

# Hot Work

## 1. Purpose

Hot work is work that has the potential to produce a source of ignition, such as sparks, flames, or temperatures high enough to cause the ignition of flammable gases or combustible materials.

The purpose of this policy is to define the requirements for performing hot work and the responsibilities of individuals serving in roles regarding hot work operations.

## 2. Scope

This policy applies to all employees and contractors while performing hot work for USPL.

The following policies in this safety manual are either referenced or are applicable to this policy and should be consulted for specific related requirements and guidance:

Air Monitoring	Electrical Safety
Permit to Work	Level 2 Hazards Identification and Task Risk Assessment (HITRA)
Confined Space Entry	

## 3. Minimum Requirements

	Minimum Requirements	Supporting Documentation
1.	A Hot Work Checklist shall be completed and issued prior to conducting Primary Source Ignition (PSI) Hot Work in a Class 1 area.	Section 7, Appendices II and III
2.	PSI and SSI Hot Work in a Class 1 area and PSI Hot Work in a non-Class 1 area shall be issued by an Asset Operator or Asset Operator Designee and shall be received by a Performing Authority. <i>Two people must be involved in the Checklist process.</i>	Section 5
3.	Initial Area monitoring for the presence of flammable gas shall be conducted and documented prior to performing/conducting Primary Source Ignition (PSI) Hot Work or Secondary Source Ignition (SSI) Hot Work in a Class 1 area. Continuous air monitoring for the presence of flammable gas shall be performed while PSI or SSI Hot Work occurs in a Class 1 area.	Section 10, Appendix III
4.	If air monitoring (initial or continuous) detects the presence of flammable gas (LEL > 0%), hot work shall not proceed until an LEL Mitigation Plan is developed and implemented to identify the source of the flammable gas and verify that the LEL is less than 10%.	Section 10, Section B of Hot Work Checklist
5.	Hot work <i>is prohibited</i> in atmospheres with LEL ≥10%.	Section 8 and 10
6.	Designated areas shall be kept free of combustible materials and shall be physically marked around the perimeter. Designated areas do not require a Hot Work Checklist or Fire Watch.	Section 6
7.	A Fire Watch is required during PSI hot work in a Class 1 Area and during PSI Hot Work in non-Class 1 Areas when performed within 35 feet of unprotected combustible materials.	Section 11, Appendix IV

Revision Date: 05/01/2020

Effective Date: 06/30/2020

Next Review Date: 05/01/2025

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8.	Individuals performing hot work roles shall be trained to execute their responsibilities as defined in this policy	Section 12
9.	All personnel performing hot work on behalf of USPL have the responsibility and authority to stop any work they consider to be unsafe.	Section 7

## 4. Definitions

**Asset Operator (AO)**—A BP employee who is responsible for the operation of the asset where work is being performed. The Asset Operator shall be accountable for the asset equipment being in a safe condition for the scope of work to be performed. The Asset Operator or an Asset Operator Designee (if used) is responsible for the completion of the PTW form.

**Asset Operator Designee (AOD)**—A BP employee or contractor individual who is authorized to issue PTWs and / or Checklists on behalf of the Asset Operator.

*Note: Reference the Permit to Work policy for additional information*

**Authorized Gas Tester**—An individual responsible for operating air monitoring equipment to monitor the area where hot work will be performed for the presence of flammable gas.

**Class 1 area**—An area in which flammable gases or vapors are, or might be, present in the air in quantities sufficient to produce explosive or ignitable mixtures. *For the purposes of this policy, Class 1 areas are defined to include Division 1 and Division 2 classified areas. Consult Facility Hazardous Area Classification diagrams to identify where Class 1 areas are defined. For hot work not performed at a facility, such as on the Right-of-Way the following are examples of Class 1 areas:*

- Within 100 feet of all leak sites or pipeline repair operations where a line will be or has been opened. This can be expanded due to the size of the leak.
- Within 10 feet of any at-grade or below-grade sumps or drains.
- Within 50 feet horizontally in all directions from any edge of pumps located outdoors where pressure  $\geq$  275 PSIG.
- Within 10 feet horizontally of an outdoor valve, flange, manifold, meter, or scraper trap.

**Combustible material**—A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn.

**Designated area**—A specific location designed and approved for hot work operations that is maintained fire-safe, such as a maintenance shop or a detached outside location, that is of noncombustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas. Hot work performed in a designated area does not require a Hot Work Checklist or Fire Watch.

*Note: Class 1 areas can never be considered a designated area.*

*Note: Designated areas are not required to be “structures”.*

**Fire Watch**—An individual who is assigned the responsibility of monitoring hot work and the surrounding area for incipient fires and changing conditions.

**Flammable gas**—A term used for brevity in this policy to include all combustible and flammable gases and vapors that burn in air when the concentration of the gas or vapor is within the range of concentration where combustion can occur.

**Hot Work**—Any work that involves either the use or the creation of a flame, spark or energy discharge that could act as the ignition source for a fire or explosion.

**Hot Work operator**—An individual who operates hot work equipment to perform hot work operations.

**Lower Explosive Limit (LEL)**—The minimum concentration (percentage) of a flammable gas that will propagate a flame in the presence of an ignition source. The more explosive the gas, the lower the LEL. A mixture below this level is considered too “lean” to burn. LEL is usually expressed as a percentage (from zero to 100% explosive) and is often used interchangeably with Lower Flammability Limit (LFL).

**Performing Authority (PA)**—A BP employee or contractor individual who receives a PTW Checklist issued by the Asset Operator or Asset Operator Designee.

*Note:* Reference the Permit to Work policy for additional information.

**Checklist Issuance**—The act of the Asset Operator or Asset Operator Designee issuing a Checklist to a Performing Authority.

*Note:* Reference the Permit to Work policy for additional information.

**Non-permissible Area**—An area where hot work is prohibited.

**Primary Source Ignition (PSI) hot work**—Work with equipment and tools that, when used in a normal manner, are likely to ignite a flammable or combustible atmosphere, solid materials, and liquids. PSI hot work is often referred to as “naked flame” hot work. High energy is present in the form of a flame, electric arc, or incandescent sparks. Examples of PSI hot work include but are not limited to the following:

Welding/burning/ grinding or similar activities, air arcing, soldering, open flame, stress-relieving.

Preheating or annealing welded fabrications where the surface temperatures may exceed 392°F.

**Secondary Source Ignition (SSI) hot work**—Any work with equipment and tools that, when used in a normal manner or due to errors or malfunctions, may create lower-energy sparks and ignite a flammable or combustible atmosphere. SSI hot work is also referred to as “spark potential” hot work. Examples of SSI hot work include but are not limited to the following:

Using electrical and electronic equipment that is not intrinsically safe or explosion-proof (e.g., most electronic communication devices, flashlights, power tools)

Using internal combustion engines (including vehicles) in a Class 1 area (vehicle entry into tank dike)

Using a rotating steel brush

Electrical isolation testing

Producing a friction spark, typically from a rusty surface

Jeep coating testing

Air powered equipment that can generate a friction spark, such as bristle blast, jackhammers

Exothermic reactions from materials and products

Abrasive blasting

*Note:* The use of hand tools such as hammers and chisels is not considered hot work.

*Note:* The use of watches, hearing aids, and other medical devices are specifically exempted as SSI sources.

**Shall**—Is used where a provision is mandatory

**Should**—Is used where a provision is preferred

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## 5. Roles and Responsibilities

### 5.1. Asset Operator (or designee)

- A. Shall issue PTWs and Checklists (if used) for hot work to the Performing Authority or can delegate Checklist issuance to the AOD.

- B. Shall determine if changes can be made to a PTW and Checklist (if used) if conditions are exceeded or if the PTW and Checklist (if used) should be cancelled and a new PTW or Checklist issued
- C. Shall evaluate hot work with regard to simultaneous operations (SIMOPS) so that operations that could likely expose flammable gas or combustible materials to ignition in the hot work area do not occur, or are controlled during hot work operations.

*Note:* Refer to the Permit to Work policy for additional requirements.

## 5.2. Authorized Gas Tester (can also be the Fire Watch)

- A. Shall not be a PSI Hot Work Operator while performing AGT duties.
- B. Can be a Hot Work Operator during SSI Class 1 hot work.
- C. Shall verify that the air monitoring device to be used is calibrated according to the manufacturer's instructions.
- D. Shall be familiar with the proper operation of the air monitoring device to be used for air monitoring.
- E. Shall perform initial, continuous, and repeat air monitoring of the Class 1 area for the presence of flammable gas per the Initial area monitoring plan, when required (see Section 10)
- F. Shall verify that an LEL Mitigation Plan is developed and implemented when required (see Section 10.6).
- G. Stops hot work if at any time air monitoring readings are  $\geq 10\%$  of the LEL

*Note:* Refer to the Air Monitoring policy for additional information regarding the Authorized Gas Tester and air monitoring equipment.

## 5.3. Fire Watch (can also be Authorized Gas Tester)

- A. Shall not be a PSI Hot Work Operator while performing Fire Watch duties.
- B. Shall verify that fire protection equipment is in place and ready for use (see Section 11).
- C. Shall stop work if unsafe conditions develop during hot work operations (e.g. combustible materials are introduced into the hot work area).
- D. Shall remain within communication range of the person(s) performing the hot work and shall maintain a line of sight with the hot work.
- E. Shall watch for fires in all areas exposed to hot work and, if a fire occurs, shall communicate to hot work operators to cease all hot work.
  - 1. The Fire Watch can try to extinguish a fire only when the fire is obviously within the capacity of the equipment available.
  - 2. If the Fire Watch determines that the fire is not within the capacity of the equipment, the Fire Watch shall implement evacuation procedures immediately.
- F. Shall remain in the hot work area at least 30 minutes after the hot work has ceased (including for work breaks) to detect and extinguish possible smoldering fires.
- G. Shall document that the above requirement was completed on the Hot Work Checklist.

## 5.4. Hot Work Operators

- A. Shall verify hot work equipment is fit for purpose and intact.
- B. Shall cease hot work operations if unsafe conditions develop and notify the Performing Authority immediately for evaluation and appropriate action.

## 5.5. Performing Authority

- A. Shall receive issued Hot Work PTWs and Checklists (if used) from the Asset Operator or Asset Operator Designee.
- B. Shall observe the Checklist hot work to verify that the work is performed within the conditions documented on the PTW and Hot Work Checklist (if used).
- C. Shall reassess the job site and revalidate the PTW and Checklist (if used) before work can resume if Check listed work is interrupted or if the job site is left unattended, or if necessary, cancels the Checklist and returns it to the AO / AOD.
- D. Shall stop work, suspend the PTW and Checklist (if used) and notify the AO / AOD if PTW or Checklist (if used) conditions are exceeded.

*Note:* Refer to the Permit to Work policy for additional requirements.

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## 6. Designated Areas

The purpose of a designated area is to provide a safe area where PSI Hot Work can be performed without a Hot Work Checklist. A designated or “free burn” area does not require a Hot Work Checklist or PTW Sections C1 or C2, a Fire Watch, or air monitoring because the procedures for establishing the designated area eliminate or effectively control flammable and combustible hazards.

- A. Designated areas shall be:
  - 1. located greater than 35 feet from a Class I area;
  - 2. kept essentially free of combustible materials; and
  - 3. physically marked around the perimeter.

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## 7. Hot Work Checklist

The Hot Work Checklist (Appendix I) has five purposes: (1) to serve as written permission to do the work; (2) to provide a *minimum* safety checklist; (3) to show the steps necessary for making the worksite safe for conducting PSI hot work; (4) to alert operating personnel to work in progress; and (5) to provide a record of safety steps taken so that the work is performed within established conditions. Appendix II offers guidelines for determining whether a Hot Work Checklist is required. Appendix III summarizes specific Checklist requirements.

### 7.1. General Requirements

- A. Before beginning PSI Hot Work in a Class 1 Area, an assessment shall confirm that other options not involving PSI hot work have been considered and ruled out.
- B. Air monitoring and other hazard considerations shall be documented on the Hot Work PSI Checklist. In Section A of the Hot Work PSI Checklist, list the potential sources of flammable gas within the monitored area, and in Section B of the Hot Work PSI Checklist provide the LEL Mitigation Plan.
- C. The following activities are exempted from a hot work Checklist and Sections C1 & C2 of the PTW:
  - 1. Performing PSI hot work in a designated area.
  - 2. Bulk liquid transport loading / unloading operations.  
*Note:* Bulk liquid transport loading / unloading operations are based on the requirements of NFPA 30 and are therefore exempt from hot work Checklist.
  - 3. Performing Non-Class 1 SSI hot work.
  - 4. Performing shielded PSI hot work outside of a Class 1 area.

*Note:* For the purposes of this policy, shielded PSI refers to equipment which is considered PSI but intrinsically shielded in a way that prevents ignition of nearby ordinary combustibles, e.g. using a gasoline powered / diesel fired hot water pressure washer cleaning pipeline pigs in a non-Class 1 area. Performing shielded PSI hot work in a Class 1 area shall require a PSI Class 1 Hot Work Checklist.

5. Replacing the Scully cord at the truck loading rack.
- D. For PSI Hot Work in a Non-Class 1 Area, the AO/AOD can validate the PTW, which shall include Section C1 of the PTW.
- E. For SSI Hot Work in a Class 1 Area, the AO/AOD can validate the PTW, which shall include Section C2 of the PTW.
- F. When completing Sections C1 and C2 of the PTW, the AO/AOD and the PA must be involved in the discussion.
- G. Individuals who have a role in the hot work Checklist or Sections C1 & C2 of the PTW process, possessing the technical and procedural competencies as defined by the USPL Training and Competency Matrix (for employees) and the contractor management process (for contractors), shall provide input to the Checklist or applicable PTW Sections to address Checklist or PTW conditions related to the hot work.
- H. For SSI Class 1 hot work (e.g. vehicle entry into tank dikes, snow plowing under the load rack, the use of tools that are not intrinsically safe in a Class 1 area), the Asset Operator can validate the conditions on the PTW to the Performing Authority via telephone.
- I. A Hot Work Checklist is valid for no more than seven (7) days, or for the duration of the scope of work documented on the Checklist, whichever period is shorter.
- J. If hot work is suspended and the job site is left unattended (including normal work breaks) during a shift, the Checklist shall be revalidated before further hot work can continue; revalidation involves inspecting the hot work area for any change in previous conditions and conducting air monitoring if PSI hot work is to recommence in a Class 1 area.
- K. If PTW/Checklist conditions are exceeded (e.g., LEL  $\geq$  10%) the Checklist shall be suspended until the Asset Operator/Asset Operator Designee determines if changes can be made to the Checklist or if the Checklist should be cancelled and a new Checklist issued.  
*Note:* All work must stop and equipment/tools shall be shut down if LEL  $\geq$  10%.
- L. The Hot Work Checklist should be at the job site until the hot work is completed or the Checklist expires. At the Asset Operator's discretion, the Hot Work Checklist may be kept at an alternate location, e.g. in the office.
- M. All personnel involved in the hot work operation have the authority and responsibility to stop work that they consider to be unsafe.
- N. The original completed Hot Work Checklists shall be retained locally for one month.

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## 8. Non-Permissible Areas

- A. PSI Hot work is prohibited in the following areas:
  1. In areas prohibited by management.
  2. In sprinkler-equipped buildings where sprinklers are impaired, unless the requirements of NFPA 25 are met, specifically Chapter 15 – Impairments.
  3. In the presence of atmospheres with  $\geq$ 10% of the LEL.
  4. In the presence of uncleaned or improperly prepared tanks, vessels, or other containers and equipment that have previously contained flammable or combustible materials when their contents might be exposed to an ignition source.

- a) Reference the Confined Space Entry policy for requirements regarding post-cleaning certification of a gas / product space.

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## 9. Hot Work Site Preparation

Hot work shall be assessed in relation to simultaneous operations (SIMOPS). In completing the PTW and Checklist (if used), the Asset Operator shall determine whether the hot work to be performed will negatively impact any other operations occurring at the same time. The Asset Operator shall decide whether the hot work can proceed and shall identify what controls are necessary to perform the hot work safely with respect to other operations.

### 9.1. All PSI Hot Work

A. The following conditions shall be verified before PSI hot work is performed:

1. Combustible materials shall be protected from ignition by relocating, shielding, or by other protective means:  
*Note:* Consideration should be given to spark containment techniques which lessen the distance sparks are able to travel freely.
2. A fully charged and operable 20-pound (minimum) fire extinguisher appropriate for the type of potential fire shall be available for use in the work area.
3. Sewer openings, ducts, and drains within 35 feet of the point of hot work shall be sealed with an impervious material. Where sealing is insecure or impractical, other methods shall be implemented to prevent sparks from entering.
4. The location of the hot work relative to combustible and flammable materials and classified areas will determine the need for a Fire Watch, as outlined in this policy (see Section 11).
5. Proper grounding and bonding shall be in place prior to the start of hot work. Examples include:
  - a) Temporary ground rods at each end of joint or continuous section of joints.
  - b) Temporary grounding mats
  - c) Rubber tired equipment
  - d) Grounded fuel trucks bonded to equipment being fueled.

*Note:* Always make the ground connection first and disconnect it last.

#### 9.1.1. Welding, Torch Cutting, and Brazing in a Confined Space or Partially Enclosed Space

- A. When welding, cutting, or brazing operations are to be conducted in a confined space or partially enclosed space the following ventilation requirements shall apply where a natural draft is not achievable:
1. General mechanical ventilation at a rate of 2,000 cubic feet per minute (cfm) per welder shall be provided; or
  2. Local mechanical ventilation using freely movable hoods placed by the welder as near as practicable to the work being welded and provided with a rate of air-flow sufficient to maintain a velocity in the direction of the hood of 100 linear feet (30 m) per minute in the zone of welding when the hood is at its most remote distance from the point of welding shall be provided.
  3. Local mechanical ventilation or airline respirators are required when welding, cutting, or brazing on hazardous metals (e.g. galvanized, stainless, chrome-molly, metals containing lead other than as an impurity).

4. All replacement air shall be from a clean source outside of the confined space or partially enclosed space.

*Note:* Refer to Appendix V General Mechanical Ventilation Guidance for Welding, Cutting and Brazing in Confined Spaces or Partially Enclosed Spaces for additional information.

- B. If the minimum rates stated above cannot be achieved, supplied air respiratory protection shall be worn by all entrants in the confined space or partially enclosed space in conjunction with ventilation.

*Note:* For the purposes of this policy, a partially enclosed space is a space that does not meet the definition of a confined space but is configured in a manner that would cause the accumulation of welding fumes without mechanical ventilation.

#### 9.1.2. PSI Hot Work in Class 1 Area

- A. The following conditions shall be verified before PSI Hot Work in Class 1 Areas is performed:
  1. A Fire Watch shall be assigned.
  2. Affected excavations, conduits, and manholes within 35 feet of the hot work shall either be monitored for the presence of flammable gas or shielded so that an ignition source is not introduced.
  3. Initial and continuous air monitoring shall be performed and initial air monitoring results shall be documented on the PTW (see Section 10 and the Air Monitoring policy).

#### 9.1.3. PSI Hot Work within 35 Feet of Buildings or Other Structures

- A. The following conditions shall be verified before PSI hot work is performed inside of or within 35 feet of buildings or structures whose building materials or contents may be combustible or flammable:
  1. Openings or cracks in walls, floors, or ducts within 35 feet of the hot work shall be tightly covered with fire-retardant or noncombustible material to prevent the passage of sparks to adjacent areas.
  2. Ducts that might carry sparks to distant combustible or flammable materials shall be shielded and / or shut.
  3. If hot work is done on one side of a wall, partition, ceiling, or roof, one of the following precautions shall be taken:
    - a) Combustibles on the other side shall be relocated.
    - b) If it is impractical to relocate combustibles, a Fire Watch shall be provided on the side of the combustibles.

#### 9.2. SSI Hot Work in Class 1 Area

- A. The following condition shall be verified before Secondary Source Ignition Hot Work in Class 1 Areas is performed:
  1. Initial air monitoring shall be performed and documented on the Permit to Work (see Section 10 and the Air Monitoring policy).

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## 10. Air Monitoring (Class 1 Areas)

Flammable and combustible liquids and gases are, or might be, present within Class 1 areas. In order to perform PSI or SSI Hot Work safely in these areas, air monitoring is required so that flammable gas in the work area is detected and properly controlled.

*Note:* If the hot work will be performed in a tank or vessel, the air monitoring requirements for confined spaces shall apply in addition to the requirements of this policy (see the Air Monitoring and Confined Space Entry policies).

*Note:* When the possibility exists for an oxygen-deficient atmosphere, the oxygen level could be below the level required by the air monitoring device to give the correct flammability (LEL) reading. This could occur where a tank, vessel, or piping contains an inert gas such as nitrogen or carbon dioxide. For this reason it is important to monitor oxygen levels prior to monitoring for LEL.

### 10.1. General Requirements

- A. All BP equipment used for air monitoring shall be in accordance with the Air Monitoring policy.
- B. If air monitoring indicates the presence of flammable gas (LEL>0%), the hot work shall not proceed until an LEL Mitigation Plan is developed and implemented (see Section 10.6).
- C. PSI & SSI Hot Work is prohibited if air monitoring readings are  $\geq 10\%$  of the LEL.

### 10.2. Initial Hot Work Air Monitoring (Class 1 Areas)

- A. Initial air monitoring shall be performed by an Authorized Gas Tester surveying at least a 35-foot radius from the point of the hot work for all Class 1 Areas.
- B. Initial air monitoring shall be conducted prior to the issuance of all PSI Hot Work Checklists and/or PTWs involving SSI Hot Work in a Class 1 area.
- C. Initial air monitoring should be conducted as close to the start of the hot work as possible.
- D. Initial air monitoring shall be conducted according to the Initial Area Monitoring Plan.

### 10.3. Continuous Hot Work Air Monitoring (Class 1 Areas)

- A. PSI or SSI Hot Work in Class 1 Areas requires continuous air monitoring while the PSI or SSI Hot Work is being performed.
- B. PSI Hot Work in Class 1 Areas requires attended continuous air monitoring by the Authorized Gas Tester while the hot work is being performed. The Authorized Gas Tester should survey the perimeter of the work area at least once an hour.

*Note:* The use of several air monitors around the hot work should be considered, depending on the work location.

*Note:* Readings from continuous air monitoring and hourly surveys are not required to be recorded on the Hot Work Checklist.

### 10.4. Air Monitoring (SSI Class 1)

- A. Initial air monitoring shall be performed prior to conducting SSI hot work in Class 1 areas.
  - 1. Before a vehicle or equipment that is not intrinsically safe is allowed to enter the Class 1 area, an Authorized Gas Tester shall survey the area along the planned path of the vehicle or equipment to its destination.
  - 2. Only when flammability readings are less than 10% of the LEL can the vehicle or equipment proceed into the classified area.
- B. Non-attended continuous air monitoring is required while performing SSI hot work in Class 1 areas.
- C. If hot work is suspended and the worksite is left unattended, repeat air monitoring shall be conducted before recommencing SSI Class 1 hot work.
- D. Performing SSI Class 1 Hot Work for multiple Class 1 areas (e.g. lawn mowing multiple tank dikes at a facility, corrosion surveys) can be performed using a single Permit to Work as long as the following requirements are adhered to:
  - a) The full scope of the hot work to be performed is defined on the permit (e.g. lawn mowing tank dike 3, 5, & 7).
  - b) Initial air monitoring is performed prior to introducing the ignition source.

- c) Continuous air monitoring is performed for each Class 1 area.

## 10.5. Initial Area Monitoring Plan

- A. An Initial Area Monitoring Plan shall be developed before PSI Hot Work in a Class 1 Area is performed.
- B. The Area Monitoring Plan shall be documented in Section A of the Hot Work Checklist or can be attached to the PTW for SSI Class 1 Hot Work.
- C. The following information shall be included in the initial Area Monitoring Plan:

- 1. The area that will be monitored by the Authorized Gas Tester
  - a) A 35-foot radius from the point of the PSI Hot Work.
- 2. Potential sources of flammable gas within the area to be monitored.

*Note:* Examples of potential sources of flammable gas include sumps, drains, flanges, valves, liquid boots, excavations, and all confined areas and equipment located within them, such as floating roof pontoons, piping, excavations, and vessels.

- 3. The wind direction.

## 10.6. LEL Mitigation Plan

The LEL Mitigation Plan documents the location of confirmed sources of flammable gas and the controls needed to reduce the LEL reading to less than 10%.

- A. An LEL Mitigation Plan shall be developed and implemented if the presence of flammable gas is detected (LEL > 0%) at any time prior to or during hot work.
- B. For SSI Hot Work in a Class 1 Area, the LEL Mitigation Plan should be attached to the PTW.
- C. If at any time the LEL reading is  $\geq 10\%$  of the LEL, the hot work shall stop immediately and shall not be allowed to resume until controls are implemented to reduce the LEL level to less than 10% and the Asset Operator / Asset Operator Designee approves changes to the Checklist.
- D. The LEL mitigation plan shall reduce and / or maintain the LEL to less than 10% and shall include the following information:
  - 1. The percent LEL that was detected.
  - 2. The identified source(s) of the flammable gas within the hot work area.
  - 3. The controls, if any, that shall be implemented to effectively reduce the flammability level to less than 10% of the LEL within the hot work area.
  - 4. The percent LEL measured after controls, if any, have been implemented.

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# 11. Fire Watch

- A. A Fire Watch shall be required for PSI Hot Work in Class 1 or Non-Class 1 Areas within 35 feet of unprotected combustible materials. A Fire Watch is not required for PSI work in a Designated Area.
- B. The Fire Watch shall be in the ready position at all times while PSI hot work is being performed. The ready position consists of:
  - 1. being attentive to the hot work being performed;
  - 2. having the fire extinguisher in position at the job site prior to the start of work; and
  - 3. maintaining a line of sight to the hot work being performed
- C. A second Fire Watch shall be required if one Fire Watch cannot directly observe combustible materials that could be ignited by the hot work operation.

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## 12. Training and Competency

- A. All personnel serving in roles listed in Section 5 of this policy shall complete training in the requirements of this policy. The following persons shall complete additional training:
1. Authorized Gas Testers—shall be trained in the use of the air monitoring equipment they will be operating.
  2. Fire Watch—shall be trained in the selection and use of fire extinguishers including a hands-on component.

*Note:* Refer to the USPL Control of Work Training and Competency matrix for specific training requirements.

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## 13. References

1. American Petroleum Institute, API Recommended Practice 500, "Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2," 2nd ed., November 1997.
2. American Petroleum Institute, API Recommended Practice 2009, "Safe Welding, Cutting, and Other Hot Work Practices in the Petroleum and Petrochemical Industries," 7th ed., February 2002.
3. BP GP 44-60, "Guidance on Practice for API RP 500 Area Classification."
4. *Facility Hazardous Area Classification* diagrams.
5. National Fire Protection Association, NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," 2002.
6. National Fire Protection Association, NFPA 51B, "Standard for Fire Prevention during Welding, Cutting, and Other Hot Work," 2003.
7. OSHA, U.S. Department of Labor, 29 CFR 1910.252, "Welding, Cutting, and Brazing: General Requirements."
8. National Fire Protection Association, NFPA 101, "Life Safety Code," 2012.

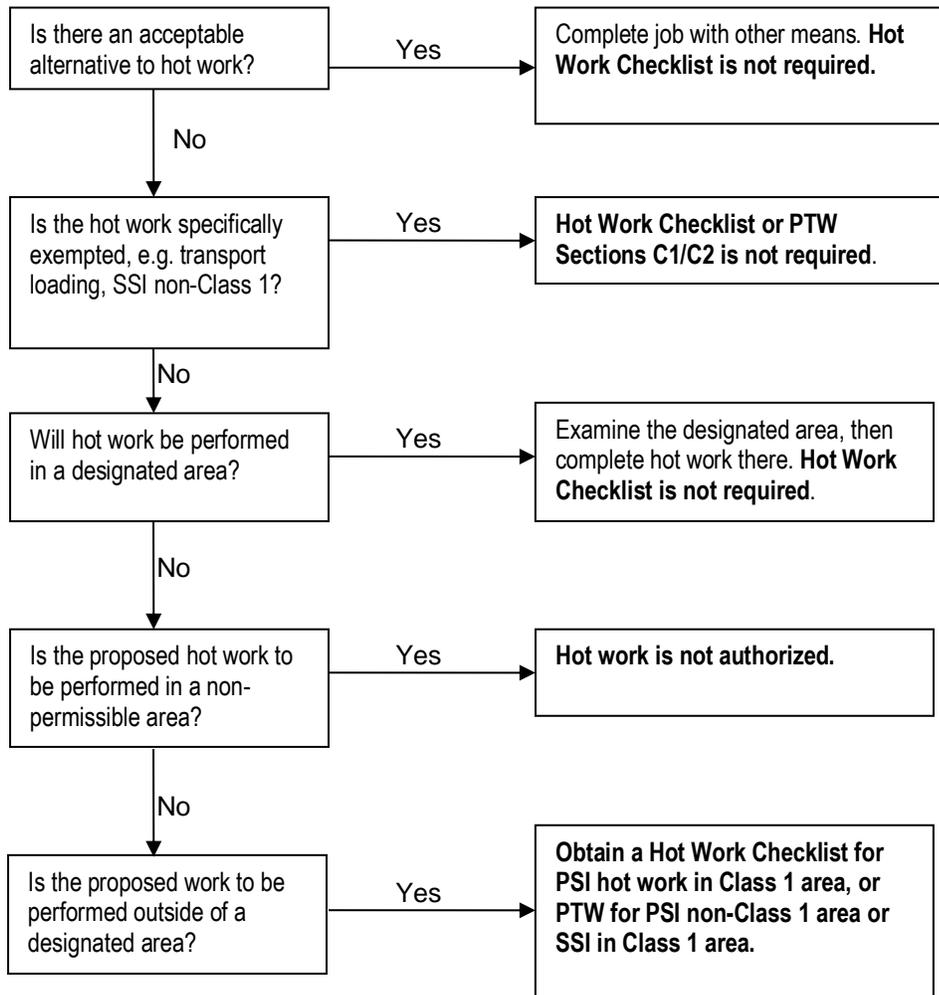
# Appendix I

## Hot Work Checklist

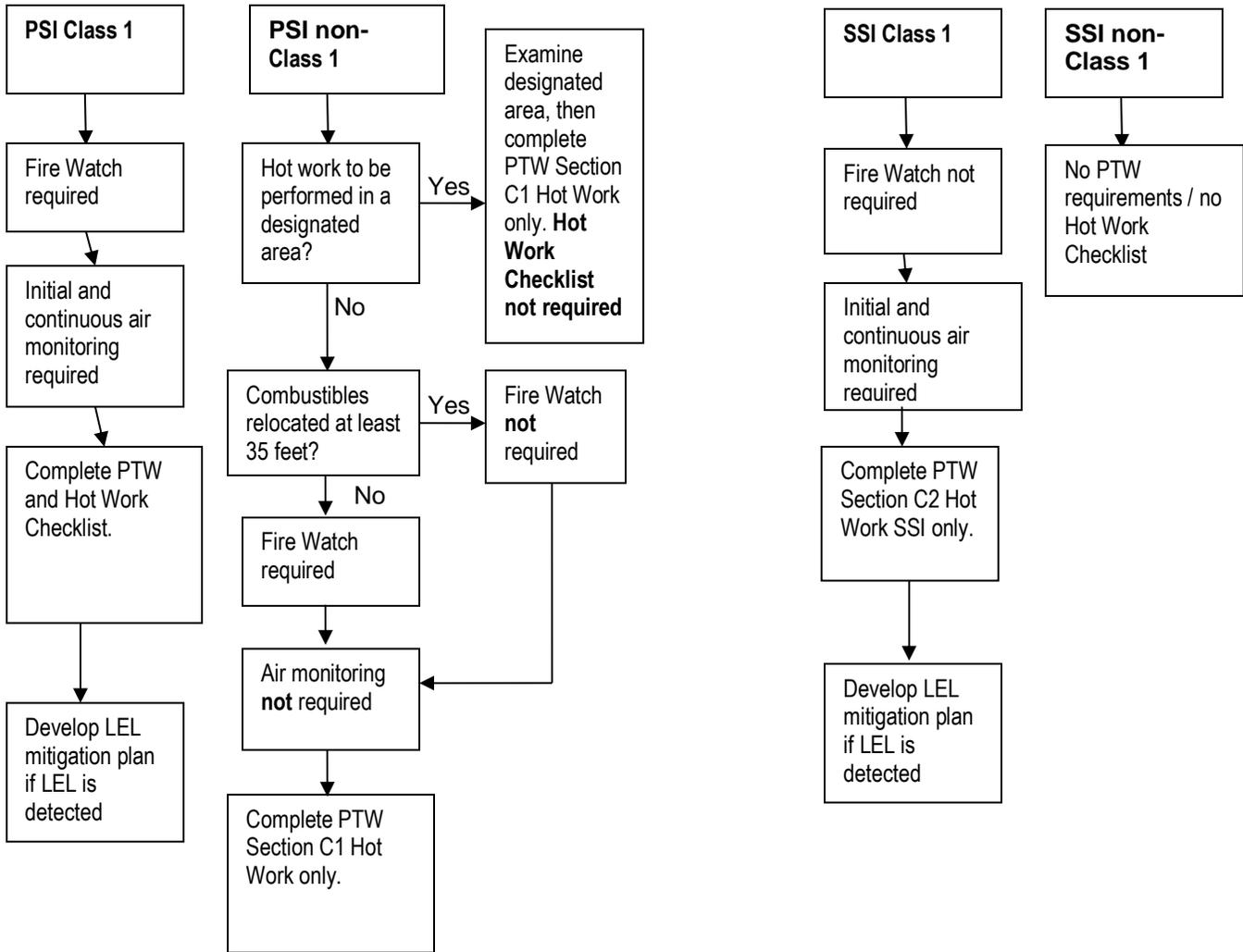
This example of the Hot Work Checklist is for reference only. Yellow highlighting represents revisions made to the Checklist and will not appear on the printable form. For a downloadable version of the Checklist, go to DRM. The electronic version can be filled out online or printed and completed as hard copy.

HW Hot Work PSI Checklist		HW - <input type="text"/>		
Issue Date <input type="text"/>		AGT Name <input type="text"/>		
		Fire Watch Name <input type="text"/>		
Section A - General Information	Work Description (include tasks, locations, and affected equipment)			
	<input type="text"/>			
Section A - General Information	List the potential sources of flammable gas within the monitored area.	Wind Direction <input type="text"/>		
	<input type="text"/>			
Section B - Area Atmospheric Monitoring	<b>Air Monitoring Plan</b>	NA	No	Yes
	A minimum of 35 ft radius is monitored for potential sources of flammable gas.			<input type="checkbox"/>
	Initial air monitoring completed.			<input type="checkbox"/>
	Continuous air monitoring is in place.			<input type="checkbox"/>
	O <sub>2</sub> is between 19.5% - 23.5%			<input type="checkbox"/>
Section B - Area Atmospheric Monitoring	LEL is 0%		<input type="checkbox"/>	<input type="checkbox"/>
	<b>LEL Mitigation Plan (if initial LEL results &gt; 0%)</b>	<input type="checkbox"/>		
	Mitigation plan completed.	<input type="checkbox"/>		<input type="checkbox"/>
Section C - Preparation for PSI Hot Work	L2 HTRA control measures effective. If "No", then include changes on the L2 HTRA "Changes, and Additional Hazards and Risk Control Measures" page.		<input type="checkbox"/>	<input type="checkbox"/>
	Fully charged 20 lbs. minimum fire extinguisher available at the job site.			<input type="checkbox"/>
	Grounding and bonding in place.	<input type="checkbox"/>		<input type="checkbox"/>
	Combustible materials within 35 ft are relocated, shielded, or protected from ignition.	<input type="checkbox"/>		<input type="checkbox"/>
	Measures taken to protect personnel from shock if arc welding equipment is to be used.	<input type="checkbox"/>		<input type="checkbox"/>
	Openings and cracks are shielded for indoor hot work to prevent the passage of sparks.	<input type="checkbox"/>		<input type="checkbox"/>
	Ducts, drains, and sewers within 35 ft are shielded to prevent the passage of sparks.	<input type="checkbox"/>		<input type="checkbox"/>
	Container cleaned or precautions taken to keep material from being exposed to an ignition source if hot work is performed in or on any container previously containing flammable material.	<input type="checkbox"/>		<input type="checkbox"/>
Ventilation plan or supplied air respirators used if welding, cutting, or brazing on hazardous metals (e.g. galvanized, stainless, chrome-moly, metals containing lead beyond impurity).	<input type="checkbox"/>		<input type="checkbox"/>	
Fire alarms / suppression system disabled for hot work. If "No", then document the precautions taken below.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Precautions:	<input type="text"/>			

## Appendix II Hot Work Checklist Applicability

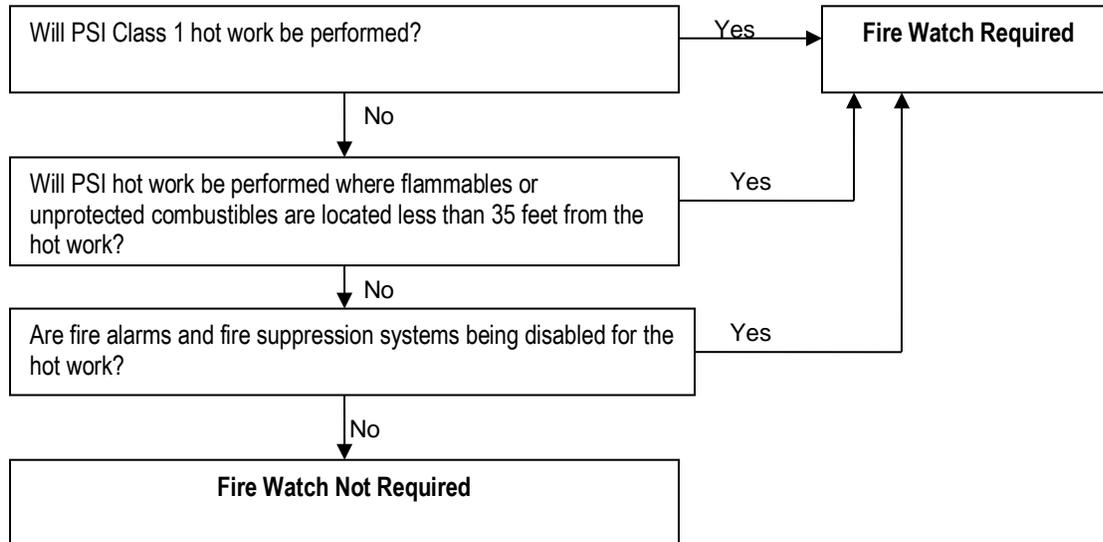


## Appendix III Hot Work Checklist Requirements



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## Appendix IV Situations Requiring a Fire Watch



## Appendix V General Mechanical Ventilation Guidance for Welding, Cutting and Brazing in Confined Spaces or Partially Enclosed Spaces

The following table provides guidance in determining the appropriate fan/blower configuration to achieve the required 2,000 cfm per welder:

No. of Fans or Horns	Size/Type of Fans or Horns with Minimum CFM Ratings per Number of Welders in the Confined Space	Maximum Number of Welders in a Confined Space
1	20" air-driven entryway-mounted reaction fan = 10,000 cfm	4
2	20" air-driven entryway-mounted reaction fan = 20,000 cfm	8
3	20" air-driven entryway-mounted reaction fan = 30,000 cfm	12
1	24" air-driven entryway-mounted reaction fan = 15,000 cfm	6
2	24" air-driven entryway-mounted reaction fan = 30,000 cfm	12
1	Model 3 HP Coppus air horn = not adequate cfm	0
2	Model 3 HP Coppus air horn = 2,500 cfm	1
3	Model 3 HP Coppus air horn = 2,500 cfm	1
1	Model 6 HP Coppus air horn = 2,500 cfm	1
2	Model 6 HP Coppus air horn = 7,500 cfm	3
3	Model 6 HP Coppus air horn = 12,500 cfm	5
1	Model 8 HP Coppus air horn = 5,000 cfm	2
2	Model 8 HP Coppus air horn = 10,000 cfm	4
3	Model 8 HP Coppus air horn = 17,500 cfm	7
1	Model 9 HP Coppus air horn = 7,500 cfm	3
2	Model 9 HP Coppus air horn = 15,000 cfm	6
3	Model 9 HP Coppus air horn = 22,500 cfm	9

The maximum number of welders allowed in a confined space or partially enclosed space in the above table was calculated using the total airflow (cfm) provided by the manufacturer for each model of air mover. An inlet air pressure of 80 psi to drive the air movers was used. This must be maintained at the site for all the air movers. Because of ventilation inefficiencies and losses due to entryway attachments, internal airflow restrictions, and variations in the actual air inlet pressure, a safety factor of 0.75 was incorporated into the equation to determine the maximum number of welders.

There must be enough fresh, breathable, makeup air entering the confined space or partially enclosed space to balance the volume being exhausted to effectively "flush" the space with clean air. Consequently, some entryways and nozzles should be left open to allow clean air to enter the space. Open entryways and nozzles should preferably be located at the lower levels and the exhaust air fans/blowers at higher levels above the work. Most welding fumes

are heavier than air and adding ducting near the floor or work area to the Coppus-type fan is recommended to move the fumes away from the welder.