



WELDING, CUTTING & HOT WORK

Control Fire, Fumes, Radiation, Gas and Electrical Hazards

POLICY STANDARD

Hot work shall be performed only by trained and authorized employees after the work area, materials, atmosphere, fire hazards, ventilation, PPE, equipment condition, adjacent areas and emergency controls have been evaluated. Required permits and fire watch shall be in place before ignition.

PHEIFER BROTHERS CONSTRUCTION CO., INC.

Effective August 26, 2026 | Revision 1

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NO-WORK CONDITIONS

Do not weld, cut, braze, solder, heat or create sparks where flammable vapor, oxygen enrichment, explosive dust, unknown container contents, uncontrolled combustible construction, an unassessed coating or an unsafe atmosphere is present.

Primary Regulatory References

- 29 CFR 1926.350 - gas welding and cutting
- 29 CFR 1926.351 - arc welding and cutting
- 29 CFR 1926.352 - fire prevention
- 29 CFR 1926.353 - ventilation and protection
- 29 CFR 1926.354 - preservative coatings
- 29 CFR 1926 Subparts E, F, K and AA and applicable substance-specific standards
- Manufacturer instructions, SDSs and applicable project/owner permit requirements

1. Purpose, Scope, Definitions and Responsibilities

Purpose and Scope

- Prevent fire, explosion, burns, electric shock, eye injury, toxic exposure, oxygen displacement/enrichment and property damage during bridge, highway, marine, shop and yard work.
- Applies to arc welding, oxygen-fuel welding/cutting, brazing, soldering, torch-applied heating, gouging, thermic cutting, grinding and other spark/flame/heat-producing work.

Key Definitions

- Hot work: work capable of producing flame, heat, sparks or molten material sufficient to ignite combustibles.
- Designated hot-work area: permanently or temporarily established area maintained free of fire hazards and approved for routine hot work.
- Permit-required area: location outside a designated area where a written authorization documents hazard controls for the specific work, place and time.
- Fire watch: trained person assigned no conflicting duties that would prevent continuous detection and response to fire.
- Welder/burner: trained and authorized employee operating welding, cutting or heating equipment.

Management / Program Administrator

- Provide equipment, training, exposure evaluation, permits, fire protection, ventilation, PPE and program review.

Foreman / Permit Authorizer

- Evaluate the area and adjacent spaces, authorize the permit, assign fire watch, verify ventilation/PPE and stop or suspend work when conditions change.

Welder / Burner

- Inspect equipment, follow the permit and manufacturer instructions, protect others, maintain controls and stop for leaks, fire, fumes, defective equipment or changed conditions.

Fire Watch / Employees

- Fire watch monitors the work and adjacent/hidden areas, maintains extinguishing equipment and initiates alarm. All employees respect barriers and report hazards immediately.

2. Planning, Authorization and Hot-Work Permits

Pre-Task Planning

- Identify the process, base metal, filler/electrode, coatings, consumables, location, duration, weather, ventilation, combustibles, cylinders, electrical supply, falling sparks, traffic, water, confined-space and rescue hazards.
- Review drawings, SDSs, coating surveys and the Lead/Bridge-Coating, Hexavalent Chromium, Respiratory Protection, Fire Prevention and Confined Space policies as applicable.

Use a Safer Location or Method

- Move the work to an approved designated area when practical. Otherwise remove movable fire hazards or protect immovable hazards with fire-resistant blankets, curtains, shields or other positive means.
- Consider cold cutting, bolting or another non-sparking method when it reduces risk.

Permit Requirement

- A company/project hot-work permit is required outside a designated area unless the program administrator has documented an equivalent controlled process. The permit is valid only for the identified area, task, shift/time and conditions.
- The authorizer inspects before ignition and verifies: combustibles controlled; openings/opposite side checked; atmosphere acceptable; extinguishers ready; fire watch assigned; alarms/sprinklers managed; ventilation/PPE adequate; emergency communication established.

Coordination

- Notify the owner/controlling contractor and affected trades. Coordinate traffic, rail, water, utilities, coatings, containment, fuel transfer, blasting/painting and work above/below.
- Never disable a fire detection/suppression system without authorization and compensating measures. Restore and document systems after work.

Permit Suspension

- Stop and reauthorize for change of location/process/material, shift interruption, ventilation failure, weather/wind change, new combustibles, gas alarm, fire, leak, changed adjacent work or loss of fire watch.

3. Fire Prevention, Fire Watch and Area Control

Combustible Control

- Move combustible material a safe distance from heat, sparks and slag. Where it cannot be moved, shield/cover it and prevent sparks from entering cracks, drains, wall/floor openings, decking, forms, containment or vegetation.
- Check below and on the opposite side of walls, floors, decks, beams, bulkheads and hollow members for heat transfer or spark penetration.

Extinguishing Equipment

- Provide suitable, inspected fire extinguishing equipment immediately available and ready for instant use. Additional hose line, water supply or specialized agent may be required by the hazard/permit.
- Maintain access and do not place the extinguisher where fire or cylinders would block retrieval.

Fire Watch

- Assign a fire watch whenever normal precautions are insufficient, sparks/heat can reach hidden or adjacent combustibles, openings exist, significant combustible construction is present or the permit/owner requires it.
- Fire watch shall understand specific hazards, know how to sound the alarm, be trained on available extinguishers and have no duty that interferes with observation.
- Maintain watch during work and afterward for a sufficient period to ensure no fire remains possible. Company minimum is 30 minutes after completion unless the permit/hazard requires longer; continue monitoring as conditions warrant.

Area Control

- Use noncombustible or flame-resistant screens, barricades and signs to protect employees/public from arc radiation, sparks, slag and hot metal. Control falling material and secure tools at elevation.
- Keep exits, ladders, stairs, aisles, fire equipment and responder access clear. Maintain housekeeping throughout the work.

Prohibited Conditions

- No hot work near flammable paint application, flammable compounds, heavy combustible-dust concentration, leaking fuel gas or uncontrolled vapor. Stop if wind carries sparks beyond the controlled area.

4. Compressed-Gas Cylinders and Storage

Identification and Condition

- Use only properly labeled cylinders with compatible, serviceable valves, caps and approved components. Do not use damaged, leaking, fire-exposed or unidentified cylinders.
- Never alter, refill, mix gases, use a cylinder as a roller/support or strike an arc on a cylinder.

Securing and Placement

- Secure cylinders upright with a suitable chain, cart or device. Keep away from sparks, slag, flame, electrical circuits, heat, falling objects, traffic, crane loads, edges and egress routes; shield when separation is impractical.
- Fuel-gas cylinders shall be used valve end up. Oxygen/fuel-gas cylinders shall not be taken into confined spaces.

Moving and Hoisting

- Close valves. Unless secured on a purpose-built carrier, remove regulators and install valve-protection caps before movement.
- Move by approved cylinder cart or tilt/roll on bottom edge; do not drag, drop or violently strike. Hoist only in a secured cradle, slingboard or pallet - never by magnet, choker sling or valve cap.
- On powered vehicles, secure cylinders vertically and protect from impact.

Storage Separation

- Separate stored oxygen cylinders from fuel-gas cylinders or combustible materials by at least 20 feet, or by a noncombustible barrier at least 5 feet high with at least a 30-minute fire-resistance rating.
- Store in assigned, dry, well-ventilated, protected locations. Do not store in unventilated lockers/cupboards or near stairs, elevators, gangways or highly combustible material.

Valves and Empty Cylinders

- Close valves when work is finished, cylinders are empty or cylinders are moved. Mark empties and segregate as required; empty cylinders remain hazardous.
- Keep oxygen equipment free of oil and grease and never handle with oily hands/gloves.

5. Oxy-Fuel Equipment and Operating Procedures

Pre-Use Inspection

- At the start of each shift inspect torch valves, tips, regulators, gauges, hoses, couplings, connections and cylinder condition. Remove defective equipment from service.
- Keep oxygen and fuel-gas hoses distinguishable and noninterchangeable. If taped together, do not cover more than 4 inches of each 12 inches. Keep hoses clear of passageways, ladders, stairs, sharp edges, traffic and hot slag.

Connections and Safety Devices

- Use correct regulators, hose, fittings and couplings; no adapters that interchange oxygen and fuel connections. Maintain check valves/flashback arrestors where specified by the manufacturer or company equipment standard.
- Leak-test with an approved solution - never a flame. Do not use oxygen to blow clothing, clean work, ventilate or cool employees.

Cylinder Startup

- Stand to the side of regulator/outlet. Crack a fuel-gas cylinder valve only as required by OSHA/manufacturer and away from ignition; open valves slowly.
- Do not open fuel-gas valves more than needed for rapid shutoff; where a wrench is required, leave it available on the stem. Never use acetylene above the manufacturer's limit or 15 psig.

Lighting and Use

- Purge and light in the manufacturer sequence using a friction lighter or approved device - never a match or hot metal. Use the correct tip and pressure; clean tips only with designed tools.
- Prevent hose kinks, burns and pinch points. Keep the torch pointed safely and never hang it from cylinders/regulators.

Shutdown, Leak or Flashback

- Close valves in the prescribed sequence, then close cylinders and bleed regulators before removal. Positively shut off supply outside an enclosed space when unattended; remove torch/hoses at shift end.
- For backfire/flashback or leak: shut down if safe, evacuate/control ignition as needed, tag equipment and notify the foreman. Hose exposed to flashback shall be tested as required by 1926.350 or removed.

6. Arc Welding, Leads, Returns and Electrical Safety

Equipment

- Use approved machines and electrode holders designed for the process/current. Hand-gripped holder parts and jaws shall be insulated; machine frames shall be properly grounded.
- Inspect machine, power cord, plug, case, controls, electrode holder, leads, connectors and return clamp before use. Keep equipment protected from rain, standing water and physical damage.

Leads and Connectors

- Use fully insulated flexible cable rated for maximum current and duty cycle. Keep the first 10 feet from the electrode holder free of repairs/splices except permitted standard connectors/equivalent splices.
- Use substantial insulated connectors and fully insulate exposed lugs. Remove damaged leads from service; protect routing from traffic, sharp edges, heat, water and trip hazards.

Ground Return

- Place the return clamp close to the work on clean metal and ensure mechanically strong, electrically adequate contact. The return path shall safely carry the maximum output.
- Do not use pipelines containing gas/flammable liquid or conduits containing electrical circuits as a return. Do not allow current to pass through bearings, wire rope, cranes, lifting devices, building systems or unknown pathways.

Operation

- Maintain dry gloves/clothing and insulated footing where needed. Avoid contact with energized electrode/holder and grounded metal; wet, conductive or confined conditions require enhanced controls.
- When unattended, remove the electrode and place/protect the holder against contact. Open the power switch for appreciable breaks or machine movement. Never cool a hot holder in water.

Arc-Radiation Control

- Use flameproof/noncombustible screens when practicable and position them without restricting ventilation or creating traffic hazards. Warn nearby employees and protect against reflected ultraviolet radiation.

7. Ventilation, Fumes and Coated Bridge Steel

Hazard Assessment

- Identify base metal, coating, primer, plating, filler, flux, cleaning chemical and process before work. Do not hot-work unknown paint or residue.
- Bridge steel may involve lead, hexavalent chromium, cadmium, zinc, nickel, manganese, asbestos-containing materials or other hazardous substances. Obtain surveys/SDSs and exposure assessment.

Ventilation

- Use local exhaust as close as practical to capture fumes at the source, or adequate general mechanical ventilation. Discharge contaminated air away from employees and clean-air intakes; replacement air shall be clean.
- Position the welder's breathing zone out of the plume. Do not rely on natural wind where containment, geometry or weather creates recirculation.

Coating Removal

- Remove coating from the heat-affected area as required by 1926.354 and the applicable exposure-control plan. Use methods that minimize dust/fume and control removed debris.
- When coating is highly flammable, strip enough area to prevent ignition. Unknown or toxic preservative coatings require competent evaluation and protective measures before heating.

Substance-Specific Controls

- Apply the Lead and Bridge-Coating Policy, Hexavalent Chromium Policy and other applicable standards for regulated areas, hygiene, clothing, respiratory protection, medical surveillance and exposure records.
- Use respiratory protection only under the Respiratory Protection Program after medical evaluation, fit testing and selection. Respirators supplement, not replace, feasible ventilation.

Symptoms / Stop Work

- Stop for ventilation failure, visible fume accumulation, unusual odor/taste, metal-fume symptoms, dizziness, headache, eye/throat irritation or monitor alarm. Move to fresh air and obtain medical evaluation as needed.

8. PPE, Screens, Burns and Ergonomics

Eye and Face

- Use a welding helmet/hand shield or cutting goggles with filter shade appropriate to the process and current, with compliant safety glasses underneath. Inspect lenses, shell and auto-darkening function.
- Use clear eye/face protection for chipping, brushing and grinding. A face shield does not replace safety glasses.

Body Protection

- Wear dry flame-resistant clothing that covers skin; suitable welding gloves; hard hat with compatible welding attachment/chin strap; and protective footwear. Remove cuffs/open pockets and secure clothing against sparks.
- Do not wear meltable synthetic clothing or contaminated/oily garments. Use leather sleeves/apron, gaiters or additional protection based on overhead and molten-metal exposure.

Hearing and Respiratory

- Use hearing protection based on noise assessment for gouging, grinding, carbon arc and related work. Maintain awareness of alarms and communication.
- Wear assigned respirator only under the respiratory program; inspect it and keep welding helmet/PPE compatible with face seal.

Screens and Bystanders

- Protect other employees, traffic and public from arc rays, sparks and slag. Screens shall be flame resistant/noncombustible and allow safe ventilation/egress.
- Barricade below elevated cutting and use blankets/catch platforms where effective. Never permit work beneath uncontrolled molten metal.

Burn and Material Handling

- Mark or barricade hot metal and use tools/tongs. Do not leave heated material where it can be mistaken for cold.
- Position work to reduce awkward posture and cable/torch strain. Secure pieces before cutting; plan for movement, loss of support and residual stress when a member separates.

9. Confined, Enclosed, Elevated and Special Work

Confined Spaces

- Follow the Confined Space Entry Policy and construction Subpart AA. Complete classification/permit, atmospheric testing, ventilation, attendant, communication and rescue planning before entry.
- Keep oxygen and fuel-gas cylinders outside. Positively shut off gas outside when torch is unattended; remove torch and hose at shift end and immediately remove open-ended disconnected hoses.
- Do not use oxygen for ventilation. Evaluate welding fumes, oxygen deficiency/enrichment, fuel-gas leakage and inert shielding-gas displacement continuously as required.

Enclosed / Containment Work

- Provide mechanical ventilation and monitor the atmosphere where fumes/gases may accumulate. Maintain fire-resistant egress and prevent exhaust recirculation.
- Coordinate bridge-paint containment, dust collection and negative-air systems so hot work does not ignite filters, dust or coatings.

Elevated / Over Water

- Apply fall protection and water-rescue policies. Protect lifelines, harnesses, nets, ropes and flotation devices from sparks/slag; reposition or shield them without compromising function.
- Secure cylinders and equipment against falling; use approved lifting methods and maintain access. Control sparks to traffic, rail, vessels and employees below.

Containers and Hollow Members

- Do not heat, weld or cut a drum, tank, pipe or hollow member that contains or contained flammable/toxic material until cleaned/purged as applicable, ventilated and tested by a qualified process.
- Provide a vent/opening to release pressure before heating. Never assume an empty container is safe.

Special Conditions

- Coordinate natural-gas pipeline work with applicable DOT pipeline rules. Obtain qualified procedures for stainless/high-alloy metal, thermic lancing, underwater cutting, structural-critical welds and energized/pressurized systems.

10. Shutdown, Emergency Response, Training and Records

Normal Shutdown

- Stop the process, secure hot materials, close cylinder valves, bleed regulators/hoses, open machine disconnect for extended stops, remove electrode and inspect the area.
- Fire watch completes the permit period and verifies adjacent, hidden and opposite-side areas. Restore alarms/sprinklers/barriers and close the permit.

Fire / Explosion

- Stop gas/electric supply only if safe, sound the alarm, call 911 and use an extinguisher only within training and with a safe escape route. Evacuate for cylinder involvement, uncontrolled fire, explosion risk or hazardous release.
- Do not approach a heated cylinder. Establish isolation, warn responders of cylinder/gas type and protect from traffic/public.

Gas Leak / Oxygen Hazard

- Close valves if safe, eliminate ignition from a safe location, evacuate and ventilate. Do not operate switches/equipment in a suspected flammable atmosphere.
- For oxygen enrichment, remove ignition/combustibles and ventilate; oxygen-saturated clothing must be aired out away from ignition.

Injury Response

- Cool thermal burns with clean cool water and obtain first aid/medical care; do not apply grease or remove material stuck to skin. Eye flash, fume illness, electric shock or inhalation requires prompt evaluation.
- For electrical contact, do not touch the victim until power is controlled; call 911 and begin trained first aid/CPR/AED response.

Training and Records

- Document welder/burner authorization, fire-watch/extinguisher training, permits, exposure/respirator requirements, inspections, incidents and corrective actions. Toolbox talks do not replace required training.

Review / Enforcement

- Review annually and after an incident, process/material change or regulatory update. Bypassing permits, ventilation, fire watch, PPE or equipment safety devices is prohibited.

11. Hot-Work Permit Decision Guide

DECISION	VERIFY BEFORE AUTHORIZATION
Location	Designated hot-work area? If no, written permit/authorization required
Material	Base metal, coating, filler and residue identified; SDS/survey reviewed
Combustibles	Moved, shielded or positively isolated; hidden/opposite-side areas checked
Atmosphere	No flammable vapor/dust; oxygen and toxic hazards evaluated/monitored
Fire protection	Correct extinguisher ready; alarm/sprinkler status controlled
Fire watch	Need determined; trained person, duration and post-work monitoring assigned
Ventilation	Local exhaust/general ventilation effective; discharge/intake controlled
Equipment	Cylinders, torch, regulators, hose, leads, machine and returns inspected
PPE / screens	Filter shade, eye/face, FR clothing, gloves, hearing/respiratory and screens
Other work	Traffic, rail, water, fall, confined space, coating and adjacent trades coordinated
Emergency	911/location, alarm, evacuation, cylinder/fire/gas response reviewed
Closeout	Supply shut down; hot material controlled; watch complete; systems restored
PERMIT LIMIT	A permit does not transfer from one location, crew, shift or materially changed condition to another. Stop and obtain reauthorization whenever a listed control is lost or the work changes.

12. Field Hot-Work Permit and Checklist

VERIFY	EXPECTATION
Work / location	Process, exact location, base metal/coating and duration identified
Area	Combustibles removed/protected; cracks/openings/opposite side checked
Atmosphere	Testing/monitoring completed where required; no flammable condition
Fire protection	Extinguisher and other equipment ready; systems remain available
Fire watch	Name, duties and post-work duration assigned
Ventilation	Capture/exhaust and clean replacement air adequate
Gas system	Cylinders secured; valves/regulators/hoses/torch inspected; no leaks
Arc system	Machine, grounding, holder, leads/connectors and return inspected
PPE / screens	Correct eye/face shade, FR protection, gloves and exposure PPE
Coordination	Confined space, elevation, water, traffic, rail and coatings controlled

PROJECT / EXACT LOCATION:	DATE / VALID TIME:
WORK / MATERIAL / COATING:	WELDER / BURNER:
FIRE WATCH / END TIME:	EXTINGUISHER / ALARM STATUS:
ATMOSPHERE / VENTILATION:	SPECIAL PPE / RESPIRATOR:
ADDITIONAL CONTROLS:	PERMIT AUTHORIZED BY:
POST-WORK CHECK / TIME:	PERMIT CLOSED BY:

13. Test Your Knowledge

Circle the best answer. Review missed questions with your foreman.

1. When is a hot-work permit normally required? A. Only after a fire B. Outside an approved designated area C. Only for welding indoors	2. How must stored oxygen be separated from fuel gas? A. 20 feet or an approved 5-foot, 30-minute barrier B. One foot C. By a plastic curtain
3. Where should oxygen/fuel cylinders be during confined-space work? A. Beside the entrant B. Inside if chained C. Outside the confined space	4. What may be used to light a torch? A. A match B. An approved friction lighter/device C. Hot slag
5. What is the company minimum post-work fire-watch period when required? A. 30 minutes, and longer when hazards/permit require B. Five minutes C. None after flame stops	6. What must happen before hot work on unknown bridge coating? A. Begin with a respirator B. Burn a test patch C. Identify/evaluate the coating and controls
7. May oxygen be used for ventilation or clothing cleaning? A. At low pressure B. No C. Only outdoors	8. What should the welder do if ventilation fails? A. Stop work and restore/re-evaluate controls B. Continue if sparks are visible C. Hold breath
9. What is prohibited as an arc-welding return path? A. A properly sized return cable B. Clean work metal under an approved plan C. Gas/flammable-liquid pipe or electrical conduit	10. What should happen when permit conditions change? A. Finish the rod B. Stop and obtain reauthorization C. Move the extinguisher closer

EMPLOYEE: _____

DATE: _____

ANSWER KEY: 1-B | 2-A | 3-C | 4-B | 5-A | 6-C | 7-B | 8-A | 9-C | 10-B