thickness | Schedule 120 Thickness | Schedule 160 Thickness | X-Strength Thickness | XX-Strength Thickness
--- | --- | --- | --- | --- | --- | ---
1 1/8 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049 | 0.049
1 1/4 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062
2 1/8 | 0.087 | 0.087 | 0.087 | 0.087 | 0.087 | 0.087
2 1/4 | 0.109 | 0.109 | 0.109 | 0.109 | 0.109 | 0.109
2 1/2 | 0.154 | 0.154 | 0.154 | 0.154 | 0.154 | 0.154
3 | 0.216 | 0.216 | 0.216 | 0.216 | 0.216 | 0.216
4 | 0.318 | 0.318 | 0.318 | 0.318 | 0.318 | 0.318
6 | 0.495 | 0.495 | 0.495 | 0.495 | 0.495 | 0.495
8 | 0.675 | 0.675 | 0.675 | 0.675 | 0.675 | 0.675
10 | 0.865 | 0.865 | 0.865 | 0.865 | 0.865 | 0.865
12 | 1.056 | 1.056 | 1.056 | 1.056 | 1.056 | 1.056
14 | 1.246 | 1.246 | 1.246 | 1.246 | 1.246 | 1.246
16 | 1.435 | 1.435 | 1.435 | 1.435 | 1.435 | 1.435
20 | 1.715 | 1.715 | 1.715 | 1.715 | 1.715 | 1.715
24 | 1.995 | 1.995 | 1.995 | 1.995 | 1.995 | 1.995
28 | 2.275 | 2.275 | 2.275 | 2.275 | 2.275 | 2.275
30 | 2.565 | 2.565 | 2.565 | 2.565 | 2.565 | 2.565

---

**Notes:**
- OD: Outside Diameter
- Thickness values are in inches.
Appendix I: Rigging Practices, Good and Bad

Use of Chokers

- **Bad** - Because of cutting action of eye splice on running line.
- **Good** - Use Thimbles in the eyes, and no cutting action on running lines.
- **Bad** - Bolt on running line can work loose.
- **Good** - Bolt cannot turn, shackle pin can’t turn.

Eye Fittings

- **Bad Practice** - Wire rope knot with dip. Efficiency 50% or less.
- **Good Practice** - Note use of the thimble in the eye splice.
- **Bad Practice** - Thimble should be used to increase strength of eye and reduce wear on rope.
- **Good Practice** - Note use of the thimble in the eye.

Hook Slings

- **Bad Practice** - Hook openings should be turned out.
- **Good Practice** - Hooks are turned out.
Wire Rope

Correct Method - U-Bolts of clips on short end of the rope. (No distortion on live end of rope.)

Wrong Method - U-Bolts on live end of the rope. (This will cause mashed spots on live end of the rope.)

Wrong Method - Staggered clips; two correct and one wrong. (This will cause a mashed spot in live end of rope due to wrong position of center clip.)

After rope is in service, and is under tension, tighten clips to take up decrease in rope diameter.

Efficiency of wire rope clip connections is dependent upon turning the rope over a proper size thimble, applying the correct number of clips for the wire rope size and construction, and tightening the nuts to the recommended torque. The user should consult the clip manufacturer's application instructions to obtain this information.

...as compared to Catalog Breaking Strength of Wire Rope:

<table>
<thead>
<tr>
<th>Figure</th>
<th>Type of Connection</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Sockets - Zinc Type - Properly Attached</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>Wedge Sockets</td>
<td>80%</td>
</tr>
<tr>
<td>4</td>
<td>Clips - Crosby Type</td>
<td>80%</td>
</tr>
<tr>
<td>5</td>
<td>Clips - Flat Grip Type</td>
<td>80%</td>
</tr>
<tr>
<td>6</td>
<td>Plate Clamp - Three Bolt Type</td>
<td>80%</td>
</tr>
<tr>
<td>7</td>
<td>Spliced Eye and Thimble</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/4 and smaller</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>3/8 to 3/4</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>7/8 to 1</td>
<td>88%</td>
</tr>
<tr>
<td></td>
<td>1 1/8 to 1 1/2</td>
<td>82%</td>
</tr>
<tr>
<td></td>
<td>1 5/8 to 2</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>2 1/2 and larger</td>
<td>70%</td>
</tr>
<tr>
<td>8</td>
<td>Swedge Socket</td>
<td>100%</td>
</tr>
<tr>
<td>9</td>
<td>Swedge Sleeve</td>
<td>100%</td>
</tr>
</tbody>
</table>
Appendix J: Wire Rope and Clips

- Space clips based upon the wire rope size. Each clip should be spaced approximately 6 times the diameter of the rope apart.

- The U-bolt piece of the clip goes on the dead end of the wire rope and the saddle goes on the live end of the rope. Remember this phrase – "Never saddle a dead horse."

- A minimum of two clips are required regardless of wire rope size. The exact number of clips required depends upon the wire rope size, as seen in the table below.

<table>
<thead>
<tr>
<th>Diameter of Rope (inches)</th>
<th>Number of Clips</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>3</td>
</tr>
<tr>
<td>1/2</td>
<td>4</td>
</tr>
<tr>
<td>5/8</td>
<td>4</td>
</tr>
<tr>
<td>3/4</td>
<td>5</td>
</tr>
<tr>
<td>7/8</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>1 1/8</td>
<td>6</td>
</tr>
<tr>
<td>1 1/4</td>
<td>7</td>
</tr>
<tr>
<td>1 3/8</td>
<td>7</td>
</tr>
<tr>
<td>1 1/2</td>
<td>8</td>
</tr>
</tbody>
</table>

- Whenever two or more ropes are to be placed over a hook, a shackle should be used
## Appendix K: Acronym List

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&amp;OI</td>
<td>Asset &amp; Operating Integrity</td>
</tr>
<tr>
<td>ACM</td>
<td>asbestos-containing material</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
</tr>
<tr>
<td>ATV</td>
<td>all-terrain vehicle</td>
</tr>
<tr>
<td>BBS</td>
<td>Behavior-Based Safety</td>
</tr>
<tr>
<td>BBP</td>
<td>bloodborne pathogens</td>
</tr>
<tr>
<td>CGP</td>
<td>Construction General Permit</td>
</tr>
<tr>
<td>CPR</td>
<td>cardiopulmonary resuscitation</td>
</tr>
<tr>
<td>CSE</td>
<td>confined space entry</td>
</tr>
<tr>
<td>CU</td>
<td>Captive Unit</td>
</tr>
<tr>
<td>CWA</td>
<td>Clean Water Act</td>
</tr>
<tr>
<td>CWMP</td>
<td>Commercial Waste Management Program</td>
</tr>
<tr>
<td>DOT</td>
<td>Department of Transportation</td>
</tr>
<tr>
<td>ESD</td>
<td>emergency shutdown</td>
</tr>
<tr>
<td>ESA</td>
<td>Endangered Species Act</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>HAZMAT</td>
<td>hazardous material</td>
</tr>
<tr>
<td>HAZWOPER</td>
<td>Hazardous Waste Operations and Emergency Response</td>
</tr>
<tr>
<td>HPD</td>
<td>hearing protection device</td>
</tr>
<tr>
<td>HRMW</td>
<td>Hazard Recognition and Management Workshop</td>
</tr>
<tr>
<td>HSE</td>
<td>health, safety and environment</td>
</tr>
<tr>
<td>IADC</td>
<td>International Association of Drilling Contractors</td>
</tr>
<tr>
<td>IATA</td>
<td>International Air Transport Association</td>
</tr>
<tr>
<td>ITR</td>
<td>Inspection, Testing and Repair</td>
</tr>
<tr>
<td>JA</td>
<td>jurisdictional agency</td>
</tr>
<tr>
<td>JSA</td>
<td>Job Safety Analysis</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicators</td>
</tr>
<tr>
<td>LCA</td>
<td>Latent Cause Analysis</td>
</tr>
<tr>
<td>LEL</td>
<td>lower explosive limit</td>
</tr>
<tr>
<td>LFL</td>
<td>lower flammability limit</td>
</tr>
<tr>
<td>LOTO</td>
<td>lockout/tagout</td>
</tr>
<tr>
<td>LSR</td>
<td>Life Saving Rule</td>
</tr>
<tr>
<td>MAWP</td>
<td>maximum allowable working pressure</td>
</tr>
<tr>
<td>MMS</td>
<td>Minerals Management Service</td>
</tr>
<tr>
<td>MOC</td>
<td>Management of Change</td>
</tr>
<tr>
<td>MODU</td>
<td>mobile offshore drilling unit</td>
</tr>
<tr>
<td>MOT</td>
<td>Materials of Trade</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>MS</td>
<td>Management System</td>
</tr>
<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>NORM</td>
<td>naturally occurring radioactive material</td>
</tr>
<tr>
<td>OCS</td>
<td>Outer Continental Shelf</td>
</tr>
<tr>
<td>OEL</td>
<td>occupational exposure limit</td>
</tr>
<tr>
<td>OIM</td>
<td>Offshore Installation Manager</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>PACM</td>
<td>possible asbestos-containing material</td>
</tr>
<tr>
<td>PEL</td>
<td>permissible exposure limit</td>
</tr>
<tr>
<td>PFD</td>
<td>personal flotation device</td>
</tr>
<tr>
<td>PPE</td>
<td>personal protective equipment</td>
</tr>
<tr>
<td>PSM</td>
<td>Process Safety Management</td>
</tr>
<tr>
<td>PSSR</td>
<td>Pre-Startup Safety Review</td>
</tr>
<tr>
<td>QMS</td>
<td>Quality Management System</td>
</tr>
<tr>
<td>RCFA</td>
<td>Root Cause Failure Analysis</td>
</tr>
<tr>
<td>RSO</td>
<td>Radiation Safety Officer</td>
</tr>
<tr>
<td>RUST</td>
<td>regulated underground storage tank</td>
</tr>
<tr>
<td>RFCM</td>
<td>respirable-fibers-containing material</td>
</tr>
<tr>
<td>RQ</td>
<td>reportable quantity</td>
</tr>
<tr>
<td>RUST</td>
<td>regulated underground storage tank</td>
</tr>
<tr>
<td>PEL</td>
<td>permissible exposure limit</td>
</tr>
<tr>
<td>SCBA</td>
<td>self-contained breathing apparatus</td>
</tr>
<tr>
<td>SLS</td>
<td>Safety Leadership Seminars</td>
</tr>
<tr>
<td>SOG</td>
<td>standard operating guideline</td>
</tr>
<tr>
<td>SOP</td>
<td>standard operating procedure</td>
</tr>
<tr>
<td>SPCC</td>
<td>Spill Prevention Control and Countermeasure</td>
</tr>
<tr>
<td>SSV</td>
<td>subsurface safety valve</td>
</tr>
<tr>
<td>STEL</td>
<td>short-term exposure limit</td>
</tr>
<tr>
<td>TLWP</td>
<td>tension-leg wellhead platform</td>
</tr>
<tr>
<td>TSCA</td>
<td>Toxic Substances Control Act</td>
</tr>
<tr>
<td>TWA</td>
<td>time-weighted average</td>
</tr>
<tr>
<td>UIC</td>
<td>Underground Injection Control</td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters Laboratories</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>USCG</td>
<td>U.S. Coast Guard</td>
</tr>
<tr>
<td>UST&amp;V</td>
<td>underground storage tank and vessel</td>
</tr>
<tr>
<td>UTV</td>
<td>utility terrain vehicle</td>
</tr>
</tbody>
</table>